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Environmental Consultants

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIR)

in terms of the Environmental Impact Assessment Regulations, 2014, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

File Reference Number: 14/12/16/3/3/2/2167

Project Title:

The development of a 400 MW Solar Photovoltaic (PV) facility and associated infrastructure (Phase 3) on the Remainder of Farm Goede Hoop 26C, Portion 3 of Farm Goede Hoop 26C and other properties, between De Aar & Hanover, Emthanjeni Local Municipality, Pixley Ka Seme District Municipality, Northern Cape Province, South Africa.

Prepared for

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November 9, 2022

(Draft for Comment)

DOCUMENT CONTROL

Table 1. Document Control.

COMPILED/REVISED BY	STATUS	REVISION	REVIEWED/ APPROVED BY	DISTRIBUTED ON
Shannon Farnsworth	Draft	00	Shaun MacGregor	10 November 2022

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
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Table 2. General Site Information

SITE	
21-digit Surveyor General codes of all affected farm portions	Non-linear Infrastructure Development (Solar PV facility) • Remainder of Farm Goede Hoop 26C — C03000000000002600000 • Portion 3 of Farm Goede Hoop 26C — C03000000000002600003 Linear Infrastructure – overhead distribution line: • Remainder of Farm Goede Hoop 26C — C03000000000002600000 • Portion 3 of Farm Goede Hoop 26C — C03000000000002600003 • Remainder of Farm Kwanselaarshoek 40C — C03000000000004000000 • Portion 1 of Farm Kwanselaarshoek 40C — C03000000000004000001 • Portion 2 of Farm Kwanselaarshoek 40C — C03000000000004000002 • Portion 4 of Farm Taaibosch Fontein 41C — C03000000000004100004
Photos of areas that give a visual perspective of all parts of the site	Appendix B

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PV FACILITY PRELIMINARY DESIGN SPECIFICATIONS	
Component	**Description/Dimensions**
PV Modules	
PV Modules	The applicant, Soventix SA (Pty) Ltd will use Bifacial Mono Perc modules. Each module is approximately 2.2 by 1.1 m (or 2,42 m^2) in size. Modules are connected to form arrays. Several arrays are then connected to an inverter. Inverters convert the voltage from direct current (DC) to alternating current (AC). The inverters are cabled to field transformers. The field transformers then transfer and increase (step up) the voltage of the alternating-current circuit to Eskom's electrical grid via an onsite substation.
Arrays (or racks)	Two rows of approximately twenty-three to twenty-six modules each will be mounted onto a single-axis tracker and supported by steel or aluminium racks. Consequently, each rack would accommodate approximately 125.84 m^2 (or a total of 270 m^2 including spaces between panels) of panel. The racks are arranged in parallel, approximately 9,5 m apart (between piles). The results of a geotechnical assessment will determine whether the racks are held in place by either a ballast or piled foundation. Solar arrays will be orientated in a northern direction and track the sun from east to west. As far as possible, arrays will be arranged in four or five blocks of approximately 150 ha each. Each block can produce up to 140MW but under current legislation will be capped at 100MW.
Inverters	There will be three to four inverters per MW depending on the inverter technology available at the time of the Notice to Proceed. (300 to 400 inverters per 100 MW block, or 1200 to 1600 inverters for 400 MW).
Field Transformers	Depending on the inverter technology available and transformer size chosen, approximately 27 inverters are connected to a field transformer, and there will be approximately twelve field transformers per 100MW. Fewer field transformers will be required if larger units are installed.
Height of PV Panels	The arrays will be placed over the vegetation. The solar panels sit in two in portrait (not landscape – they are rectangular shaped), so from the centre pivot point, 2.274 m each way (as each panel is 2.274 m long). They stow overnight horizontally, that is at zero tilt to reduce wind loading See cross-section drawing of horizontal panel on right of figure below. The height of the array above the ground in the stow position is ± 2 m. The solar panels cannot move to a vertical (90º) position. The maximum tilt at sunrise (east-facing) and sunset (west-facing) is 45º to 55°, so the ground clearance and maximum height during these brief periods will be 0.3 m and 3,822 m. The maximum and minimum height is the starting position and ending position at sunrise and after sunset, respectively.

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	Soventix SA (Pty) Ltd is working with the mounting structure supplier to increase the minimum height, however the maximum height will not exceed 4 m.
PV Block 1	
Area of PV Array (Block)	Approximately 265 ha
Number of inverters required	Approximately 495 X 330kW Inverters
Number and capacity of transformers required	Approximately 18 transformer stations Capacity: Approximately 9MVA each
Area occupied by inverter and transformer stations.	Area of inverters: Approximately 250 m² Area of Transformers: Approximately 580 m²
Length & width of two-track internal roads between solar arrays.	Length (m): Approximately 205 500 m Width (m): No wider than 2 m
Length & width of cleared/graded internal access roads to inverters & transformers.	Length (m): Approximately 8 950 m Width (m): Approximately 5 – 6 m
Length and capacity of underground water pipeline from Borehole No. 5 to livestock watering trough.	Location: Refer to Appendix A Length (m): Approximately 500 m Width (of servitude) (m): 0.6 m Depth of trench (m): 0.8 m Design and capacity: Underground pipelines from three (3) boreholes to their respective deionization plants and water storage tanks, as well as livestock watering troughs, will cross a watercourse.
Area occupied by permanent laydown area.	N/A for PV Block 1
Length, height, and type of fencing around PV Block.	Description: The facility will be fenced off with a galvanised diamond razor mesh security fence that is 1.8 m high. Where the sand is soft enough to tunnel under, the fence will be embedded 300 mm into the ground. Access will be controlled using a security gate. It is planned to maintain continuity throughout the ephemeral drainage line by installing the perimeter fence around each PV block approximately 1 m outside the demarcated 50 m ecological buffer. A 9 m-wide fire break, comprising a constructed road with mowed vegetation will be created inside the perimeter fence. The road will be located within 2 m of the perimeter fence (as per the recommendation by the Avian specialist). The fire break will be extended by mowing 1 m of vegetation beyond the perimeter fence, that is until the 50 m ecological buffer.

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	Perimeter of fence around PV Block 1: 6 480 m
PV Block 2	
Area of PV Array (Block)	Approximately 170ha
Number of inverters required	Approximately 426 X 330kW Inverters
Number and capacity of transformers required	Approximately 18 transformer stations Capacity: Approximately 9MVA each
Area occupied by inverter and transformer stations.	Area of inverters: Approximately 250 m^2 Area of Transformers: Approximately 576 m^2
Length & width of two-track internal roads between solar arrays.	Length: Approximately 164 000 m Width: No wider than 2m
Length & width of graded internal access roads to inverters & transformers.	Length: Approximately 7 157 m Width: Approximately 5 - 6 m
Deionization plant and water storage tanks linked to Borehole No. 4	Number of tanks: Ten 10m^3 water tanks Total physical footprint of plant and tanks: 130 m^2
Length and capacity of underground water pipeline from Borehole No. 4 to plant and livestock watering trough.	Location: Refer to Appendix A Length (m): Approximately 230 m Width (of servitude) (m): 0.6 m Depth of trench (m): 0.8 m Design and capacity: Underground pipelines from three (3) boreholes to their respective deionization plants and water storage tanks, as well as livestock watering troughs, will cross a watercourse.
Deionization plant and water storage tanks linked to Borehole No. 5	Number of tanks: Ten 10 m^3 water tanks Total physical footprint of plant and tanks: 130 m^2
Length and capacity of underground water pipeline from Borehole No. 5 to plant.	Location: Refer to Appendix A Length (m): 220 m Width (of servitude) (m): 0.6 m Depth of trench (m): 0.8 m Design and capacity: Underground pipelines from three (3) boreholes to their respective deionization plants and water storage tanks, as well as livestock watering troughs, will cross a watercourse.

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Area occupied by permanent laydown area.	N/A for PV Block 2
Length, height, and type of fencing around PV Block.	Description: As above. Perimeter of fence around PV Block 2: Approximately 5 350 m
PV Block 3	
Area of PV Array (Block)	Approximately 190 ha
Number of inverters required	Approximately 470 Inverters
Number and capacity of transformers required	Approximately 18 Transformers Capacity: 9MVA each
Area occupied by inverter and transformer stations.	Area of inverters: Approximately 235 m^2 Area of Transformers: Approximately 576 m^2
Length & width of two-track internal roads between solar arrays.	Length: 181 000 m Width: No wider than 2 m
Length & width of graded internal access roads to inverters & transformers.	Length: Approximately 10 220 m Width: Approximately 5 - 6 m
Length and capacity of underground water pipeline from Borehole No. 4 to livestock watering trough.	Location: Refer to Appendix A Length (m): Approximately 200 m Width (of servitude) (m): 0.6 m Depth of trench (m): 0.8 m Design and capacity: Underground pipelines from three (3) boreholes to their respective deionization plants and water storage tanks, as well as livestock watering troughs, will cross a watercourse.
Area occupied by permanent laydown area.	N/ A for PV Block 3
Length, height, and type of fencing around PV Block.	Description: As above Perimeter of fence around PV Block 3: Approximately 6 440 m
PV Block 4	
Area of PV Array (Block)	Approximately 26 ha
Number of inverters required	Approximately 49 inverters
Number and capacity of transformers required	Approximately 3 Capacity: 6MVA each

Area occupied by inverter and transformer stations.	Area of inverters: Approximately 25 m^2 Area of Transformers: Approximately 96 m^2
Length & width of two-track internal roads between solar arrays.	Length: Approximately 18 870 m Width: No wider than 2m
Length & width of graded internal access roads to inverters & transformers.	Length: Approximately 2 500 m Width: Approximately 5 - 6 m
Deionization plant and water storage tanks linked to Borehole No. T1 or T2	Number of tanks: Ten 10 m^3 water tanks Total physical footprint of plant and tanks: 130 m^2
Length and capacity of underground water pipeline from Borehole No. T1 or T2 to plant and livestock watering trough.	Location: Refer to Appendix A Length (m): Approximately 900 m Width (of servitude) (m): 0.6 m Depth of trench (m): 0.8 m Design and capacity: Underground pipelines from three (3) boreholes to their respective deionization plants and water storage tanks, as well as livestock watering troughs, will cross a watercourse.
Area occupied by operational area	Description: The operational area comprises a controlled access (security gate), single-storey building, unpaved parking, and a sewerage treatment plant(s). The building shall be constructed from brick with metal sheet roofing and include space for an office, showers (incl. change rooms), toilets, medical room, control room, kitchen, storeroom, and workshop. Approximately 1.3 ha
Area occupied by buildings in operational area	Approximately 718 m^2
Capacity of and area occupied by on-site substation	All four 100 MW blocks will feed into an on-site substation. A 10 to 15 m lightning mast will be erected within proximity to the on-site substation. Capacity: Approximately 500 MW Area (m^2): Approximately 8 516 m^2
Proximity to grid connection (km)	7.6 km
Area occupied by construction laydown area (inside operational area)	Approximately 1.3 ha
Length, height, and type of fencing around PV Block.	Description: The facility will be fenced off with a galvanised diamond razor mesh security fence. Where the sand is soft enough to tunnel under the fence is embedded 300 mm into the ground and is 1.8 m high. Access will

	be controlled using a security gate. A 10 m-wide fire break, comprising a constructed road plus mowed vegetation will be created inside the perimeter fence. It is planned to maintain continuity throughout the watercourse by keeping the perimeter fence around each PV block outside the demarcated ecological buffer. Perimeter of fence around PV Block 4: Approximately 2 537 m
Roads	
Two-track roads	Description: Approximately two 2 m wide two-track access roads totalling an estimated 553 km will be placed between the parallel arrays during the construction phase. It is assumed that the total length of two-track access roads will be equal to the total length of solar arrays, that is 553 km.
Cleared/graded roads	Description: Existing roads will be upgraded (graded, imported material, shaped for runoff, and compacted), including the servitude road under the Eskom 132 kV powerline. New roads will also be built (graded, imported material, shaped for runoff, and compacted) to access the construction camp, operational area, components of the PV system, such as the field transformers, on-site substation, and distribution line. Except for passing lanes, upgraded and new access roads will be approximately 5 – 6 m wide and total an estimated ± 5 km and ± 35.6 km under the Eskom power lines between the Dx and the MTS (2.5 km from Dx to road and then 5.1km to the MTS), respectively.
Road Crossings	Six (6) road crossings will be required to access the four different PV Blocks of the Solar PV facility, which is fragmented by the watercourse. Two of the crossings are existing and will therefore be expanded, whereas four of the road crossings will be new developments. All 6 road crossings will be combined with underground cables and/or water pipelines. Pre-cast box culverts or pipes will be required for the road crossings. The 132 kV distribution line, including a service road within the 22 m-wide servitude, will cross two watercourses. The first watercourse crossing is 151 m wide, whereas the second watercourse south of the railway line is a braided channel, comprising 4 crossings (811 m, 574 m, 499 m and 76 m wide).
Passing Lanes	Passing lanes which will widen the total road width up to 8 m wide and ± 30 m long will be placed at strategic areas on existing or new roads. No passing lanes are permitted within the 50 m ecological buffer of any watercourse.
Roads within 100 m of the watercourse	
Upgrading (expanding) existing roads within 100 m of the watercourse.	Existing two-track dirt roads will be widened to a total width of 6 m within 100 m of two existing road crossings over the ephemeral drainage line.

The addition of Passing Lanes on existing roads within 100 m of the watercourse.	Sections of existing two-track dirt roads will be widened to create passing lanes up to 8 m wide and approximately 30 m long.
Road Crossings **within watercourse bank to bank as delineated by aquatic specialist**	
Upgrading (& expansion) of existing two-track road crossings	Location: PV Block 2 to PV Block 3 Length (m): 325 m Road will be widened by: ±4 m Area of expansion (m^2): 1300 m^2 (the 2 m wide two-track dirt road will be widened to 6 m) Width of road after expansion: 6 m Location: PV Block 3 to PV Block 1 Length (m): 342 m Road will be widened by: ±4 m Area of expansion (m^2): 1368 m^2 (the 2 m wide two-track dirt road will be widened to 6 m) Width of road after expansion: 6 m Design: Construction activities include grading, importing road material, shaping for runoff, and compacting. Precast box culverts or pipes will also be required for these road crossings.
Development of new road crossings:	Location: PV Block 1 to PV Block 2 Area of physical footprint (m^2): Up to 4 200m^2 Length (m): 700 m Width (m): Up to 6 m Location: PV Block 1 to PV Block 4 Area of physical footprint (m2): Up to 1 620 m^2 Length (m): 270 m Width (m): Up to 6 m Location: PV Block 3 to PV Block 4

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	Area of physical footprint (m^2): Up to 1 836 m^2 Length (m): 306 m Width (m): Up to 6 m Location: Distribution Line Area of physical footprint (m^2): Up to 1 890 m^2 Length (m): 315 m Width (m): Up to 6 m Design: Construction activities include grading, importing road material, shaping for runoff, and compacting. Precast box culverts or pipes will also be required for these road crossings.
Cable crossings **within watercourse bank to bank as delineated by aquatic specialist**	
Cable Crossings adjoining road crossings: location, capacity, and length.	Location: PV Block 1 to PV Block 2 Area of physical footprint (m^2): Up to 2 100 m^2 Length (m): 700 m Width (m): Up to 3 m Location: PV Block 2 to PV Block 3 Area of physical footprint (m^2): Up to 975 m^2 Length (m): 325 m Width (m): Up to 3 m Location: PV Block 3 to PV Block 1 Area of physical footprint (m^2): Up to 1 035 m^2 Length (m): 345 m Width (m): Up to 3 m Location: PV Block 1 to PV Block 4 Area of physical footprint (m^2): Up to 810 m^2 Length (m): 270 m

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	Width (m): Up to 3 m Location: PV Block 3 to PV Block 4 Area of physical footprint (m^2): Up to 918 m² Length (m): 306 m Width (m): Up to 3 m Location: Distribution Line Area of physical footprint (m^2): Up to 10 080 m² Length (m): 315 m Width (m): Up to 22 m Depth of trench (m): Up to 2 m Design: Some of the underground cables from the field transformers to the on-site substation will cross a watercourse.
Distribution Line	
Description	The planned 132 kV distribution line will intersect an existing Eskom distribution line (Bletterman/Taaibos 1, 132 kV Overhead Line) and two watercourses en route to the MTS at Phase 1.
Length and width of servitude	The distribution line is 20 m high, and the servitude width is 22 m.
Capacity (kilovolts) and height of structure	Description: The field transformer voltage is 33kV. It's unlikely that 33kV will be sufficient to evacuate the full phase 3 capacity (up to 500 MW). It would imply that the distribution voltage from the respective phases would then be at a higher voltage, planned with Eskom to be 132 kV. Consequently, the substation on Phase 3 will be linked to the Main Transmission Substation (MTS) on Phase 1 via a 132 kV distribution line. Capacity: 132 kV Height (m): 20 m
Total number of pylons: Total physical footprint of each pylon (m^2). Number of pylons in each of the two watercourses (bank to bank). Total volume of foundation (for the footings of the pylons)	This information will only become available once the overhead line design has been done taking into account the topographical layout of the area and the minimum required height to ground of the slack point of the conductor which will in turn determine the inter-pylon spacing and resultant quantities.

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in each of the two watercourses (bank to bank).	
Service Road under distribution line	Length: 7.6 km from Dx to MTS Width: Up to 6 m Design: Construction activities include grading, importing road material, shaping for runoff, and compacting.
External Access Roads	
Expansion of Eskom Service Road underneath its 132 kV powerline	Length (m): 2 630 m Original width (m): ±2 m Expanded by (m): ±4 m Physical footprint of expanded area (m^2): 10 520m^2
Expansion of farm road through Phase 2 (linking Eskom service Road to District Road)	The planned Eskom service road from Phase 3 to the MTS intersects with the District Road and therefore no expansion of the farm road is anticipated.
Expansion of District gravel road along Transnet railway line.	No expansion of the District gravel road is anticipated. The road surface will be improved through grading, compacting and general maintenance to facilitate the additional use for the construction phase.
Cleared Areas (physical footprints)	
Vegetation clearance	Vegetation will be cleared from the physical footprint of the: (a) Construction camp (including construction/operational laydown area) Approximately 8 627 m^2 within operational area. (b) Inverters (n=2 000): Approximately 1 000 m^2 (c) Field transformers (n=80): Approximately 2 560 m^2 (d) On-site substation (n=1): Approximately 8515 m^2 (e) Rack foundations/piles to support the solar arrays: Approximately 5 350 m^2 (f) Pylon footings: unknown at this stage (g) Underground cables: Approximately 380 000 m^2 - NOTE that this allows for individual trenches but the final layout will use less space because trenches will invariably be shared by more than one cable. (h) Underground water pipes: Approximately 2 500 m^2 (i) Two-track roads: Approximately 553 000 m^2 (j) Cleared/graded roads: Approximately 227 016 m^2 (k) Fire-break Road in each PV Block: Up to 201 710 m^2

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	(l) Fencing posts: Approximately 170 m² (m) Operational area: 1.3 ha (n) Borrow pit: 2 ha (o) Water storage tanks and deionization plant(s): Approximately 400 m²
Borrow Pit	
Borrow Pit	Description: Any fill material required for road construction will be obtained from existing borrow pits (no mining permit is required as per the exemption afforded in section 106 of the MRPDA) and/or a new borrow pit will be mined. Location: Refer to Appendix A Area: 2 ha

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CHECKLIST

Table 3. Content of EIA Report in terms of Appendix 3 of the EIA Regulations, 2017.

"An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-"		
	YES	NO
(a) details of-	**SECTION A**	
(i) the EAP who prepared the report; and	X	
(ii) the expertise of the EAP, including a curriculum vitae;	X	
(b) the location of the development footprint of the activity, on the approved site as contemplated in the accepted scoping report including-	**SECTION B**	
(i) the 21 digit Surveyor General code of each cadastral land parcel;	X	
(ii) where available, the physical address and farm name;	X	
(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	X	
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is -	**SECTION C**	
(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	X	
(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	N/A	
(d) a description of the scope of the proposed activity, including-	**SECTION D**	
(i) all listed and specified activities triggered;	X	
(ii) a description of the associated structures and infrastructure related to the development;	X	
(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	**SECTION E**	
	X	
(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	**SECTION F**	
	X	
(g) a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	**SECTION G**	
	X	

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(h) a full description of the process followed to reach the proposed development footprint within the approved site, as contemplated in the accepted scoping report, including;	**SECTION H**	
(i) details of all the development footprint alternatives considered;	X	
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	X	
(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	X	
(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	X	
(v) the impacts and risks identified 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;	X	
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	X	
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	X	
(viii) the possible mitigation measures that could be applied and level of residual risk;	X	
(ix) if no alternatives development footprints for the activity were investigated, the motivation for not considering such and	X	
(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	X	
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including—	**SECTION I**	

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(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	X	
(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	X	
(j) an assessment of each identified potentially significant impact and risk, including-	**SECTION J**	
(i) cumulative impacts;	X	
(ii) the nature, significance and consequences of the impact and risk;	X	
(iii) the extent and duration of the impact and risk;	X	
(iv) the probability of the impact and risk occurring;	X	
(v) the degree to which the impact and risk can be reversed;	X	
(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and	X	
(vii) the degree to which the impact and risk can be mitigated;	X	
(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	**SECTION K**	
	X	
(l) an environmental impact statement which contains-	**SECTION L**	
(i) a summary of the key findings of the environmental impact assessment:	X	
(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and	X	
(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	X	
(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	**SECTION M**	
	X	
(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	**SECTION N**	
	X	
(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	**SECTION O**	
	X	

(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	**SECTION P**	
	X	
(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	**SECTION Q**	
	X	
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	**SECTION R**	
	X	
(s) an undertaking under oath or affirmation by the EAP in relation to -	**SECTION S**	
(i) the correctness of the information provided in the reports;	X	
(ii) the inclusion of comments and inputs from stakeholders and I&APs;	X	
(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and	X	
(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	X	
(t) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	**SECTION T**	
	N/A	
(u) an indication of any deviation from the approved scoping report, including the plan of study, including-	**SECTION U**	
(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	N/A	
(ii) a motivation for the deviation;	N/A	
(v) any specific information that may be required by the competent authority; and	**SECTION V**	
	N/A	
(w) any other matter required in terms of section 24(4)(a) and (b) of the Act.	**SECTION W**	
	N/A	

(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report the requirements as indicated in such notice will apply.

EXECUTIVE SUMMARY

Introduction

ECOLEGES Environmental Consultants was appointed by Soventix South Africa (Pty) Ltd as the Environmental Assessment Practitioner to undertake the Scoping and Environmental Impact Assessment (S&EIA) for the proposed development of a 400 MW solar photovoltaic (PV) facility (Phase 3) located between De Aar & Hanover in the Northern Cape.

The National Department of Environmental Affairs granted an environmental authorisation with DEA Reference: 14/12/16/3/3/2/998 on 16th April 2018 (including two amendments in 2020 and 2021) for a 300 MW solar photovoltaic (PV) facility known as Phase 1. The applicant intents to develop two more 300 and 400 MW facilities (Phases 2 and 3, respectively). The two additional Solar PV will feed into the authorised sub-station on Phase 1. The required expansion of the substation footprint will require a third (Part 2) amendment to the existing environmental authorisation (DEA Reference: 14/12/16/3/3/2/998).

The Final Scoping Report was submitted to the competent authority for decision-making on the 22nd of July 2022 in accordance with Regulation 21 (1) of GN R 326. A decision to accept the scoping report was made by the competent authority on 02 September 2022, in line with Regulation 22 of the EIA Regulations.

Locality

The proposed development is located approximately 35km South East of the town of De Aar in the Northern Cape. The property details are the Remainder of Farm Goede Hoop 26C, Portion 3 of Farm Goede Hoop 26C and other properties (overhead distribution line), between De Aar & Hanover which occur within the Emthanjeni Local Municipality, and the Pixley Ka Seme District Municipality**.**

Brief Project Description

The size of the proposed development footprint for Phase 3 (a 400 MW solar PV facility) is approximately 650 ha. The facility is located 35 km Southeast of the town of De Aar within the Emthanjeni Local Municipality, and the Pixley Ka Seme District Municipality of the Northern Cape. The property details are the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C.

The solar PV facility will be managed as an ‘Agrivoltaic’ system by combining current land use practices, specifically extensive livestock (sheep) production with green energy generation, simultaneously supporting the agricultural and energy industries.

Phase 3 will be built sequentially in 4 x 100 MW blocks. That way it is possible to limit the amount of people on site, as well as mitigate the need for excessive amounts of equipment, storage etc. There will also be some overlap between construction and operation. Once the first 100 MW block is complete, it will start feeding electricity into the national grid while the second and subsequent 100 MW blocks are being built. Consequently, construction items from fencing and roads to the on-site substation and operational offices must be completed first under the civil construction phase, generally 4 to 6 months. Subsequent construction of each 100 MW block typically takes 12 to 15 months from start to finish (pers. comm. JP De Villiers, Managing Director, Soventix).

Listed and Specified Activities

An application for an EA has been submitted to the National Department of Forestry, Fisheries and the Environment (DFFE) in terms of the EIA Regulations, 2014 as amended to undertake listed activities 11, 12, 19, 28, and 48 of **Listing Notice 1** (GG No. 40772, GN No. 327, 07th April 2017), listed activities 14 and 18 of

Listing Notice 3 (GG No. 40772, GN No. 324, 07 April 2017), and listed activities 1 and 15 of **Listing Notice 2** (GG No. 40772, GN No. 325, 07 April 2017).

None of the listed and/or specified activities that were triggered, and which required environmental authorisation, specifically included the term '*and related operation*'. Consequently, the scope of the activities pertaining to this project does not include an operational (or decommissioning) component. All activities that are to be undertaken during the development of the 400 MW solar PV facility have been described for the planning and design, pre-construction, construction, and post-construction phases only. Pre-construction follows on from the final project planning and tender phase and leads up to the establishment of the appointed contractor on site.

Specialist Studies

The following specialist's studies have been identified and form part of the S&EIA process: Agricultural Agro-Ecosystem, Terrestrial Biodiversity, Animal and Plant Species, Avifauna, Bat Impact, Aquatic Biodiversity, Archaeological & Cultural Heritage, Palaeontological, Visual Impact, Hydrology, Geotechnical, Geo-Hydrological, Socio-Economic and Traffic Impact (**Appendix E**). None of the specialist studies identified any fatal flaws. All specialists' studies have recommended the development subject to proposed mitigation measures which have been incorporated into the Environmental Management Programme (EMPr) attached as **Appendix F**.

Public Participation

The level of public participation was determined by taking into account the scale of the anticipated impacts of the proposed development, the sensitivity of the affected environment and the degree of controversy of the project, and the characteristics of the potentially affected parties. Based on the findings of the above considerations, and taking cognisance of the Covid-19 pandemic, it was decided to fulfil the minimum requirements of the public participation process outlined in the EIA Regulations, 2014.

Concerns raised by I&AP's have been captured in the Public Participation Process Report (**Appendix C**) as well as being addressed by the various specialists' assessments and mitigations thereof included in the EMPr (**Appendix F**).

Alternatives

The preferred alternative and no-go option were identified for further assessment under alternatives.

Preferred Alternative

Solar PV facilities have a specific suite of requirements limiting site alternatives. The location of this application is further constrained by the fact that it is the third phase of a larger (1 GW) development, and therefore needs to be within close proximity to the authorised (Phase 1) development, and specifically the Main Transmission Substation where the electricity will tie into the national grid.

As such, the preferred layout will not be determined by an assessment of potential alternative configurations but will be the product of a holistic and multi-disciplinary investigation, involving various online spatial planning tools and the site-specific findings and recommendations of all the specialist assessments.

No-go Option

The option of not implementing the activity is used as the benchmark against which all impacts associated with the proposed development were assessed. In this case, the no-go option would be to not rezone and develop Phase 3 to operate as an "Agrivoltaic" system and retain the land use for grazing sheep only.

Environmental Impacts Identified

Environmental aspects (or attributes) to be assessed as part of the environmental impact assessment process includes: Terrestrial & Avian fauna, Terrestrial flora, Aquatic fauna, Aquatic flora, Soil and Rock, Ground & Surface water, Atmosphere, Terrestrial Ecosystem, Aquatic Ecosystem, Economic, Social, Property, Land Use, Health & safety, Security, Public services, Visual aesthetics and Heritage and Culture.

An assessment of the preferred alternative site relative to the no-go alternative has shown that it is not only possible with mitigations to reduce the significance of environmental impacts to within acceptable limits, but in the case of the terrestrial ecosystem, even provide a powerful climate resilient land-use option that the no-go alternative (extensive livestock grazing only) cannot.

Conclusion

South Africa is currently in an energy crisis. President Cyril Ramaphosa's address to the nation on energy crisis on 25 July 2022 mentioned a set of actions namely: *"Firstly, are aimed at improving the performance Eskom's existing fleet of power stations. Secondly, will accelerate the procurement of new generation capacity. Thirdly, are intended to massively increase private investment in generation capacity".* Further, Minister of the Department of Forestry, Fisheries and Environment, Ms Barbara Creecy on 21 July 2022 announced initiatives for further streamlining the environmental assessment process for renewable energy projects in South Africa. The measures will improve the efficiency of the environmental assessment processes to facilitate the development of Solar PV and associated infrastructure in areas of low to medium environmental sensitivity. The initiatives to be implemented will exempt developers from obtaining environmental authorisation for certain listed or specified activities for the development of solar facilities. Whilst this particular application is not exempted under the above, these new initiatives clearly show Governments' intention to fast-track new energy generation projects in order to address the current energy crisis in the country.

Additionally, Southern Africa is witnessing an increased frequency and intensity in climate change-associated extreme weather events, causing water, food, and energy insecurity. The proposed development involving an 'Agrivoltaic' system can, if supported by sound ecological and water use management strategies, provide the kind of cross-sectoral climate change adaptation opportunity needed to respond to the challenge of climate change on the water-energy-food (WEF) nexus in Southern Africa.

Three concerns were identified during the scoping phase which included: sustainable yields of groundwater in the underground aquifer, the protection and restoration of NFEPA wetlands and a Strategic Water Source Area, and the impact on high levels of local scenic quality (Karoo landscape).

There is enough groundwater available on a sub-catchment level to sustain the proposed 8-hour abstraction from the designated boreholes and the sub- catchments they fall in. Provided the surplus estimates are not exceeded, the impact on the groundwater reserve will likely be minimum.

Potentially significant impacts to terrestrial biodiversity such as bat and avifauna, aquatic ecosystem and scenic quality can be mitigated through appropriate ecological, massing and visual sensitivity buffers to reduce the significance of environmental impacts to within acceptable limits or at a cost that is acceptable for the predicted justifiable socio-economic outcomes and building resilience to climate change.

In consideration of the investigated cumulative impacts, the nature and extent of the proposed development, compliance with the relevant legal, policy and planning documentation (i.e. "need and desirability") and the findings of the specialist studies, it is the opinion of Ecoleges that the proposed 400MW Solar PV Plant development is supported from an environmental perspective and should be considered for Environmental Authorisation, subject to the implementation of the identified buffers, mitigations and recommendations.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
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Annexure B: General Site Layout

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Annexure A: Generic EMPr's for the development of substation infrastructure, overhead electricity transmission and distribution infrastructure (as per Government Gazette No. 42323)

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ABBREVIATIONS AND DEFINITIONS

Table 4: List of terms for abbreviations and acronyms used in this document.

Abbreviation	Term
CA	Competent Authority
DEA	Department of Environmental Affairs (National)
DMR	Department of Mineral Resources
DENC	Department of Environment and Nature Conservation (Northern Cape)
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EIAr	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
ELM	Emthanjeni Local Municipality
ELU	Existing Lawful Use
GA	General Authorisation
GWh	Gigawatt per hours
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IPR	Integrated Resource Planning
LA	Listed Activity (EIA Regulations, 2014)
LN1	Listing Notice 1: GN R. 327, 07 April 2017
LN2	Listing Notice 2: GN R. 325, 07 April 2017
LN3	Listing Notice 3: GN R. 324, 07 April 2017
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MTS	Main Transmission Station
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998)

PDM	Pixley ka Seme District Municipality
PPA	Power Purchase Agreement
REFIT	Renewable Energy Feed-in Tariff
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
WUL	Water Use License

Table 5: Definitions of some terms used in this document.

Term	Source	Definition
Environmental Impact	ISO 14001: 2004	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.
Scope	ISO 14001:2004	Refers to the extent and boundaries of the EMPr including geographical location, a timeframe, organisational units and activities.
Aspect	ISO 14001:2004	Element of an organization's activities or products or services that can interact with the environment.
Impacts	ISO 14001:2004	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.

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SECTION A: DETAILS OF THE EAP AND APPLICANT

3(1) A EIA report… must include –

(a) details of-

(i) The EAP who prepared the report; and

(ii) The expertise of the EAP, including a curriculum vitae;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

Environmental Assessment Practitioner	Ecoleges Environmental Consultants
Contact Person	Shannon Farnsworth
Postal Address	PO Box 516, Machadodorp, 1170
Telephone	+27(0)72 654 8202
E-mail	shannon@ecoleges.co.za

Project Applicant	Soventix South Africa (Pty) Ltd
Trading Name (if any)	Soventix South Africa
Contact Person	Jean-Paul de Villiers
Physical Address	Unit E2 and E3, 8 Quantum Road Firgrove Business Park (Off main Road M9) Somerset West South Africa
Postal Address	
Postal Code	7130
Telephone	+27(0)21 852 7333
Cell	+27(0)82 550 6672
Fax	+27(0)21 852 5089
Email	Jp.devillers@soventix.com

Abbreviate Curriculum Vitae

SHANNON FARNSWORTH

Name	Shannon Farnsworth
Date of birth	02 February 1990
Nationality	South African
Current Address	Raptors View Wildlife Estate, Hoedspruit, Limpopo, South Africa Cell: 072 654 8202 E-mail: shannon@ecoleges.co.za
Languages	English, basic Afrikaans
Driver's Licence	Code B
Specialisations	Key Fields: environmental/ecological management plans, environmental auditing, Environmental Impact & Basic Assessment, protected area management
Qualifications & Courses Attended	**2009 – 2011** Bachelor of science: Environmental Management & Geography, University of Kwa-Zulu Natal, Pietermaritzburg. **2012 – 2019** • Firearm training in the handle and use of handgun, shotgun, manual and self-loading operated rifle and carbine. • Environmental Management Inspector [EMI] basic training course for government officials conducted by the national Department of Environmental Affairs [DEA]. designated by the hon. MEC in KwaZulu-Natal for Economic Development, Tourism and Environmental Affairs, Mr. Sihle Zikalala, as a grade 2 environmental management inspector • Wetland wet-heath and Wet-ecoservices training provided by WESSA and UKZN • Certificate of successful completion of: basic Geographic Information Systems [GIS] arc 10 training course • Mini-SASS [stream assessment scoring system] by Duzi Umgeni Conservation Trust [DUCT] and the then Department of Agriculture and Environmental Affairs [DAEA] • Certificate of attendance issued by Maccaferri Africa for hydraulics: introduction to river protection and for hydraulics: introduction to coastal protection • Ecological infrastructure training workshop by WESSA
Memberships & Registrations	**2013 – Present:** Registered member of the South African Council for Natural Scientific Professions [SACNASP] as a Certified Natural Scientist in terms of section 20[3] of the *Natural Scientific Professionals Act, 2003 [Act 27 of 2003]* in the field of Environmental Science. Registration Number: 200215/13

	2020 – Present: Registered as a professional Environmental Assessment Practitioner [EAP] with the Environmental Assessment Practitioners Association of South Africa [EAPASA]. Registration Number: 2020/176
Career Summary	**September 2021 – Current:** Environmental Assessment Practitioner – Ecoleges Environmental Consultants **December 2020 – Current:** Member of the Mopani District Municipal Planning Tribunal – Environmental Portfolio **February 2020 – November 2020:** Operational Management - African Dawn Safaris **April 2019 – December 2019:** Manager: Environmental Management Unit at Msunduzi Municipality **January 2012 – March 2019:** Environmental Scientist: Environmental Management Unit at Msunduzi Municipality **2008–2009:** Invasive Alien Plant planning, control, and eradication with Servest Landscapes.

SECTION B: LOCATION OF THE PROPOSED ACTIVITY

3(1) A EIA report… must include –

(b) the location of the development footprint of the activity, on the approved site as contemplated in the accepted scoping report including-

(i) The 21-digit Surveyor General code of each cadastral land parcel;

(ii) where available, the physical address and farm name;

(iii) where the required information in terms (i) and (ii) is not available, the coordinates of the boundary of the property or properties;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended:

The 21-digit Surveyor General Codes of each cadastral land parcel are as follows:

Table 6. The 21-digit Surveyor General Codes of each cadastral land parcel.

Property Description	21-digit code
Non-linear Infrastructure Development (Solar PV facility)	
Remainder of Farm Goede Hoop 26C	C03000000000002600000
Portion 3 of Farm Goede Hoop 26C	C03000000000002600003
Linear Infrastructure – overhead distribution line	
Remainder of Farm Goede Hoop 26C	C03000000000002600000
Portion 3 of Farm Goede Hoop 26C	C03000000000002600003
Remainder of Farm Kwanselaarshoek 40C	C03000000000004000000
Portion 1 of Farm Kwanselaarshoek 40C	C03000000000004000001
Portion 2 of Farm Kwanselaarshoek 40C	C03000000000004000002
Portion 4 of Farm Taaibosch Fontein 41C	C03000000000004100004

Postal Address: De Bad Farm, PO Box 65, Hanover, 7005

Table 7. Coordinates of the boundary of the property (**Figure 1**):

Corner Point	GPS coordinate
Corner A	30º 50’ 12.2“ S 24º 19‘ 58.7“ E
Corner B	30º 48‘ 48.5“ S 24º 21‘ 26.4“ E
Corner C	30º 50’ 12.6“ S 24º 23‘ 19.7“ E
Corner D	30º 51’ 07.4“ S 24º 21‘ 33.2“ E

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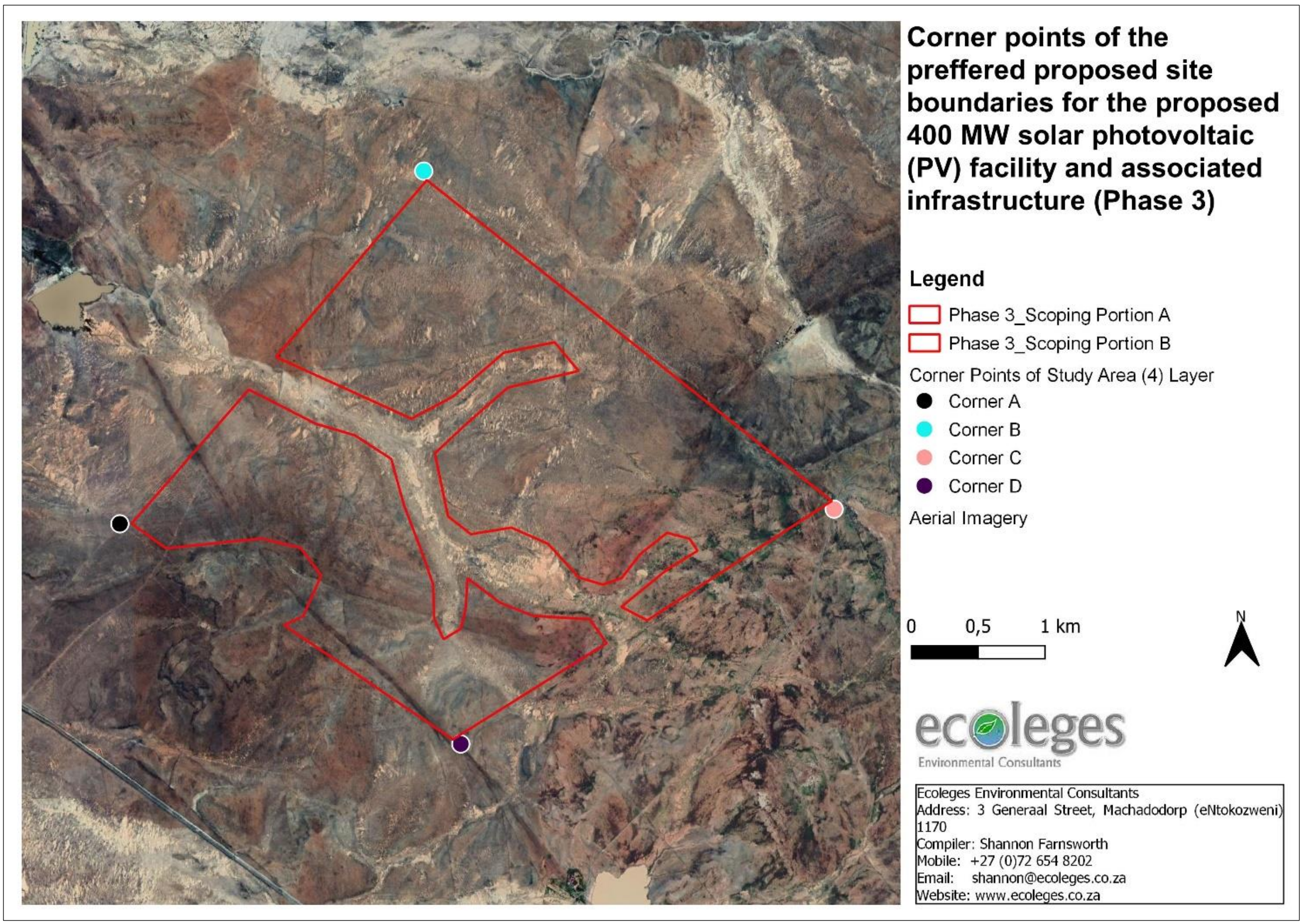

Figure 1: Corner points of the boundary of the preferred proposed site as identified in the Final Scoping report.

Please refer to the following Appendices for more details:

- **Appendix A:** SITE PLANS

SECTION C: LOCATION PLAN OF THE PROPOSED ACTIVITY

3(1) A EIA report… must include –

(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is -

(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities to be undertaken; or

(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended:

The proposed development of a 400 MW solar photovoltaic (PV) facility, including PV modules and arrays, inverters and field transformers are just one part of the PV system. The field transformers must transfer and increase (step up) the voltage of the alternating-current circuit to Eskom's electricity grid via an on-site substation. Consequently, an on-site substation and a circa 22 m-wide servitude for a 132 kV distribution line will also be developed to evacuate the electricity generated on site and feed it into the national grid (via Phase 2 to Phase 1).

GPS co-ordinate of substation:

- Centre point: 30°50'45.61"S and 24°21'51.78"E

GPS co-ordinates for the proposed centre line of a 132 kV overhead distribution line:

- Start: S30° 50' 47.435" E24° 21' 51.593"
- Midpoint: S30° 51' 53.498" E24° 19' 54.817"
- End: S30° 53' 15.498" E24° 19' 3.321"
- Point/Bend 2 (watercourse crossing): S30° 50' 49.543" E24° 21' 47.589"
- Point/Bend 3 (watercourse crossing): S30° 50' 58.824" E24° 21' 42.894"
- Point/Bend 4: S30° 52' 3.006" E24° 19' 35.911"
- Point/Bend 5: S30° 52' 12.362" E24° 18' 56.458"
- Point/Bend 6: S30° 52' 22.937" E24° 18' 57.113"
- Point/Bend 7: S30° 52' 36.904" E24° 18' 51.087"
- Point/Bend 8: S30° 52' 48.999" E24° 18' 57.174"
- Point/Bend 9: S30° 53' 9.638" E24° 18' 51.960"
- Point/Bend 10: S30° 53' 12.693" E24° 19' 2.188"
- Entry 1 (watercourse crossing): S30° 51' 35.911" E24° 20' 29.779"
- Exit 1(watercourse crossing): S30° 51' 49.105" E24° 20' 3.552"
- Entry 2 (watercourse crossing): S30° 51' 54.085" E24° 19' 53.651"
- Exit 2 (watercourse crossing): S30° 52' 3.227" E24° 19' 34.982"

- Entry 3 (watercourse crossing): S30° 52' 4.837" E24° 19' 28.191"
- Exit 3 (watercourse crossing): S30° 52' 9.111" E24° 19' 10.170"
- Entry 4 (watercourse crossing): S30° 53' 3.122" E24° 18' 53.606"
- Exit 4 (watercourse crossing): S30° 53' 5.509" E24° 18' 53.003"

Please refer to the following Appendices for more details:

- **Appendix A:** SITE PLANS
- **Appendix B:** SITE PHOTOGRAPHS

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
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SECTION D: DESCRIPTION OF THE SCOPE OF THE PROPOSED ACTIVITY

3(1) A EIA report… must include –

(d) a description of the scope of the proposed activity, including-

(i) all listed and specified activities triggered and being applied for; and

(ii) a description of the associated structures and infrastructure related to the development;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended:

PROJECT BACKGROUND

In 2016 ecoleges undertook a S&EIA for the development of a 225 MW Solar PV facility between Hanover and De Aar in the Northern Cape. Three alternative footprints (PV01, PV02, PV03) were investigated during the assessment process. The central footprint (PV02) was identified as the preferred option because of its lower environmental impact and proximity to an existing 400kV Eskom powerline when compared with PV01 and PV03. The National Department of Environmental Affairs granted an environmental authorisation (DEA Reference: 14/12/16/3/3/2/998) on 16th April 2018. The activity must commence on the PV02 footprint within a period of five years from the date of issue.

An amendment to increase the capacity (not the footprint) of the facility to 300 MW due to technological advancements in solar photovoltaic efficiency and electrical output was granted on 24th November 2020.

A second amendment was granted in 2021 for the inclusion of containerised lithium-ion battery Storage and dual-fuel backup generators with associated fuel storage.

The competent authority was the National Department of Environmental Affairs because the application was part of the REIPPP or RMIPPP BID rounds, which formed part of a Strategic Infrastructure Project (SIP) as described in the National Development Plan, 2011. Soventix SA (Pty) Ltd was an unsuccessful bidder. However, the applicant has since partnered with another company, Solar Africa, with 1.5 GW in private renewable energy offtake agreements, making it economically feasible to develop two more 300 and 400 MW facilities (Phases 2 and 3, respectively).

Soventix will therefore apply for an environmental authorisation to develop an additional 300MW on the PV03 footprint (Phase 2) that was considered during the initial S&EIA. It is proposed to connect this second phase to the substation that forms part of the authorised facility on PV02 (Phase 1).

Unlike footprints PV02 and PV03, Phase 3 was not assessed during the S&EIA for Phase 1. Phase 3 involves the development of a third 400 MW Solar Photovoltaic (PV) facility on the Remainder of Farm Goede Hoop 26C, Portion 3 of Farm Goede Hoop 26C and other properties (overhead distribution line).

The two additional Solar PV facilities (Phase 2 and 3) will feed into the authorised sub-station on the PV02 footprint (Phase 1). Consequently, the required expansion of the substation footprint will require a third (Part 2) amendment to the existing environmental authorisation (DEA Reference: 14/12/16/3/3/2/998).

The proposed Phase 3 activity entails the construction of a 400MW solar photo-voltaic (PV) farm, in the form of 4 interconnected 100MW plants. An on-site substation will be required with the necessary infrastructure to feed the electricity generated to the Main Transmission Substation (MTS) on Phase 1 via a 132 kV distribution line.

The Final Scoping Report was submitted to the competent authority for decision-making on the 22nd of July 2022 in accordance with Regulation 21 (1) of GN R 326. A decision to accept the scoping report was made by the competent authority on 02 September 2022, in line with Regulation 22 of the EIA Regulations.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Rezoning and land-use

The site is currently zoned *Agricultural 1* and would need to be rezoned to *Renewable Energy Plant zone* or other appropriate zoning in terms of the Spatial Planning and Land Use Management Act (Act 16 of 2013). A rezoning application will need to be prepared and submitted to the relevant Municipal Planning Tribunal for consideration and approval.

Project phases

Construction Phase

Phase 3 will be built in 4 x 100 MW blocks. That way it is possible to limit the amount of people on site, as well as mitigate the need for excessive amounts of equipment, storage etc.

There will also be some overlap between construction and operation - once the first 100 MW block is complete, it will start feeding electricity into the national grid while the second and subsequent 100 MW blocks are being built. Consequently, construction items from fencing and roads to the on-site substation and operational offices must be completed first under the civil construction phase, generally 4 to 6 months. Subsequent construction of each 100 MW block typically takes 12 to 15 months from start to finish (pers. comm. JP De Villiers, Managing Director, Soventix).

During this period there will be approximately 650 employment opportunities (mainly unskilled and semi-skilled). Many the workforce would be sourced from the surrounding areas. Specific training would also be provided for more technical tasks. The appointed contractor would be required to establish a construction camp and laydown area.

Heavy delivery vehicles will use the same staging area as for Phase 1 and 2. Materials, machinery and equipment will then be transferred onto lighter vehicles so that they can pass underneath Transnet's railway line unhindered and transported to the laydown area in the construction camp.

It is anticipated that the construction equipment will include at least:

- Water tankers,
- Graders,
- Tipper trucks,
- Drilling rigs
- Mobile pile ramming machines
- Rock crushing plant,
- Excavators,
- TLBs,
- Concrete mixers,
- Compaction equipment,
- Light delivery vehicles, and

- Heavy delivery vehicles (for the transformers).

Operational Phase

The operational phase is expected to last in excess of 25 years and has a preliminary staff complement of approximately 55 persons.

DESCRIPTION OF ASSOCIATED STRUCTURES AND INFRASTRUCTURE

Size

The size of the development footprint for the 400 MW solar PV facility, comprising four separate but interconnected PV Blocks is approximately 650 ha***.***

Agrivoltaic System

The solar PV facility will be managed as an 'Agrivoltaic' system by combining current land use practices, specifically extensive livestock (sheep) production with green energy generation.

PV Modules

A single PV device is known as a cell. To boost the power output of PV cells, they are connected in chains to form larger units known as modules or panels. The applicant, Soventix (Pty) Ltd will use Bifacial Mono Perc modules. Each module is approximately 2.2 by 1.1 m (or 2,42 m^2) in size. Modules are connected to form arrays. Several arrays are then connected to an inverter. **I**nverters convert the voltage from direct current (DC) to alternating current (AC). The inverters are cabled to field transformers. The field transformers then transfer and increase (step up) the voltage of the alternating-current circuit to Eskom's electrical grid via an onsite substation.

Arrays (or racks)

Two rows of approximately twenty-three to twenty-six modules each will be mounted onto a single-axis tracker and supported by steel or aluminium racks. Consequently, each rack would accommodate approximately 125.84 m^2 of panel (or a total area of 270 m^2 including gaps between the panels). The racks are arranged in parallel, approximately 9,5 m apart (between piles). The results of a geotechnical assessment will determine whether the racks are held in place by either a ballast or piled foundation. Solar arrays will be orientated in a northern direction and track the sun from east to west. As far as possible, arrays will be arranged in four or five blocks of approximately 150 ha each. Each block can produce up to 140 MW, but under current legislation will be capped at 100 MW.

Inverters

There will be three to four inverters per MW (300 to 400 inverters per 100 MW block, or 1200 to 1600 inverters for 400 MW).

Field Transformers

Depending on the inverter technology available and transformer size chosen, approximately 27 inverters are connected to a field transformer, and there will be approximately twelve field transformers per 100 MW. Fewer field transformers will be required if larger units are installed.

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Height of the Modules (or panels)

The arrays will be placed over the vegetation. The solar panels sit in two in portrait (not landscape – they are rectangular shaped), so from the centre pivot point, 2.274 m each way (as each panel is 2.274 m long). They stow overnight horizontally, that is at zero tilt to reduce wind loading (See cross-section drawing of horizontal panel on right of **Figure 2** below). The height of the array above the ground in the stow position is ± 2 m. The solar panels cannot move to a vertical (90º) position. The maximum tilt at sunrise (east-facing) and sunset (west-facing) is 45º to 55º, so the ground clearance and maximum height during these brief periods will be 0.3 m and 3,822 m, respectively (See cross-section drawing of angles – panel on left of **Figure 2**). The maximum and minimum height in the design below is the starting position and ending position at sunrise and after sunset, respectively. Soventix South Africa (Pty) Ltd is working with the mounting structure supplier to increase the minimum height, however the maximum height will not exceed 4 m.

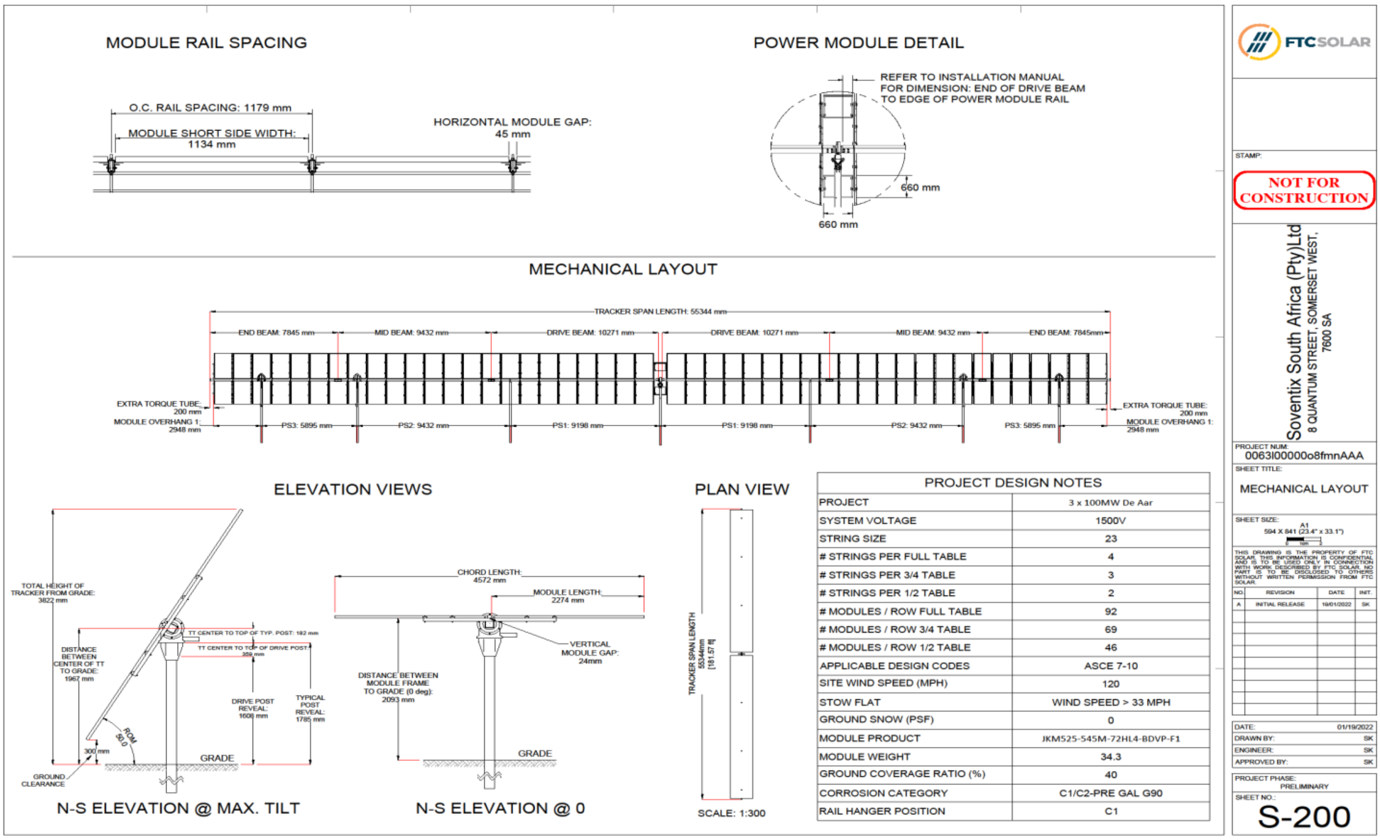

Figure 2: Elevation views of solar modules on a single-axis tracker at maximum tilt (left) and zero tilt (right).

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On-site Substation and Distribution Line

Separate generic Environmental Management Programmes have been published for the on-site substation and the distribution line as per Government Notice No.42323 dated March 2019 (Appendix F: Annexure A of EIA report)

For background information, all four 100 MW blocks will feed into an on-site substation. A 10 to 15 m lightning mast will be erected within proximity to the on-site substation. The on-site substation will be linked to the Main Transmission Substation (MTS) on Phase 1 via a 132 kV distribution line. The distribution lines are approximately 20 m high, and the servitude width is approximately 22 m (11 m from the centre line).

The planned 132 kV distribution line, including a service road within the 22 m-wide servitude, will intersect an existing Eskom distribution line (Bletterman/Taaibos 1, 132 kV Overhead Line) and two watercourses. The first watercourse crossing is 151 m wide, whereas the second watercourse south of the railway line is a braided channel, comprising 4 crossings (811 m, 574 m, 499 m and 76 m wide).

Timing and Employment

The three phases will be built sequentially. There may be some overlap. Once civil works on Phase 1 are complete the civils' team would move onto Phase 2. Furthermore, each phase would be built sequentially, e.g., Phase 3 will be built in 4 x 100 MW blocks. That way it is possible to limit the amount of people on site, as well as mitigate the need for excessive amounts of equipment, storage etc.

There will also be some overlap between construction and operation. In other words, once the first 100 MW block is complete, it will start feeding electricity into the national grid while the second and subsequent 100 MW blocks are being built. Consequently, construction items from fencing and roads to the on-site substation and operational offices must be completed first under the civil construction phase, generally 4 to 6 months. Subsequent construction of each 100 MW block typically takes 12 to 15 months from start to finish (pers. comm. JP De Villiers, Managing Director, Soventix).

We have assumed 650 construction staff during peak construction, and 55 staff during operation (pers. comm JP De Villiers, Managing Director, Soventix). Whilst the construction phase numbers provided are within the expected range, they are based on the requirement for a very tight completion deadline as communicated by the IPP. The phased construction of all individual 100 MW projects will therefore have a large overlap period, thereby creating the expected peak (pers. comm. Bruce Conné, General Manager, Soventix). Should the individual project implementation program stagger out for any reason then the number of expected person-hours of employment created will still be the same, but the peak would be lower because of the extended timeline (pers. comm. Bruce Conné, General Manager, Soventix).

Vegetation Clearance

Vegetation will be cleared from the physical footprint of the construction camp (including laydown area), inverters, field transformers, on-site substation, rack foundations, pylon footings, underground cables and water pipes, roads (including the fire-break road) and fencing posts, operational area, borrow pit, water storage tanks and deionization plant(s). A total of 155 ha will be cleared.

Roads

Two-track roads

Approximately two (2) m-wide two-track access roads totalling an estimated 553 km will be placed between the parallel arrays during the construction phase. It is assumed that the total length of two-track access roads will be equal to the total length of solar arrays, that is 553 km.

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Cleared/Graded Roads

Approximately 5 km of existing two-track roads (including the servitude road under the existing Eskom 132 kV powerline) will be upgraded, that is graded 5 to 6 m wide, imported material, shaped for runoff, and compacted.

An estimated ± 35,6 km of new access roads (including the proposed 132 kV distribution line between the on-site substation (Dx) and the Main Transmission Substation (MTS) - 2,5 km from Dx to road and then 5,1 km to the MTS) will be constructed (graded 5 – 6 m wide, imported material, shaped for runoff, and compacted) to access the construction camp, operational area, components of the PV system, such as the field transformers, on-site substation, and distribution line.

Road Crossings

Six (6) road crossings will be required to access the four different PV Blocks of the Solar PV facility, which is fragmented by the watercourse. Two of the crossings are existing and will therefore be expanded, whereas four of the road crossings will be new developments. All 6 road crossings will be combined with underground cables and/or water pipelines. Pre-cast box culverts or pipes will be required for the road crossings.

The 132 kV distribution line, including a service road within the 22 m-wide servitude, will cross a braided watercourse south of the railway line, comprising 4 channels or crossings (811 m, 574 m, 499 m and 76 m wide).

Passing Lanes

Passing lanes which will widen the total road width up to 8 m wide and ± 30 m long will be placed at strategic areas on existing or new roads. No passing lanes are permitted within the 50 m ecological buffer of any watercourse.

Borrow Pit(s)

Any fill material required for road construction will be obtained from existing borrow pits (no mining permit is required as per the exemption afforded in section 106 of the MRPDA) and/or a new borrow pit (not more than 2 ha in surface area) will be mined.

Operational Area

The operational area comprises a controlled access (security gate and guard house (± 11 m^2)), single-storey buildings (OM building (± 262 m^2), main warehouse (± 302 m^2) and secondary warehouse (± 143 m^2)), unpaved parking, and a sewerage treatment plant(s). The buildings shall be constructed from brick with metal sheet roofing and include space for an office, showers (incl. change rooms), toilets, medical room, control room, kitchen, storeroom, and workshop.

Fencing

The facility will be fenced off with a galvanised diamond razor mesh security fence that is 1.8 m high. Where the sand is soft enough to tunnel under, the fence will be embedded 300 mm into the ground. Access will be controlled using a security gate. It is planned to maintain continuity throughout the ephemeral drainage line by installing the perimeter fence around each PV block approximately 1 m outside the demarcated 50 m ecological buffer. A 9 m-wide fire break, comprising a constructed road with mowed vegetation will be created inside the perimeter fence. The road will be located within 2 m of the perimeter fence (as per the recommendation by the Avian specialist). The fire break will be extended by mowing 1 m of vegetation beyond the perimeter fence, that is until the 50 m ecological buffer.

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Visual screening

The visual recommendations from the Visual Impact Assessment were all incorporated into the layout design, including a 250 m 'visual sensitivity buffer' from sensitive receptor boundaries, specifically the Remainder of Farm No. 149 and Portion 2 of Taaibosch Fountain 41, and a 70 m 'visual sensitivity buffer' along the boundary with the Remainder of farm Leuwe Fountain 27.

Lighting

The facility will not be lit up at night. The fence line will be secured using multiple FLIR PTZ cameras which have a 2 km range in absolute darkness (pers. comm. JP De Villiers, Managing Director, Soventix). The obvious areas that would have lights is the control and security office, as well as the on-site substation, which is a legal requirement (pers. comm. JP De Villiers, Managing Director, Soventix).

Electricity

Electricity during construction of at least the first PV block will be sourced from a 20 kVA mobile generator with an integrated diesel tank (fuel capacity ± 55 litres) but used in conjunction with a solar system. The generator will be located at the construction camp. Once the first PV block is complete and operational (capable of generating electricity), then it will be able to supply electricity for the remainder of construction.

Access

The main access is off the N10 between De Aar & Hanover, which enters the site from the west. The provincial unsurfaced road (Burgersville District Road), Transnet's service road and the existing farm access road will also be utilised. Once on the farm, an Eskom servitude road will be used to access Phase 3, specifically the Main gate to the operational area and on-site substation.

Water Abstraction

<u>Estimated Yields</u>

There are two existing boreholes in the study area; Borehole No. 4 or BH4 (30°49'43.62"S and 24°20'55.07"E) is located on the Remainder of Farm Goede Hoop 26C. and Borehole No. 5 or BH5 (30°49'30.17"S and 24°22'5.58"E) is located on Portion 3 of Farm Goede Hoop 26C. The sustainable abstraction yields, based on the recommended abstraction rate of 8 hrs pumping per day, are 6,58 l/s (or **189,5 m^3/day**) and 5,11 l/s (or **147,17 m^3/day**) for BH4 and BH5, respectively (Geohydrological Assessment Report (Final Rev 3), prepared by GCS Water and Environmental Consultants, dated 10th August 2022, GCS Project Number: 22-0401). Consequently, the combined sustainable abstraction yields for both properties is **336,67 m^3/day**.

A third borehole is proposed within proximity to the construction camp/operational area (PV Block 4). Two potential sites have been identified on the Remainder of Farm Goede Hoop 26C; T1 (30°51'3.60"S and 24°21'26.89"E) and T2 (30°51'5.04"S and 24°21'28.30"E).

<u>Estimated Water Demand</u>

The water use license application pertaining to the abstraction of groundwater from both properties combined, including all boreholes contained thereon, shall be for **216 m^3/ day** during the construction period (including when it overlaps with operation), and **150 m^3/day** during operation.

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However, abstraction may not exceed the sustainable abstraction yield at the recommended pumping rate of 8 hrs per day for each borehole, that is 6,58 l/s @ 8hrs (or **189,5 m^3/8hr day**) for BH4 and 5,11 l/s @ 8 hrs (or **147,17 m^3/8hr day**) for BH5.

Rainwater Harvesting (during operation)

Harvesting rainfall run-off from a roof (Schedule 1 Permissible Use of Water (1) (c) “store and use run-off water from a roof”) is only worth it if the water can supplement non-potable usage. In this case the only non-potable usage options during operation are toilet-flushing and dust suppression. Furthermore, the principal source of water that can already be used to supplement toilet flushing and dust suppression is the treated effluent from the Multirock 60 treatment system. The treatment system could generate sufficient treated effluent for toilet flushing with some excess for dust suppression. Consequently, the benefit of harvesting rainfall runoff from the roof would be limited to dust suppression and only during the wet months of the year when dust suppression is likely to be in least demand. Another potential benefit of rainwater collection is to help disinfect the treated effluent from the Multirock 60 treatment system.

Consequently, and only if the project engineers determine rainwater harvesting to be a feasible water-saving strategy, rainwater will be stored in the same tank system as the treated effluent from the Multirock 60 treatment system. The three (3) 10 m3 water storage tanks making up the tank system may be increased by two additional tanks to accommodate the rainwater run-off (up to five (5) tanks or **50 m^3** in total).

Water Storage

<u>Groundwater during construction and operation</u>

Twenty (20) tanks or **200 m^3** will be used for potable water from Boreholes No. 4 and No. 5 (in PV Block 2), and Ten (10) tanks or **100 m^3** will be used for potable water at the operational area (in PV Block 4), for washing solar panels and domestic use.

During construction only four (4) tanks or up to **40 m^3** will be used for storing potable groundwater on top the toilet containers connected to the NEWGen100 wastewater treatment system.

The construction and operational phases will overlap. Consequently, the combined storage of groundwater on Portion 3 of Farm Goede Hoop 26C during construction and operation shall not exceed **340 m^3.**

<u>Treated Effluent during construction</u>

Up to four (4) tanks or **40 m^3** will be used for storing treated effluent that is the disinfected recycled water for flushing toilets, on top the toilet containers connected to the NEWGen100 wastewater treatment system.

Excess ‘unrecycled’ but treated effluent from the NEWGen100 flush toilet sewage treatment system will need to be stored in 4 additional 10 m^3 tanks or **40 m^3** and reused for dust control and/or be disposed of via a sub-surface soakaway.

<u>Treated Effluent (and rainwater) during operation</u>

Up to five (5) tanks or **50 m^3** will be used for storing treated wastewater (and rainwater) from the Multirock 60 on-site disposal facility for disposal and/or reuse (toilet flushing and/or dust suppression.

<u>Untreated Effluent (concrete slurry from e.g., concrete mixer trucks) during construction</u>

Up to ten (10) 10 m^3 containers or **100 m^3** will be used to store concrete slurry for reuse or disposal.

<u>Contaminated Soil</u>

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Storing contaminated soil for reuse (bioremediation and rehabilitation) and/or disposal - a **10 m^3** container will be made available for the storage and bioremediation of soil contaminated with hydrocarbon spills or storage and collection for disposal at the De Aar licensed landfill site.

In summary, the construction and operational phases will overlap. Consequently, the combined storage of groundwater on Portion 3 of the Farm Goede Hoop 26C during construction and operation shall not exceed **340 m^3** (**S21(b)**), the combined storage of treated effluent shall not exceed **130 m^3**, the combined storage of untreated effluent (concrete slurry from e.g., concrete mixer trucks) shall not exceed **100 m^3**, and the storage of contaminated soil shall not exceed **10 m^3**.

Domestic Wastewater

Construction

Assuming the estimated demand shall be **16,25 m^3/day** during construction (650 staff and the provision of 25 litres of potable water per person per day), **13 m^3** of "domestic wastewater" (wastewater arising from domestic and commercial activities and premises and may contain sewage) shall be generated each day.

The principal sanitation system during construction shall be a sewerage treatment package plant. Black water (flush toilet sewerage) and grey water (from hand wash basins) will be treated in a decentralised toilet block treatment system known as NEWGen100. NewGen100 is a compact containerised treatment unit that treats and recycles >99% of the flush toilet sewage from multiuser toilet blocks. The system is an autonomous, solar-powered, compact, and off-grid sewage treatment system which utilizes membrane biotechnology for the treatment of sewage from toilets for re-use in the toilets.

The NewGen100 sanitation system will be supplemented by portable chemical toilets for use by the work front further away from the construction camp. Collected by supplier for disposal at a licensed municipal Wastewater Treatment Works (WWTW).

The NewGen100 sanitation system shall comprise a 6 m shipping container that houses the NewGen100 Treatment unit, a NEWGen1000 Multiplier Treatment unit (for 1 000 users per day) and up to four (4) 12 m toilet containers (10 toilets per container). The modular design makes the plants capable of handling a phased variation in capacity.

Outputs of the system include,

(1) Screening and grit removal (Collected for disposal at a licensed hazardous waste landfill site),

(2) Sludge (Sludge beneficiation is encouraged, otherwise the sludge from septic tanks will be disposed of in accordance with the "Guidelines for the Utilisation and Disposal of Wastewater Sludge: Volume 3: Requirements for the on-site and off-site disposal of sludge."),

(3) Biogas (CO_2 and Methane - Biogas to energy is encouraged; reused for cooking, boiling water in a hot water urn and/or to provide hot water to the basins in the containerised toilet blocks via a gas geyser), and

(4) Treated effluent (Discharge Limit: Toilet flushing standards).

A sub-surface soakaway will be required to dispose of the 'unrecycled' or excess treated effluent that cannot be reused for dust control/suppression.

Operation

Assuming the estimated demand shall be **5,5 m^3/day** during operation (55 staff and the provision of 100 litres of potable water per person per day), **4,4 m^3** of "domestic wastewater" (wastewater arising from domestic and commercial activities and premises and may contain sewage) shall be generated each day.

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The principal sanitation system during operation shall be a sewerage treatment package plant. Black water (flush toilet sewerage) and grey water (hand wash basins in kitchen, change rooms, medical room, and/or workshop) shall be treated to general limits with a Biorock package plant. Biorock products are capable of recycling domestic sewerage to produce a high-quality final product fit for irrigation or to return safely to the local receiving environment.

The Multirock 60 treatment system shall accommodate the predicted 55 staff during operation, and still have capacity to accommodate for occasional increases in staff during, for example, stakeholder meetings and site inspections.

The system will be made up of four (4) 6 m^3, 3-chambererd primary (septic) tanks, and two (2) 5 m^3 ECOROCK-5010 treatment unit(s). The primary tank clarifies the sewage water of fats, oils, greases, and organic solids before the sewage then passes through an effluent filter and discharges into the ECOROCK-5010 units. The aerobic purification (secondary treatment) and the filtration (tertiary treatment) processes take place in the ECOROCK-5010 units.

The treated effluent will be discharged by submersible pump into three (3) 10 m^3 water storage tanks. The tank system will provide about 4 to 5 days of storage of the treated effluent before it will overflow, but it may significantly deteriorate if stored for more than 24 hrs. Hence, the treated effluent will be disinfected and preserved in the water tank with a simple floating chlorine basket (contact chlorination). Alternative means of disinfection include germicidal UV-light radiation, and dilution, using rainwater when available.

Outputs of the system include,

(1) Sludge, and

(2) Treated effluent (Discharge Limit: Toilet flushing standards).

A sub-surface soakaway will be required to dispose of the treated and disinfected effluent that cannot be reused for dust control/suppression.

The Biorock service includes a set of water samples professionally analysed by an accredited laboratory to determine the process performance of the sewerage treatment system (every 12 months). A sample set comprises two samples, one taken from the primary tank, and the second from the outlet of the ECOROCK-5010 unit(s) (before disinfection). The results are presented in a laboratory analyses report, as well as a summary analyses report by BIOROCK Africa. Sample analysis and reporting will take 7-14 days from submission to the laboratory.

Waste Management

Construction

It is anticipated that both general and hazardous waste types will be generated during construction (**Table 8.**). Except for domestic wastewater (**13 m^3/day**), volumes cannot be known.

The principal sanitation system during construction shall be a sewerage treatment package plant as mentioned above.

Table 8. Identification of construction waste types and proposed management methods.

Source	Waste type	Proposed Control Method(s)
Concrete mixing	Rubble (Inert)	Solid concrete rubble will be re-used as fill material and/or disposed at the De Aar licensed landfill site.
	wet Slurry	Slurry from the concrete mixing will be recycled in concrete production or once

	(Hazardous) dry Slurry (General waste)	hardened, reused as fill material and/or disposed at the De Aar licensed landfill site.
	Residual wastewater (Hazardous)	Reuse residual wastewater by replacing borehole water for making new mortar or concrete, and/or allowed to evaporate.
Construction plant	Used motor oil (Hazardous)	Collected by a registered collector or mechanic (during emergency repairs) for recycling.
	Contaminated soil (Hazardous)	Bioremediation and/or collected for disposal at the De Aar licensed landfill site.
Containerised toilet blocks, staff welfare area/ kitchens connected to the **NewGen100**	Domestic wastewater	NEWGen100 treats and recycles >99% of the flush toilet sewage for re-use in the toilets.
		Excess 'unrecycled' grey water from the NEWGen100 flush toilet sewage treatment system will be reused for dust control and/or be disposed of via a sub-surface soakaway.
	Screening and Grit (Hazardous)	Collected for disposal at a licensed hazardous waste landfill site.
	Sludge	Sludge beneficiation is encouraged, otherwise the sludge from septic tanks will be disposed of in accordance with the "Guidelines for the Utilisation and Disposal of Wastewater Sludge: Volume 3: Requirements for the on-site and off-site disposal of sludge."
	Biogas (CO_2 and Methane)	Biogas to energy is encouraged; reused for cooking, boiling water in a hot water urn and/or to provide hot water to the basins in the containerised toilet blocks via a gas geyser.
Chemical toilets	Domestic wastewater	Collected by supplier for disposal at a licensed municipal Wastewater Treatment Works (WWTW).
Office	Paper (General waste)	Collected for recycling.
	Stationary (General waste)	Separated for re-use and/or recycling, and/or collected for disposal at the De Aar licensed landfill site.

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	Ink cartridges (Hazardous)	Transferred to or collected by supplier for recycling.
Staff Welfare area	Organic (food) waste (General waste)	Collected for disposal at the De Aar licensed landfill site
	Food/drink packaging (General waste)	Separated for re-use and/or recycling, and/or collected for disposal at the De Aar licensed landfill site
Packaging	Cardboard, plastic, wood, cement bags (Inert)	Collected for re-use and/or recycling.
Solar PV components	Modules, wiring/cabling, etc. (e-waste)	Recycled and/or disposed of at a licensed hazardous waste landfill site.

Operation

It is anticipated that both general and hazardous waste types will be generated during operation (**Table 9.**). Except for domestic wastewater (**4,4 m^3/day**), volumes cannot be known.

The principal sanitation system during operation shall be a sewerage treatment package plant as mentioned above.

Table 9. Identification of operation waste types and proposed management methods.

Source	Waste type	Proposed Control Method(s)
Parking area	Contaminated soil (Hazardous)	Bioremediation and/or collected for disposal at the De Aar licensed landfill site.
Ablutions (toilets and showers) and Kitchen connected to the **Multirock 60**	Domestic wastewater	Treated effluent from the BioRock sewage treatment system reused for toilet flushing, dust control and/or disposed of via a sub-surface soakaway
	Sludge	Sludge beneficiation is encouraged, otherwise the sludge from septic tanks will be disposed of in accordance with the "Guidelines for the Utilisation and Disposal of Wastewater Sludge: Volume 3: Requirements for the on-site and off-site disposal of sludge."
Office	Paper (General waste)	Separated and collected for recycling.
	Stationary (General waste)	Separated for re-use and/or recycling, and/or collected for disposal at the De Aar licensed landfill site.

	Ink cartridges (Hazardous)	Transferred to or collected by supplier for recycling.
Kitchen	Organic (food) waste (General waste)	Collected for disposal at the De Aar licensed landfill site
	Grease trap (General waste)	Collected for disposal at the De Aar licensed landfill site
	Food/drink packaging (General waste)	Separated for re-use and/or recycling, and/or collected for disposal at the De Aar licensed landfill site
Packaging	Cardboard, plastic, wood (Inert)	Collected for re-use and/or recycling.
Solar PV components	Modules, wiring/cabling, etc. (e-waste)	Recycled and/or disposed of at a licensed hazardous waste landfill

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LISTED AND SPECIFIED ACTIVITIES

An application for an EA has been submitted to the National Department of Forestry, Fisheries and the Environment (DFFE) in terms of the EIA Regulations, 2014 as amended to undertake listed activities 11, 12, 19, 28, and 48 of **Listing Notice 1** (GG No. 40772, GN No. 327, 07th April 2017), listed activities 14 and 18 of **Listing Notice 3** (GG No. 40772, GN No. 324, 07 April 2017), and listed activities 1 and 15 of **Listing Notice 2** (GG No. 40772, GN No. 325, 07 April 2017) (**Table 10**).

Table 10. All listed and specified activities triggered and being applied for.

Activity No(s):	Provide the relevant **Basic Assessment Activity(ies)** as set out in **Listing Notice 1** of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
LN 1, Listed Activity 11	The development of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts;	The placement of factory-manufactured 800V/33kV in-field transformer stations that collectively feed into an on-site substation which steps the voltage up to a 132 kV Distribution Line for the transmission and distribution of electricity on land zoned as Agriculture (a rural area).
LN 1, Listed Activity 12	The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	Five new linear infrastructure crossings including road crossings, underground cables and/or underground water pipelines will have a combined physical footprint of approximately 25 258 square metres within 32 m of the ephemeral drainage line. The 132kv distribution line will have a combined physical footprint of approximately 53 482 square metres within 32 m of the affected watercourses.
LN 1, Listed Activity 19	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;	Seven linear infrastructure crossings including roads, underground cables and underground water pipelines between the four solar PV blocks will result in the combined excavation and infilling of approximately 56 179 m^3 of soil from the ephemeral drainage line. The 132 kV distribution line will result in the excavation and infilling of approximately 92 884 m^3 of soil from five watercourse crossings.
LN 1, Listed Activity 28	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	The development of a 400 MW Solar PV facility on approximately 650 ha of land zoned as Agriculture (in a rural area).

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	April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;	
LN1, Listed Activity 48	The expansion of – (i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; where such expansion [or expansion and related operation] occurs - (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	Two existing two-track dirt road crossings (PV3 to PV2 and PV3 to PV1) will be upgraded (graded, imported material, shaped for runoff, and compacted) and expanded to accommodate underground cables and/or water pipelines by approximately 5 647 m^2 within 32 m of the ephemeral drainage line.
Activity No(s):	Provide the relevant **Basic Assessment Activity(ies)** as set out in **Listing Notice 3** of the EIA Regulations, 2014 as amended.	Describe the portion of the proposed project to which the applicable listed activity relates.
LN3, Listed Activity 14 (replaces LA12 of LN1)	The development of – (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs - (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; g. Northern Cape ii. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; yes - Study area is in an ESA in the Northern Cape CBA Map 2016.	Five new linear infrastructure crossings including road crossings, underground cables and/or underground water pipelines will have a combined physical footprint of approximately 25 258 square metres within 32 m of the ephemeral drainage line. The 132kv distribution line will have a combined physical footprint of approximately 53 482 square metres within 32 m of the affected watercourses.
LN3, Listed Activity 18	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.	Existing two - track dirt roads will be widened by more than 4 m to a total road width up to 6m within 100 m of two existing road crossings (PV3

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	g. Northern Cape ii. Outside urban areas: (ii) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland; yes	to PV2 and PV3 to PV1) over the ephemeral drainage line. Sections of existing two-track dirt roads within 100 m of two existing road crossings (PV3 to PV2 and PV3 to PV1) over the ephemeral drainage line will be widened by more than 4 m to create passing lanes (up to 8 m wide and ± 30 m long) for delivery vehicles during construction.
Activity No(s):	Provide the relevant **Scoping and EIR Activity(ies)** as set out in **Listing Notice 2** of the EIA Regulations, 2014 as amended.	Describe the portion of the proposed project to which the applicable listed activity relates.
LN 2, Listed Activity 1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.	The development of a 400 MW Solar Photovoltaic (PV) facility on land zoned as agriculture (in a rural area).
LN 2, Listed Activity 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for – (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	Approximately 150 ha of indigenous vegetation will be cleared from the physical footprint of the construction camp (including laydown areas), inverters, field transformers, on-site substation, rack foundations/piles, pylon footings, underground cables and water pipes, roads, a fire-break road and fencing posts, operational area, borrow pit, water storage tanks and deionization plants.

Section 24E of NEMA requires that every EA must ensure that adequate provision is made for the ongoing management and monitoring of impacts of the activity on the environment throughout the life cycle of the activity. The life cycle of the activity is determined by the scope of the activity. If the activity requires EA for development only, the development phase is the scope of the activity. If the activity requires EA for development and operation, the development and operational phases make up the scope of the activity (Environmental Authorisation Validity Period Explanatory Document, 2018). Only when the activity includes such an operational component, the relevant Scoping and Environmental Impact Assessment, the Environmental Authorisation (including any conditions thereto) and the EMPr can include aspects regarding the operation scope of the activity e.g., mitigation actions for the operational phase (Environmental Authorisation Validity Period Explanatory Document, 2018).

None of the listed and/or specified activities that are triggered, and which require environmental authorisation, specifically include the term '*and related operation*' (**Table 10**). Consequently, the scope of the activities pertaining to this project does not have an operational (or decommissioning) component.

Description of Development Activities

All activities that are to be undertaken during the development of a 400 MW solar PV facility, have been described for the planning and design, pre-construction, construction, and post-construction phases only (**Table 11**). Pre-construction follows on from the final project planning and tender phase and leads up to the establishment of the appointed contractor on site.

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Table 11. A description of the activities to be undertaken during development, and the associated environmental aspects.

PHASES, ACTIVITIES, SERVICES & PRODUCTS ON PREFFERED FOOTPRINT	SUB-ACTIVITY	ENVIRONMENTAL ASPECT
Planning & Design		
Legal Compliance - acquiring authorisations, permits and/or licenses for activities/uses undertaken during construction and operation	Protected Species	NPNCA, 2009/NFA, 1998/NEMBA 2004
	Invasive Species	NEMBA, 2004
	Water Use S21(c) and (i)	NWA, 1998
	Water Use S21 (a)	NWA, 1998
	Water Use S21 (b)	NWA, 1998
	Water Use S21 (g)	NWA, 1998
	Water Use S21 (e)	NWA, 1998
	Mining (Borrow pit)	MPRDA, 2002
	Eskom 132kV servitude	Servitude Agreement and Letter of Consent
	Construction of the 20 m high 132 kV distribution line & 10-15m lightning mast	Civil Aviation Act (Act No. 13 of 2009)
	Development of substation infrastructure and distribution infrastructure	GN No. 435 of 22 March 2019 in terms of Section 24(5) of NEMA, 1998
	Development of a 400 MW Solar PV Facility	Astronomy Geographic Advantage (AGA) Act (Act No. 21 of 2007)
	Compliance Monitoring (ECO Appointment)	Environmental Authorisation
Consideration of Alternatives - including location, layout and design, magnitude, etc.	Alternative Sites	NA
	Alternative Technologies	NA
Climate Change	Solar PV Facility	

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Heat Island Effect	Solar PV Facility	Atmospheric warming
Change Land Use	Rezoning Land use application for a "Renewable Energy Plants Zone" submitted through the Emthanjeni LM for a decision by the District Municipal Planning Tribunal	SPLUMA and the ELM Land Use Scheme 2022
		Conflict with surrounding land uses.
	Uncertainty (SIA)	Property values
		Fires
	Increased traffic on District Gravel Road during construction	Development of potholes, corrugations and puddles
	Land Acquisition and Access to Site	Physical and economic displacement of individuals and households.
Planning	Commencement	
	Agreements	Eskom
	Labour	Job Creation
	Dust suppression	Water Usage
	Haulage Routes	
	Space	Magnitude of physical disturbance
Layout & Design	Overall	
	Lighting	
	Installing Perimeter Fence and Access Control	Security
		Terrestrial barrier
	Installing panel arrays and associated infrastructure (from racks to field	Physical Structures
		Atmospheric warming

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	transformers) including within 100 m of a watercourse or 500 m of a wetland/pan	Shading
		Surface water hydrology (run-off)
		Heritage
		Interfering with ecological processes and biodiversity pattern
	Distribution Lines	Obstruction
	Effluent Infrastructure (Sanitation)	Effluent disposal
	Water infrastructure (Supply)	Groundwater abstraction, purification and storage
	Culverts/Stormwater outlets	
	Quarry (new)	
	Services (pipes and cables)	Dispersive Soils
	Roads	
	Buffers	Specialist Assessment Reports
	Flood lines	
	Building Plans	Municipal Bylaws
	Building Lines	Agriculture Zone 1
		Eskom servitude
Pre-construction		
Planning	Social Impact Management Plan	Social Impact Management Plan
	Stakeholder Engagement Plan	Communication
		Grievance Mechanism

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		Compensation and Claims
	Corporate Social Responsibility	
	Recruitment	Recruitment
	Procurement	Procurement
	Traffic Management Plan	Traffic
		Safety and Security
	Waste Management Plan	
Monitoring		
Contractor Readiness	Awarding of preferred bidder	
	Acquiring permits, licenses, Letters of consent and permissions	**Permission:** No mechanical equipment shall be used in the vicinity of Eskom's apparatus and/or services without prior written permission having been granted by Eskom (Eskom letter dated 14 March 2017 ref: Invest14/03/2017)
		Fire Management Plan
		EMPr
		Other approvals
	Cultural Heritage Resource rescue and relocation	Stone Age open-air surface scatters
		old Wagon Road
	Employment of labour	Influx of job-seekers and construction workers into the area.
		Training
	Development of Method Statements	
	Commencement	

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Site Establishment (Layout)	Site Selection	
	Site Area (size)	
	Access Restricted Areas	
	Perimeter/boundary fence	
	Site Offices	
	Lighting	
	Flammable and other hazardous substance stores	
	Quarry & Crushing Plant	
	Laydown areas	
	Machinery Parking Area	
	Maintenance and workshop areas	
	Fuel storage and refuelling area	
	Vehicle wash bays	
	Sanitation/Ablutions	
	Pollution control	
	Eating/Rest Areas	
	Accommodation	
	Kitchen	
	Temporary access roads	
	Batching plant/Cement-mixing area	
Construction		
Employee management (including appointment, conduct and movement)	Supervision	Avoid harm to the environment and persons

	Communicating	Noise generation
	Eating (lunch breaks)	Organic and inorganic waste arisings
	Abluting	Land contamination
	Keeping warm or cooking	Starting fires
	Harvesting muthi plants, collecting firewood and/or poaching	Removal of medicinal plants, dead wood and/or wildlife
Construction Plant Management including Deliveries	Driving/Transport	Generating dust
		Generating noise
		Speed (en route to & from site)
		Generating emissions
		Congestion for other road users/Disruption to landowners
		Damage to the environment
	Operating equipment	Generating noise
	Operating equipment	Causing spills
	Parking	Causing spills
	Parking	Damage to the environment
	Maintenance	Land contamination
	Maintenance	Watercourse contamination
	Washing plant	Land contamination
	Washing plant	Watercourse contamination
Water management (abstraction, storage and use)	Monitoring	
	Pumping from a borehole	Use of natural resources

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	Installing a deionizing plant	
	Storage in tanks	Overflow and surface water run-off
	Sanitation and drinking	
	Dust suppression	Use of natural resources
		Surface water run-off
	Mixing concrete on site	Addressed under 'Handling Hazardous Substances'
General and Hazardous Waste Management	Handling and Collection (incl. chemical toilets)	Effluent discharges
		Land contamination
		Watercourse contamination
	Reuse	Health and safety
	Storage	Land contamination
		Watercourse contamination
		Unpleasant odours
	Transport	Land contamination
	Transport	Watercourse contamination
	Disposal	Land contamination
	Disposal	Watercourse contamination
Handling Hazardous Substances	Fuel Storage	Land contamination
		Watercourse contamination
	Refuelling	Use of resources
		Causing spills
	Cement Storage	Land contamination
		Watercourse contamination

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	Mixing concrete on site	Effluent (cement slurry) discharges and **land contamination**
		Effluent (cement slurry) discharges and **watercourse contamination**
		Waste arisings (cement bags)
	Importing Ready mix/Cleaning the cement trucks	Generating dust
		Generating noise
		Speed (en route to & from site)
		Generating emissions
		Damage to the environment
		Land contamination
		Watercourse contamination
		Waste arisings (cement slurry)
	Transporting concrete	Land contamination
	Placing concrete	Watercourse contamination
	Waste Slurry and Concrete Storage and Disposal	Land contamination
		Watercourse contamination
	Disposal of Domestic Wastewater	Land contamination
		Watercourse contamination
		Unpleasant odours
	Explosives Storage	Land contamination
	Paint Storage and Disposal	Land contamination
		Watercourse contamination
	Lubricating, Oil Storage and Disposal	Land contamination

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		Watercourse contamination
	Oil-contaminated water Storage and Disposal	Land contamination
		Watercourse contamination
	Contaminated Soil Storage and Disposal	Land contamination
		Watercourse contamination
	Damaged Solar panel and other e-waste Disposal	Land contamination
Alien Plant Management	Disturbance to natural areas	Favourable conditions for alien plant/animal recruitment.
Fire Management	Wildfires	
STORMWATER MANAGEMENT AND EROSION CONTROL		
Chance Find Protocol		
Security		Influx of contractors and workers into the area.
Health and Safety		
QUARRY (Sourcing materials (aggregate) for roads and concrete)	Importing aggregate	
	New Quarry & Crushing Plant Operation (and maintenance)	Dust generation
		Noise generation
		Soil contamination (hydrocarbon spills)
LINEAR INFRASTRUCTURE CROSSINGS	Distribution Line Pylons	Clearing & Grubbing/Removal of Vegetation/ Sedimentation

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		Importing material/ Excavating/Diversion Works/Sedimentation /Erosion
		Clearing/ Excavating/ Importing material/Dust generation
		Installing pylons/Watercourse contamination
		Compacting/Noise generation
	Roads	Grading existing & new roads/Removal of Vegetation /Sedimentation
		Importing material/ Shaping/Diversion Works/Sedimentation /Erosion
		Clearing/ Excavating/ Importing material/Dust generation
		Installing culverts/Watercourse contamination
		Compacting/Noise generation
	Underground Pipelines and Cables	Clearing & Grubbing/Removal of Vegetation/Sedimentation
		Importing material/ Trenching/Diversion Works/Sedimentation /Erosion
		Clearing/ Excavating/ Importing material/Dust generation
		Installing cables & pipes/Watercourse contamination
		Compacting/Noise generation

ROAD MANAGEMENT Construction of permanent and temporary access roads (including upgrading existing roads and establishing new roads), As WELL AS maintenance of District gravel road	Driving new two-track roads	Removal of vegetation and habitat
		Creating bare surfaces susceptible to erosion
	Grading existing and new roads	Removal of vegetation and habitat
		Creating bare surfaces susceptible to erosion
	Importing material	Dust generation
		Sedimentation of watercourse
	Compacting	Noise generation
	Use including gravel District Road, Transnet Service Road and internal roads	Dust generation
		Development of corrugations, potholes and puddles
Clearing/Grubbing and Grading	Construction camp (incl. operational area), borrow pit, upgrading existing and new roads, trenches for underground cables and water pipes, holes for racks, fence posts and pylons, foundations for inverters, field transformers and on-site substation, water storage tanks and deionization plant.	Removal of vegetation
		Noise generation
		Dust generation
		Creating bare surfaces susceptible to erosion
		Interfering with biodiversity patterns (fauna and flora)
		Destruction of artefacts
		Creating bare surfaces susceptible to alien invasive plant recruitment
Drilling and/or Ram Piling (for rack foundations and fence poles)	Drilling Rig on land and in a watercourse (perimeter fence)	Noise generation
		Dust generation

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		Mixing soil horizons
		Waste arisings (spoil)
		Traps
		Sedimentation of watercourse
		Vibration
		Soil contamination (hydrocarbon spills)
Installing panel arrays and associated infrastructure (from racks to field transformers) including within 100 m of a watercourse or 500 m of a wetland/pan	Field transformers	
	Electrical circuits	
	Panels	Dripline
Earthworks - holes for racks and fence posts, inverters, field transformers, on-site substation, pylons and operational area (building, on-site disposal facility) and trenches for underground cables and pipes, and water storage tanks and deionization plant.	Excavating and Trenching	Disturb animals
		Dust generation
		Mixing soil horizons
		Destruction of artefacts
		Sedimentation of watercourse
		Traps
		Increased porosity of repacked dispersive soils
		Alter surface water hydrology
		Alter visual landscape
		Waste arisings (spoil)
	Backfilling	Dust generation
		Subsidence (if not adequately compacted)

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		Tunnel erosion (when using unsuitable bedding in sodic sites)
Blasting		Noise generation
		Dust generation
		Fly Rock
Stockpiling and Storing (Laydown)	Mulch, topsoil, aggregate, spoil and infrastructure	Cover fauna/nests/burrows
		Smother and damage flora
		Wind erosion & entrainment
		Impede river flow or surface water run-off
		Sedimentation of watercourse
		Removal by runoff
	Topsoil	Viability of stockpiled material
Erecting the 33kV powerline underneath Eskom's 133kV powerline	Relocation of existing services	Disruption in the provision of services
	Consultation with affected parties	Insufficient consultation
	Working near or under powerlines	Unsafe environment (damage to property and loss of life)
Post-construction (incl. Construction)		
Rehabilitation	Temporary structures and infrastructure	
	Pollution and Waste	Soil contamination (hydrocarbon spills)
	Borrow Pit	Surface water hydrology (run-off)
		Compaction
		Compromised topsoil
		Overgrazing
	Roads	

	Disturbed areas - terrestrial	Surface water hydrology (run-off)
		Bare ground
		Compaction
		Compromised topsoil
		Overgrazing
	Disturbed areas - aquatic	Reshaped bed and banks
		Bare ground
		Compromised topsoil
		Overgrazing
Facility Management		
Grazing Management		Veld condition
Maintenance and Monitoring		Erosion
		Water Quality/Quantity
		Compromised topsoil
		Revegetation
		Veld condition
		Bat monitoring
		Avian Study monitoring
		Alien plant recruitment

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SECTION E: DESCRIPTION OF THE POLICY AND LEGISLATIVE CONTEXT

3(1) A EIA report… must include –

(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

List of Applicable Legislation and Other Documents

The following legislation, guidelines, departmental policies, environmental management instruments and/or other decision-making instruments that have been developed or adopted by a competent authority in respect of activities associated with a development of this nature, were identified and considered in the preparation of this S&EIA process:

1. Astronomy Geographic Advantage (AGA) Act (Act No. 21 of 2007);
2. Civil Aviation Act, 2009 (Act No. 13 of 2009);
3. Conservation of Agricultural Resources Act (Act No 43 of 1983);
4. DEA (2010), Guideline on Need and Desirability, Integrated Management Guideline Series 9, Department of Environmental Affairs (DEA), Pretoria, South Africa;
5. DEA (2010), Public Participation 2010, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs, Pretoria, South Africa;
6. DEA (2011), National list of ecosystems that are threatened and in need of protection. GN 1002, GG 34809, 9 December 2011;
7. DEA (2019), Notice of Identification, in terms of Section 24(5) of the National Environmental Management Act, 1998, of a Generic Environmental Management Programme relevant to an application for Substation and Overhead Electricity Transmission and Distribution Infrastructure in GN No. 435 published in Government Gazette No. 42323;
8. DEA&DP (2010), Guideline on Alternatives, EIA Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning (DEA&DP);
9. DEAT (2002), Specialist Studies, Information Series 4, Department of Environmental Affairs and Tourism (DEAT), Pretoria;
10. DoE, Integrated Resource Plan Update - Assumptions, Base Case Results And Observations dated October 2016 published in Government Gazette No. 40445;
11. DWAS (2016), General Authorisation in GN No. 509 published in Government Gazette No. 40229 dated 26 August 2016;
12. DWA (2007), Guideline for Developments within a Flood line (Edition 1), Department of Water Affairs and Forestry, Pretoria, South Africa;

13. DWAS (2016), General Authorisation in GN No. 538 published in Government Gazette No. 40243 dated 2 September, 2016;
14. Electricity Act, 1987 (Act No. 41 of 1987), as amended in 1994);
15. Emthanjeni Local Municipality, 2007 Spatial Development Framework;
16. Environment Conservation Act (No 73 of 1989), including Schedules 4 and 5 of the National Regulations regarding Noise Control made under Section 25 of the Environment Conservation Act, 1989 (Act 73 of 1989) in GN No. R 154 of Government Gazette No. 13717 dated 10 January 1992. (Note that this particular section of the Environment Conservation Act is not repealed by NEMA (107 of 1998)). Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983);
17. Generic Environmental Management Programme for Substation and Overhead Electricity Transmission and Distribution Infrastructure published in Government Notice No. R. 435 in Government Gazette No. 42323 of 22 March 2019;
18. IDP (Final) 2021 – 2022, Emthanjeni Local Municipality;
19. Minerals and Petroleum Resources Development Act, 2002 (Act No 28 of 2002);
20. National Environmental Management Act, 1998 (No 107 of 1998) including EIA Regulations, 2014 (as amended) published in Government Notice No. R. 326, R. 327, R. 325, and R. 324 in Government Gazette No. 40772 of 07 April 2017;
21. Generic Environmental Management Programme for Substation and Overhead Electricity Transmission and Distribution Infrastructure published in Government Notice No. R. 435 in Government Gazette No. 42323 of 22 March 2019;
22. National Environmental Management: Air Quality Act, 2003 (Act No 57 of 2003) including the list of activities which result in atmospheric emissions published in GN No. 248 of Government Gazette No. 33064 dated 31 March 2010;
23. National Environmental Management: Biodiversity Act, 2004 (Act No 10 of 2004);
24. National Environmental Management: Biodiversity Act: Alien and Invasive Species Regulations lists published in Government Gazette 43735, Notice 1020 of 25 September 2020;
25. National Environmental Management Protected Areas Act (Act No. 57 of 2003);
26. National Environmental Management: Waste Act, 2009 (Act No. 59 of 2009) (“NEM:WA”);
27. National Forest Act, 1998 (No 84 of 1998);
28. National Heritage Resources Act, 1999 (Act No 25 of 1999);
29. National Veld and Forest Fire Act, 1998 (Act No 101 of 1998);
30. National Water Act, 1998 (Act No. 36 of 1998);
31. National Building Regulations and Building Standards (Act No. 103 of 1977);
32. National Fencing Act (Act No.31 of 1963) and the Fencing Amendment Act (Act No. 3 of 1971);
33. Northern Cape Provincial Growth and Development Strategy (2004-2014);
34. Northern Cape Strategic Plan (2020 – 2025);

35. Northern Cape Climate Change Adaptation Response Strategy (2016);
36. Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009);
37. Pixley Ka Seme District Municipality, Spatial Development Framework (2013 – 2018).
38. Pixley Ka Seme District Municipality, Climate Change Response Plan (2016).

Legislative Context of the Proposed Activity

A review of the relevant legislation, policies and documents pertaining to the energy sector indicate that solar energy and the establishment of photovoltaic power plants are supported at a national, provincial and local level.

International policy and legislative context

The Convention on Biological Diversity (CBD)

This is an international agreement adopted at the Earth Summit, in Rio de Janeiro, in 1992. It has three main objectives:

- to conserve biological diversity;
- to use its components in a sustainable way; and
- to share fairly and equitably the benefits arising from the use of genetic resources.

The CBD was discussed under the guidance of the United Nations. It was signed by more than 150 government leaders at the Rio Earth Summit, amongst which South Africa is a signatory. The convention highlights the need to apply the precautionary principle "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

The Paris Agreement

This Agreement builds upon the United Nations Framework Convention on Climate Change (UNFCCC) to promote greenhouse-gas-emissions reduction and adaptation to climate change, starting in the year 2020. Its main objective is to strengthen the ability of countries to deal with the impacts of climate change, with greater support to assist developing countries to do so. The Paris Agreement brings all nations into a collective cause to keep a global temperature rise to less than 1.5 degrees Celsius above pre-industrial levels through nationally determined contributions (NDCs). South Africa is one of the 194 states who have signed the Agreement with a percentage of greenhouse gases for ratification of 1.46%. The goals of the Paris Agreement are being incorporated into national agendas and several initiatives are being created such as the Least Developed Countries Renewable Energy and Energy Efficiency Initiative for Sustainable Development (LDC REEEI) which aims to:

- bring sustainable, renewable and clean energy to least developed countries;
- improve energy access;
- promote skill development and creation of jobs; and

- contribute to the achievement of the Sustainable Development Goals.

National policy and legislative context

Constitution of the Republic of South Africa (Act No. 108 of 1996)

Provides the legal framework for the regulation of environmental management activities in South Africa, especially Section 24 which states that the people of South Africa have the right to an environment that is not harmful to their health or well-being and makes it the duty of the State to control ecologically sustainable infrastructure development and use of natural resources while promoting reasonable economic and social development.

National Environmental Management Act (NEMA) (Act No. 107 of 1998)

Promotes the integrated environmental management of activities that may have a significant effect (positive or negative) on the environment. Section 24(1) of the NEMA states that "in order to give effect to the general objectives of integrated environmental management laid down in this Chapter, the potential impact on the environment of listed activities must be considered, investigated, assessed and reported to the competent authority charged by this Act with granting the relevant environmental authorization." The reference to "listed activities" in Section 24 of the NEMA relates to the NEMA: EIA Regulations and its amendments.

NEMA: Environmental Impact Assessment (EIA) Regulations

Requires that an environmental authorisation is obtained before activities, which have been listed in terms of NEMA, are commenced with. The Minister of Environmental Affairs has on the 07th April 2017, published amendments to the NEMA: EIA Regulations of 2014 Government Notices Regulation (GNR) 326 and the three Listing Notices GNR 324, GNR 325 and GNR 327. Where an applicant proposes to undertake one of the listed activities contained in the three Listing Notices GNR 324, GNR 325 and GNR 327; a basic assessment (BA) or a S&EIR process is required. To apply for an Environmental Authorisation for the proposed 400 MW solar PV facility, a full S&EIR process is required. The potential impact of the proposed activities on the environment must be considered, investigated, assessed and reported to the competent authority.

The Competent Authority (CA) would normally be the Provincial Environmental Department, in this case the Department of Environment and Nature Conservation (DENC) in the Northern Cape Province. However, the Department of Environment and Nature Conservation in Kimberley, has requested the National Department of Forestry, Fisheries and Environment (DFFE) to act as the CA for dealing with this application, and excuse DENC of their responsibility to act as the CA on the grounds of currently being under resourced to handle an application of this nature **(refer to Section K)**.

National Environmental Management: Waste Act (NEMWA) (Act No. 59 of 2008)

This Act provides for regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation. The Act also provides for the licensing and control of waste management activities through GNR. 921 (2013 as amended 2022): List of Waste Management Activities that Have, or are Likely to Have, a Detrimental Effect on the Environment.

The proposed solar PV facility does not constitute a Listed Activity requiring a Waste Management Licence (WML) as defined in GNR 921.

However, the contents of the Environmental Management Programme (EMPr) will include reasonable measures for the prevention of pollution and waste management.

National Environmental Management: Biodiversity Act (NEMBA) (Act No. 10 of 2004)

Provides for "the management and conservation of South Africa's biodiversity within the framework of the NEMA", including avoidance and mitigation of loss of biodiversity through habitat loss, degradation or fragmentation; eradication and prevention of invasive species, biodiversity offsets. NEMBA also prescribes what must be done when a development overlaps with one of the 225 threatened ecosystems listed in the Act. Based on the EIA process and specialist assessments undertaken for the proposed site, none of the threatened ecosystems occur within the proposed site area.

The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) Regulations with regards to alien and invasive species have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014. Specific management measures for the control of alien and invasive plants will be included in the Environmental Management Programme (EMPr).

National Environmental Management Protected Areas Act (NEMPAA) (Act No. 57 of 2003)

The purpose of the National Environmental Management Protected Areas Act (Act No. 57 of 2003) (NEMPAA) is to, inter alia, provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. To this end, it provides for the declaration and management of various types of protected areas.

According to the National Protected Area Expansion Strategy (NPAES), there are no areas within the study area that have been identified as priority areas for inclusion in future protected areas. The study area is therefore outside the NPAES focus area.

National Forest Act (NFA) (Act No. 84 of 1998)

Provides the list of protected trees for which a license is required for any removal, cutting, disturbance, damage to or destruction of any of the listed protected trees. The presence of any of these species within the final development layout will be determined during the implementation of the plant rescue and protection plan as per the EMPr.

National Heritage Resources Act (NWA) (Act No. 25 of 1999)

This Act sets out requirements for site assessment and specialist reporting to ensure the protection and appropriate management of heritage resources in South Africa. The Act provides details on the permits required for any activities which may have an impact on heritage resources and more specifically:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old as well as military remains more than 75 years old;

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- Section 36: graves and human remain older than 60 years and located outside of a formal cemetery administered by a local authority.

Depending on the type of permits required, the application must be submitted to the South African Heritage Resources Agency (SAHRA) and/or the provincial heritage resources authority of the Northern Cape: Ngwao-Boswa Ya Kapa Bokoni.

A Cultural Heritage Impact Assessment and a Palaeontological Impact Assessment will be undertaken during the S&EIR to identify and assess any potential impact on heritage resources. Ngwao- Boswa Ya Kapa Bokoni and the SAHRA is being consulted during the S&EIR and invited to provide comment on the proposed project. The heritage specialist and palaeontological specialist reports compiled for the proposed development will be uploaded into the project folder created on the South African Heritage Resources Information System (SAHRIS) for the proposed project. SAHRIS case number is 17965.

<u>National Water Act (NWA) (Act No. 36 of 1998)</u>

This Act aims to ensure the protection of aquatic ecosystems and sets out general principles for the regulation of water use. Section 21 of the NWA identifies certain activities, water supply/demand and waste disposal as 'water uses' which require authorisation (licensing) by the Department of Water and Sanitation (DWS). A water use must be licensed unless it is listed in Schedule I, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a licence. According to section 21 of the Act, the following water uses must be licensed:

(a) taking water from a water resource;

(b) storing water;

(c) impeding or diverting the flow of water in a watercourse;

(d) engaging in a stream flow reduction activity contemplated in section 36;

(e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);

(f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;

(g) disposing of waste in a manner which may detrimentally impact on a water resource;

(h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;

(i) altering the bed, banks, course or characteristics of a watercourse;

(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and

(k) using water for recreational purposes.

The Section 21 water uses associated with the proposed development are as follows:

(a) - taking water from a water resource

(b) - storing of water

(c) - impeding or diverting the flow of water in a watercourse.

(e) - engaging in a controlled activity in terms of section 37 or 38 of the NWA by way of Irrigation of any land with waste or water containing waste generated through any industrial activity or by a waterwork (dust suppression),

(g) - disposing of waste in a manner which may detrimentally impact on a water resource

(i) - altering the bed, banks, course, or characteristics of a watercourse.

The DWS will make the final decision on water uses that are applicable to the project through a pre-application meeting after which a Water Use License Application (WULA) as determined by the risk assessment will be undertaken in compliance with procedural regulations.

Astronomy Geographic Advantage Act (AGA) (Act No. 21 of 2007)

Aims to protect astronomy in all its forms in South Africa, specifically but not limited to the MeerKAT and SKA projects in the Northern Cape Province. The AGA Act regulates the identification and protection of areas in which astronomy projects can be undertaken as well as the undertaking of activities which cause or could cause Radio Frequency Interference (RFI) to astronomical activities in these areas. The AGA Act is legislation that gives the Minister of Science and Technology the power to protect areas, through regulations, that are of strategic national importance for astronomy and related scientific activities. Such area is declared as an Astronomy Advantage Area (AAA).

To ensure protection of the SKA project, the government had to pass a law to protect areas suitable for astronomy studies by, among others, regulating radio and electrical interference: the Astronomy Geographic Advantage (AGA) Act of 2007. The AGA Act and associated regulations have implications for people living within an Astronomy Advantage Area (AAA).

The South African Radio Astronomy Observatory (SARAO), a facility of the National Research Foundation, is responsible for managing all radio astronomy initiatives and facilities in South Africa.

Should the facility be located within the Karoo Central Astronomy Advantage Area (KCAAA), it will be subject to the requirements of the AGA Act, and the relevant regulations governing the protection of the KCAAA.

The site area does not fall within an Astronomy Advantage Area (AAA) under the Astronomy Geographic Advantage (AGA) Act (Act No. 21 of 2007). The letter from SARAO dated 16 March 2022 states *"SARAO has undertaken a high-level impact assessment and based on the information provided it was determined that the project represents a low risk of interference to the SKA radio telescope with a compliance surplus of 57.02 dBm/Hz. As such, we do not have any objection to the proposed development."* **(Annexure E of the PPP Report attached as Appendix C)**

Civil Aviation Act (Act No. 13 of 2009)

Provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. In South Africa all structures higher than 15 m above ground level must be assessed and registered as potential obstacles to aviation in the Electronic Terrain and Obstacle Database (eTOD). The Obstacle Evaluation Committee (OEC) which is made up of members from both the SA CAA and South African

Air Force (SAAF) fulfils the role of streamlining and coordinating the assessment and approvals of proposed developments or activities that have the potential to affect civil aviation, military aviation, or military areas of interest. With both being national and international priorities, the OEC is responsible for facilitating the coexistence of aviation and renewable energy development, without compromising aviation safety.

As of the 1st of May 2021, Air Traffic and Navigation Services (ATNS) has been appointed as the new Obstacle application Service Provider for Windfarms and later Solar Plants. Their obligation would pertain to the assessments, maintenance, and all other related matters in respect to Windfarms and in due time Power Plant assessments.

The DEA Screening Tool Report identified Civil Aviation as having low sensitivity for the proposed solar PV facility. Nonetheless. ATNS and SACAA have been added as an Interested and Affected Party. They will be informed of the proposed Project, and comment will be sought from these authorities as applicable.

<u>Mineral and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002)</u>

Specifies that mineral and petroleum resources are the common heritage of all the people of South Africa and that the state is the custodian thereof for the benefit of all South Africans. In terms of Section 53 of the MPRDA the approval of the Department of Minerals and Resources (DMR) Minister is thus required for any land surface use that may be contrary to the objectives of the MPRDA. A Section 53 application is required for all land uses other than those proposed within an area with an already approved town planning scheme, farming related land uses, or other land uses identified by the Minister as not requiring approval.

With a project lifecycle of at least 20 years and the likelihood of upgrade at the end of the operation phase, the Solar PV facility is considered to have the potential for temporarily preventing access to below ground mineral resources and may require approval in terms of Section 53 of the MPRDA. The DMR has been included as a registered Interested and Affected Party in this S&EIA.

<u>National Energy Act, 2008</u>

One of the objectives of the National Energy Act, 2008 (No. 34 of 2008) is to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar (see extract below).

“To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements …; to provide for … increased generation and consumption of renewable energies …”

<u>Electricity Regulation Act, 2006 (Act No. 4 of 2006)</u>

The Act’s objective is to provide for control over the generation and supply of electricity, as well as the existence of NERSA and other related matters. The issuing of licences, determination of process, settling disputes, collecting information are the functions of NERSA.

<u>Occupational Health and Safety Act (Act No. 85 of 1993)</u>

The National Occupational Health and Safety Act (No. 85 of 1993) (OHSA) and the relevant regulations under the Act are applicable to the proposed solar PV facility. This includes the Construction Regulations promulgated in 2014 under Section 43 of the Act. Adherence to South Africa's OHSA and its relevant Regulations is essential.

Policies and Plans

White Paper on the Energy Policy of the Republic of South Africa (1998)

This paper identifies the need for demand side management and the development and promotion of energy efficiency in South Africa. It requires energy policies to consider 'energy efficiency and energy conservation' within the Integrated Resource Planning (IRP) framework from both supply and demand side in meeting energy service needs;

"Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future".

The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, such as the proposed De Aar Solar One Photovoltaic Power Project. These renewable applications are in fact in most cases the most cost effective; more so when social and environmental costs are taken into account.

Government policy on renewable energy is thus concerned with meeting the following challenges:

- Ensuring that economically feasible technologies and applications are implemented;
- Ensuring that an equitable level of national resources are invested in renewable technologies, given their potential and compared to investments in other energy supply options; and
- Addressing constraints on the development of the renewable industry.

The White Paper also acknowledges that South Africa has neglected the development and implementation of renewable energy applications. The White Paper also notes that renewable energy applications have specific characteristics that need to be considered.

Advantages include:

- There are less environmental impacts in operation compared with traditional supply technologies; and
- Generally high labour intensities and lower running costs.

Disadvantages include:

- Higher capital costs in some cases;
- Lower energy densities; and
- Depending on specific conditions, especially with sun and wind based systems, provide lower levels of availability.

Integrated Energy Plan (2003)

The development of a National IEP was envisaged in the White Paper on the Energy Policy of the Republic of South Africa of 1998 and, in terms of the National Energy Act, 2008 (Act No. 34 of 2008), the Minister of Energy is mandated to develop and, on an annual basis, review and publish the IEP in the Government Gazette.

The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development.

The IEP notes that South Africa needs to grow its energy supply to support economic expansion and in so doing, improve supply bottlenecks and supply-demand deficits. In addition, it is important that all citizens are provided with clean and modern forms of energy at an inexpensive price.

<u>National Development Plan 2030</u>

The National Development Plan aims to eliminate poverty and reduce inequality by 2030. The NDP identifies a number of supporting milestones. Of relevance to the proposed development the NDP refers to the need to produce sufficient energy to support industry at competitive prices and ensure access for poor households, while reducing carbon emissions per unit of power by about one-third. In this regard the infrastructure is not just necessary for faster economic growth and higher employment.

Chapter 3, Economy and Employment, identifies some of the structural challenges specific to South Africa, including an energy constraint that will act as a cap on growth and on options for industrialisation. The NDP notes that from an environmental perspective South Africa faces several related challenges. The reduction of greenhouse gas emissions and shift to a green low-carbon economy, is one of these challenges.

<u>Integrated Resource Plan 2010 – 2030</u>

The Integrated Resource Plan (IRP) 2010-30 was promulgated in March 2011. It was indicated at the time that the IRP should be a “living plan” which would be revised by the Department of Energy (DoE) every two years. Since the promulgation of the Integrated Resource Plan (IRP) 2010-30 there have been a number of developments in the energy sector in South and Southern Africa. In addition, the electricity demand outlook has changed markedly from that expected in 2010. The objective of the IRP 2010 is to develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next 25 years. The IRP 2010 is intended to, *inter alia*, consider environmental and other externality impacts and the effect of renewable energy technologies. The IRP 2010 further aims to:

- allocate 43% of new energy generation facilities in South Africa to renewables;
- allow for an additional 14 749 MW of renewable energy in the electricity blend in South Africa by 2030;
- an accelerated roll-out of renewable energy options to derive the benefits of localisation in these technologies.

While there are a number of renewable energy options (including, *inter alia*, wind, solar and hydropower) being pursued in South Africa, many more renewable energy projects are required to meet the targets set by the IRP 2010. With regards to photovoltaic solar energy the IRP 2010 expresses the need for firm commitment to this sector in order to facilitate the connection of the first units to the grid in 2012. It also identifies the need to provide security of investment in order to ramp up a sustainable local industry cluster.

<u>Renewable Energy Feed-in Tariff</u>

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The NERSA 'Renewable Energy Feed-in Tariff'' (REFIT) guidelines were published in 2009 under the Electricity Regulation Act (Act of No. 4 of 2006) pledging attractive rates of payment for renewable energy sold back to the grid. An innovative initiative to encourage investment within the sector of renewable energy and to help achieve the national renewable energy targets.

The REFIT programme includes a number of phases as follows;

- Phase 1: Including quotas for wind, small hydro, landfill gas and Concentrated Solar Power (CSP);
- Phase 2: Including quotas for Solar though without storage and central tower, additional CSP and photovoltaic systems including large ground or roof based and concentrating photovoltaic (CPV), as well as biomass solid and biogas technologies.

Provincial policy and legislative context

<u>Northern Cape Nature Conservation Act (Act No. 9 of 2009)</u>

Includes a list of protected flora and associated requirements for the issuing of permits and other authorisations. A permit for the clearance of indigenous vegetation on site as well as for relocation or destruction of any listed protected flora species under the Act will be required if any of the identified protected plant species are impacted by the proposed development.

A detailed plant search and rescue operation will be conducted prior to the commencement of the construction phase to record the position of the protected plant species and inform the required applications. In addition, if there are any nationally protected trees within the development footprint a destruction permit from the Department of Environment, Forestry and Fisheries would also be required.

<u>Northern Cape Provincial Growth and Development Strategy (2004-2014)</u>

At a provincial level the Northern Cape Provincial Growth and Development Strategy (NCPGDS) makes reference for the need to ensure the availability of inexpensive energy for the Northern Cape. The NCPGDS notes;

"*the development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which new economic opportunity and activity is generated in the Northern Cape*".

The NCPGDS also highlights the importance of close co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised. The NCPGDS also highlights the importance of enterprise development and noted that current levels of private sector development and investment in the Northern Cape are low. It also noted that the Northern Cape lags in the key policy priority areas of small, medium and micro enterprise (SMME) development and Black Economic Empowerment. The proposed project has the potential to create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape.

<u>Northern Cape Strategic Plan (2020-2025)</u>

The Northern Cape Strategic Plan (2020 -2025) identifies the province as one of the best sites in the world to produce solar renewable energy and that this potential has attracted to the province a large number of investors who are developing their CSP and PV plants under the DoE's Renewable Energy Independent Power Producer

Procurement Programme (RE IPP). The new vision of the Province is "A Modern, Growing and Successful Province".

Northern Cape Climate Response Strategy

The Northern Cape Government is in the process of finalising a Provincial Climate Change Response Strategy. The key aspects of this strategy are, however, summarised in the MEC's (Northern Cape Provincial Government: Environment and Nature Conservation) 2011 budget speech. These are;

- commitment to develop and implement policy in accord with the National Green Paper for the National Climate Change Response Strategy (2010);
- an acknowledgement of the Northern Cape Province's extreme vulnerability to climate-change driven desertification.

The renewable energy sector, including solar and wind energy (but also biofuels and energy from waste), is explicitly identified as an important element of the Provincial Climate Change Response Strategy.

Northern Cape Provincial Spatial Development Framework (2013 - 2018)

The Northern Cape Provincial Spatial Development Framework (2011) notes that the Northern Cape Province's major energy challenges include securing energy supply to meet growing demand, providing everybody with access to energy services and tackling the causes and impacts of climate change. In this regard, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies for the Northern Cape Province and avoiding energy imports while minimising the environmental impacts. The Provincial Spatial Development Framework further notes that renewable energy has been identified as a mechanism to diversify the economy and thereby promoting a green economy in the province.

The Provincial Spatial Development Framework also notes that the tourism sector is identified as one of the key sectors with the capacity to 'grow, transform and diversify the provincial economy'. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed project; do not affect the tourism potential of the Province.

Pixley ka Seme District Municipality Integrated Development Plan (IDP) (2017-2022)

According to the Pixley ka Seme District Municipality IDP, solar and wind farms have been identified as renewable energy opportunities for the District in terms of the SWOT analysis. The growth and development context in the district has also changed radically since 2013 (after it had been stagnant for decades) owing mainly to private and public investments in the area as a hub for renewable energy generation and astronomy, respectively.

Section 4 of the IDP highlights the districts development strategies for period 2017 – 2022. In terms of local economic development (Economic Infrastructure) it is the municipalities strategic objective to:

- The proportion of people with access to the electricity grid should rise to at least 90% by 2030, with non-grid options available for the rest;
- Promote economic growth in the district; and

- Monitor and support local municipalities to enhance service delivery.

In terms of Environmental Sustainability and resilience, the district aims for:

a. At least 20 000MW of renewable energy contracted by 2030 – 8 years' time.

<u>Pixley ka Seme District Renewable Energy Hub</u>

The District Renewable Energy Hub Draft Conceptual Document (26 February 2010) drafted by the Local Economic Development Division of the Pixley ka Seme District Municipality has proposed that the areas around the northern and eastern borders of Pixley ka Seme the Pixley Ka Seme District Municipality, with a distance of 50 kilometres from the Orange River, forms part of this hub. The hub has the potential to stimulate special economic development zoned within the area and industrial development.

The draft concept document outlines the proposed strategy, which is in line with both the National and Provincial policy with respect to renewable energy generation.

The Renewable Energy Hub is seen as a critical component to the revitalisation of both the broader District and the town of De Aar. The District is well positioned for renewable energy development (including solar, wind, biomass and hydro-electric) due to the ample availability of suitable land, the existence of adequate existing infrastructure.

It is envisaged that the Hub will:

- attract both local and foreign investors and research institutions;
- alleviate the increasing demand on electricity nationally;
- reduce South Africa's dependence on fossil fuel;
- create employment and downstream business opportunities for local entrepreneurs; and
- utilise the high insolation rates and steady winds.

<u>Pixley ka Seme District Climate Change Response Plan (2016)</u>

Pixley ka Seme District Municipality acknowledges that climate change poses a threat to the environment, its residents, and future development as such the district prioritised the development of a Climate Change Vulnerability Assessment and Climate Change Response Plan. Through this program key climate change vulnerability indicators were identified. These are indicators where Pixley ka Seme District Municipality may be at risk to the impacts of climate change.

Agriculture

Climate change is predicted to negatively impact on the agricultural sector in Pixley ka Seme District Municipality. Increased temperatures, drought, and the increase in frequency and severity of storm events will impact on the crops that can be grown and potentially result in a loss of livestock.

The proposed priority responses in the Agriculture Sector are:

- Conduct research into understanding the impacts of climate change on grain production and possible alternative crops
- Conduct research on climate resilient cultivars

- Conduct a regular assessment of the grazing capacity of veld areas and encourage good veld management and practices such as crop rotation.

Biodiversity and Environment

In the Pixley ka Seme District Municipality, it is projected that with the warmer temperatures that there will be a replacement of Nama Karoo biome with Savanna and Desert biomes. A large amount of Nama Karoo and Nama Karoo related species will be lost. Furthermore, development and changes in land use will impact negatively on the environment in the District.

- The proposed priority responses in the Biodiversity and Environment Sector are:
- Commission research on hydrological fracking for all critical ecosystems
- Increased awareness for developers, and development of stricter by-laws promoting green developments.
- Look into biodiversity offsets for industry. e.g. Offsets for the SKA development.

Water

Pixley ka Seme District Municipality is currently experiencing issues of water scarcity and quality. Climate change is expected to exacerbate this problem. Drought, reduced runoff, increased evaporation, and an increase in flood events will impact on both water quality and quantity.

The proposed priority responses in the Water Sector are:

- Establish additional desalination plants to support those that are currently in operation
- Conduct a feasibility study and research on drilling additional boreholes
- Investigate the use of recycled water for irrigation

<u>Emthanjeni Local Municipality IDP 2021/2022 (09 June 2021)</u>

Emthanjeni has in recent time seen the influx of investment in Renewable energy projects and is a potential industrial growth point with ample industrial sites, reasonable prices and tariffs, affordable labour and the necessary infrastructure. The Emthanjeni Local Municipal Integrated Development Plan indicates that energy consumption will potentially increase by 10% and a similar strategy for alternative energy will have to be identified for both cooling in summer and heat in winter. The alternative of solar energy will be needed to relieve electricity.

The Municipality is convinced that the Renewable Energy projects, New District Hospital and possibility of new Warehouse Hub and Manufacturing project for further development planned for the area would grow the economy enormously.

<u>Emthanjeni Municipality Spatial Development Framework (SDF) 2007</u>

It is the intention of the SDF to arrange development activities and the built environment in such a way and manner that it can accommodate and implement ideas and desires of people without compromising the natural environment.

The towns of Emthanjeni lie in an extensive stock farming area with the emphasis on sheep, mutton and wool farming, especially Merino's. It is proposed that the agricultural sector be retained as it is at present to ensure that it still plays an economic part in the future of the Municipal area. Tourism possibilities must be explored and developed to broaden the economic base of these areas.

As mentioned, the current land use is sheep farming, which will continue within the solar PV facility to ensure minimal reduction (if any) on the agricultural potential of the land.

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SECTION F: MOTIVATION FOR THE NEED AND DESIRABILITY FOR THE PROPOSED ACTIVITY

3(1) A EIA report… must include –

A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

Note: As the Guideline on Need and Desirability (2017) has not yet been published in a Government Gazette (date of commencement is unclear) hence the Guideline on Need and Desirability (2010) has been used.

Legislative Background and Strategic Context

National Environmental Management Principles of NEMA, 1998, which guide the interpretation, administration and implementation of NEMA, 1998 (and the EIA Regulations, 2014) specifically require *inter alia* that environmental management must place people and their needs at the forefront of its concern (Section 2(2)). The latter refers to the broader societal/community needs and interests, and is put into effect through the EIA Regulations, 2014, which require environmental impact assessments to specifically consider 'need and desirability' in order to ensure that the 'best practicable environmental option' is pursued, and that development more equitably serves broader societal needs now and in the future. Furthermore, it ensures that the proposed actions of individuals are measured against the long-term public interest.

What is needed and desired for a specific area must be strategically and democratically determined (DEA&DP (2010) Guideline on Need and Desirability). The strategic context for informing need and desirability is best addressed and determined during the formulation of the sustainable development vision, goals and objectives of Integrated Development Plans ('IDPs') and Spatial Development Frameworks ('SDFs') during which collaborative and participative processes play an integral part, and are given effect to, in the democratic processes at local government level (DEA&DP (2010) Guideline on Need and Desirability). The need and desirability must therefore be measured against the contents of the credible IDP, SDF and EMF (**no adopted EMF for the development site**) for the area, and the sustainable development vision, goals and objectives formulated in, as well as the desired spatial form and pattern of land use reflected in, the area's IDP and SDF (DEA&DP (2010) Guideline on Need and Desirability). Integrated Development Planning (and the SDF process) effectively maps the desired route and destination, whilst the project-level EIA decision-making finds the alternative that will achieve the desired goal (DEA&DP (2010) Guideline on Need and Desirability). However, inadequate planning or the absence of a credible IDP and SDF means that the EIA has to address the broader need and desirability considerations. Consequently, 'need and desirability' is determined by considering the broader community's needs and interests as reflected in a credible IDP, SDF and EMF for the area, and as determined in the EIA decision-making process.

Furthermore, the Constitution calls for *justifiable* economic development. The specific needs of the broader community must therefore be considered together with the opportunity costs and distributional consequences in order to determine whether or not the development is 'justified'.

The general meaning of need and desirability refers to time and place, respectively, e.g., is this the right time and is it the right place for locating the proposed activity. The need and desirability of this application was addressed separately and in detail by answering *inter alia* the following questions.

The answers to the questions below will form key informants to the identification and consideration of alternatives, including the option not to proceed with the development.

Need ('timing')

<u>Question 1</u>

Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority? (e.g., is the proposed development in line with the projects and programmes identified as priorities within the credible IDP).

Explanation:

Question 1 and 2 seeks to find clarity as to whether the proposed land use is catered for in the current planning framework of the SDF and is intended for at that specific point in time. In this context the term land use should not only be broadly defined as agriculture, residential or industrial use, etcetera., but where relevant, it must be further qualified, for example, stating specifically whether a housing development is for social or high-income purposes, or whether the industrial use is for service industries, or heavy industry, or whether the development is a high-rise as opposed to low-rise development, etcetera. Furthermore, if the land use is to occur in the proximity of an urban area, clarity must also be provided regarding its location in relation to the urban area.

- Yes. The proposed project would contribute to the economic stability of the area by establishing a sustainable industry on a property that has low agricultural potential.
- At a provincial level, the Northern Cape Provincial Spatial Development Framework (PSDF, see Section 1.5.2.8) notes that the Northern Cape Province's major energy challenges include securing energy supply to meet growing demand, providing everybody with access to energy services and tackling the causes and impacts of climate change. In this regard, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies for the Northern Cape Province and avoiding energy imports while minimising the environmental impacts. The PSDF further notes that renewable energy has been identified as a mechanism to diversify the economy and thereby promoting a green economy in the province.
- The Northern Cape Provincial Growth and Development Strategy (NCPGDS) (see Section 1.5.2.5) states that the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments must be encouraged. In this regard the NCPGDS notes that the development of energy sources such as solar energy could be a means by which new economic opportunity and activity is generated in the Northern Cape. The NCPGDS also highlights the importance of close co-operation between the public and private sectors for the economic development potential of the Northern Cape to be realised.
- The ELM IDP lists a number of industrial and manufacturing projects that form part of the larger strategy for the economic development of the municipality. One of these projects includes the establishment of De Aar as a Renewable Energy Hub. Basic service delivery, with energy as one of the priority issues, micro- and macro-economic development as well as land use management have been highlighted as key performance areas to be addressed within the ELM. The

establishment of the proposed photovoltaic power plant has the potential to support a number of key strategies in the ELM IDP.

- The proposed project will create up to 650 employment opportunities (mainly unskilled and semi-skilled) during the construction phase and up to 55 during the operational phase. A large number of the workforce would be sourced from the surrounding areas. Specific training would also be provided for more technical tasks.
- Further, the Social Impact Assessment undertaken found that the *"The project outcomes align with the national, local, and regional planning objectives in terms of economic development and sustainability".*

Question 2:

Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?

- Yes, the ELM IDP recognises the need for economic growth and the creation of employment opportunities for local people;
- The N10 has been identified as a central part of the energy hub;
- The project list is incorporated in the IDP based on the needs of the community. The critical areas remain Infrastructure and Local Economic Development. Within the limited resources of the Municipality, it will have to address the following;
  - Roads
  - Storm water
  - Housing delivery (servicing of sites)
  - Bulk services (**electricity**, water)
  - Support to SMME's
  - Sewerage.
- South Africa is currently in an energy crisis. President Cyril Ramaphosa's address to the nation on energy crisis on 25 July 2022 mentioned a set of actions namely: *"Firstly, are aimed at improving the performance Eskom's existing fleet of power stations. Secondly, will accelerate the procurement of new generation capacity. Thirdly, are intended to massively increase private investment in generation capacity".*
- Further, Minister of the Department of Forestry, Fisheries and Environment, Ms Barbara Creecy on 21 July 2022 announced initiatives for further streamlining the environmental assessment process for renewable energy projects in South Africa. The measures will improve the efficiency of the environmental assessment processes to facilitate the development of Solar PV and associated infrastructure in areas of low to medium environmental sensitivity. The initiatives to be implemented will exempt developers from obtaining environmental authorisation for certain listed or specified activities for the development of solar facilities.

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Question 3:

Does the community/area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g., development is a national priority, but within a specific local context it could be inappropriate).

Explanation:

Question 3 *relates to the type of development and land use and not just its associated benefits or costs (e.g., the specific needs of the community at that specific time, e.g., small business rather than shopping centres, low-cost housing rather than luxury housing, etcetera, must be considered).*

- Yes, the area has an unemployment rate of 28% (Census 2011 data) and the site is marginal for profitable agricultural activities. The proposed project would create a relatively large number of temporary and permanent (over the lifespan of the project) employment opportunities for the local De Aar/Hanover communities. The area around De Aar has also been identified as a Renewable Energy Hub in the ELM IDP.
- The Municipality has agreed on seven (7) Strategic Objectives that are to be achieved.
  - Basic Services and Infrastructure Development
  - Institutional Development and Municipal Transformation
  - Good Governance and Public Participation
  - Financial Viability
  - Local Economic Development
  - Safety and Security
  - Social Development
- The policy case for the roll-out of renewable energy in South Africa has been made at a national and provincial government level using arguments that are in line with international policy trends. Targets that include solar energy have been set and incentives have been offered to renewable energy developers through the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) to encourage projects. Aside from impacts on the achievement of national goals and policy imperatives, the project also has the potential to contribute to greater energy supply stability and security in the province and local area to the benefit of local residential electricity consumers as well as farmers and businesses.
- As indicated in the EML IDP, Emthanjeni has in recent time seen the influx of investment in Renewable energy projects and is a potential industrial growth point with ample industrial sites, reasonable prices and tariffs, affordable labour and the necessary infrastructure. Further, the Emthanjeni Local Municipal Integrated Development Plan, indicates that energy consumption will potentially increase by 10% and a similar strategy for alternative energy will have to be identified for both cooling in summer and heat in winter. The alternative of solar energy will be needed to relieve electricity.
- In the Northern Cape Province, exceptionally high radiation levels make the province particularly suited for power generation from solar energy (**Figure 3**). Besides solar, the province also has potential for Wind, Hydro and Biomass power generation.

- The Northern Cape Provincial Spatial Development Framework (2012) specifically recognises the potential for solar development in the province, identified with the introduction of a solar corridor stretching between ZFMgcawu and the Pixley ka Seme regions and the solar-themed special economic zone (SEZ) in Khara Hais Municipality.
- In 2014, the Renewable Energy Centre of Excellence (RECE) launched in the Northern Cape42. It serves as a platform for innovation and skills development in the renewable energy sector and focuses on unlocking potential and attracting investment.
- The province intends to become a net producer of Renewable Energy to the rest of the country by 2020, inviting investment and development into the province (*State of Renewable Energy in SA, 2015*).
- The project outcomes align with the national, local, and regional planning objectives in terms of economic development and sustainability.
- The project will use a natural, renewable resource and assist with decreasing the country's reliance on coal as a source of energy.
- The project will not affect the environmental rights of any of the affected stakeholder groups and no-one's livelihoods will be affected in a negative manner.
- The project will contribute to livelihood strategies of stakeholders in the area – directly through job creation and secondary economic opportunities, and indirectly through enterprise and socio-economic development by means of a community trust. Should the mitigation measures be implemented as recommended, the contribution to long-term sustainable outcomes will be significant.
- The project will complement the socio-economic benefits in the area. Given the rural setting of the site there will be a need to transport goods and people over a distance, but the negative impact of this aspect can be mitigated by the secondary economic opportunities that the need for transport service providers will create.
- There are vulnerable people that will be affected by the project. The vulnerable groups include the poor and unemployed people in the urban areas, people suffering from FASD, the elderly, women, children, and the farm workers in the rural areas.
- The project offers opportunities for semi- and unskilled labourers, which will ensure that the vulnerable groups are not excluded from economic opportunities.
- The project will not result in any unfair discrimination or affect the social and environmental rights of any of the stakeholder groups, should the mitigation measures be implemented as suggested.
- From a social perspective the positive impact that the project will have on the affected environment outweighs the negative impacts by far, and where there are negative impacts, it can be mitigated.

<u>Question 4:</u>

Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?

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Explanation (Question 4 and 5):

According to the NEMA EIA Regulations, an EIA must contain a description and assessment of the significance of any environmental impacts, including cumulative impacts, that may occur as a result of the undertaking of the activity or identified alternatives or as a result of any construction, erection or decommissioning associated with the undertaking of the activity. An associated activity/component essential for the undertaking of a proposed development (i.e. any associated component of the development, which cannot be separated from the development itself; e.g. residential development that cannot exist without the essential municipal infrastructure to serve it in terms of water and electricity provision, waste removal, treatment of sewage and management of stormwater) must be considered together with the proposed development, before the environmental authority decides on the development application. The environmental authority must (be able to) apply its mind to all the impacts (of the development and all its associated activities/components) prior to decision-making. Deferring decision-making on associated components to a future date constitutes conditional and piecemeal (incremental) decision-making, which result in the environmental authority not applying its mind to all the impacts and the pre-empting of decisions on the associated components-resulting in unsustainable development and legally impermissible administrative action.

- Yes.
- Electricity during construction of at least the first PV block will be sourced from a 20 kVA mobile generator with an integrated diesel tank (fuel capacity ± 55 litres) but used in conjunction with a solar system. The generator will be located at the construction camp. Once the first PV block is complete and operational (capable of generating electricity), then it will be able to supply electricity for the remainder of construction.
- Electricity during operation will be obtained from Eskom via the existing supply to the site.
- The proposed project would strengthen the local electricity grid for the area and thus improve the available electrical services.
- In terms of water requirements, the proposed project would utilise groundwater from two existing boreholes and one proposed new borehole on the property. Rainwater harvesting from operation area office roof is also suggested. The Geo-hydrological Assessment confirmed that *"based on the groundwater availability on all sub-catchments for the current setting it is estimated that there is enough groundwater available on a subcatchment level to sustain the proposed 8-hour abstraction from the designated boreholes and the sub-catchments they fall in."*
- All general waste would be disposed of at the De Aar licensed landfill site.
- The principal sanitation system during construction shall be a sewerage treatment package plant (**S21(g)**). Black water (flush toilet sewerage) and grey water (from hand wash basins) will be treated in a decentralised toilet block treatment system known as NEWGen100. NewGen100 is a compact containerised treatment unit that treats and recycles >99% of the flush toilet sewage from multiuser toilet blocks. The system is an autonomous, solar-powered, compact, and off-grid sewage treatment system which utilizes membrane biotechnology for the treatment of sewage from toilets for re-use in the toilets. A sub-surface soakaway will be required to dispose of the 'unrecycled' or excess treated effluent that cannot be reused for dust control/suppression.

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- The NewGen100 sanitation system will be supplemented by portable chemical toilets for use by the work front further away from the construction camp.
- The principal sanitation system during operation shall be a sewerage treatment package plant (S21(g)). Black water (flush toilet sewerage) and grey water (hand wash basins in kitchen, change rooms, medical room, and/or workshop) shall be treated to general limits with a Biorock package plant, specifically the Multirock 60 treatment system. Biorock products are capable of recycling domestic sewerage to produce a high-quality final product fit for irrigation or to return safely to the local receiving environment. A sub-surface soakaway will be required to dispose of the treated and disinfected effluent that cannot be reused for dust control/suppression.

Question 5:

Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)?

- Yes.
- In South Africa's growing Renewable Energy footprint, the Northern Cape, offers the most favourable solar radiation levels, has attracted the majority of the Solar PV projects and all of the CSP projects. The province, host to 48 of the 92 IPP projects in the country, is expected to contribute 3,566 MW to the total procured Renewable Energy capacity once construction is complete (*State of Renewable Energy in SA, 2015*).
- The District Municipality has proactively diversified its economy away from mining and agriculture through innovative local economic development initiatives, declaring themselves as a Renewable Energy Hub, seeking to attract foreign direct investment into solar, wind, hydro and biomass projects.
- Further, the Emthanjeni SDF proposes that the agricultural sector be retained as it is at present to ensure that it still plays an economic part in the future of the Municipal area. As mentioned, the current land use is sheep farming, which will continue within the solar PV facility to ensure minimal reduction (if any) on the agricultural potential of the land.

Question 6:

Is this project part of a national programme to address an issue of national concern or importance?

Explanation (Question 6):

While the legislative frameworks require that national, provincial and municipal plans should be aligned, it is acknowledged that there might be certain strategically important developments (e.g. the construction of a nuclear power station) that are part of strategic programmes that are not always catered for in current planning framework of the SDFs. In these instances, the strategic need and desirability considerations must be measured against the needs and desires of the area in question when determining the need and desirability of the development under consideration.

- Yes.
- The proposed project would strengthen the local electricity grid for the area and contribute to meeting the national renewable energy targets set by the Department of Energy (DoE).
- There is a national electricity supply shortage and the country is now in a position where it needs to commission additional plants urgently. Consequently, renewable energy projects are a high priority (*Northern Cape Provincial SDF 2012*).
- South Africa is currently in an energy crisis. President Cyril Ramaphosa's address to the nation on energy crisis on 25 July 2022 mentioned a set of actions namely: "Firstly, are aimed at improving the performance Eskom's existing fleet of power stations. Secondly, will accelerate the procurement of new generation capacity. Thirdly, are intended to massively increase private investment in generation capacity".
- Further, Minister of the Department of Forestry, Fisheries and Environment, Ms Barbara Creecy on 21 July 2022 announced initiatives for further streamlining the environmental assessment process for renewable energy projects in South Africa. The measures will improve the efficiency of the environmental assessment processes to facilitate the development of Solar PV and associated infrastructure in areas of low to medium environmental sensitivity. The initiatives to be implemented will exempt developers from obtaining environmental authorisation for certain listed or specified activities for the development of solar facilities.

Desirability ('placing')

<u>Question 7:</u>

Is the development the best practicable environmental option for this land/site?

Explanation (Question 7):

According to NEMA the "best practicable environmental option" means the option that provides the most benefit and causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term. In determining the best practicable environmental option, adequate consideration must also be given to opportunity costs.

- Yes. There are other similar developments in the area, and it can be operated parallel to the farming activities.
- The location factors are favourable for the development of a Solar PV facility including high and good quality solar irradiation, flat and gentle slopes and close proximity to existing Eskom infrastructure including powerlines to feed into the grid and the N10 for transport links.
- The prevailing unfavourable climatic conditions for arable agriculture, as well as the prevalence of soils with limited depth, the farm does not have a high agricultural potential.
- Furthermore, the proposed project plans to integrate with the current small livestock practices, increasing the profitability and optimises the opportunity costs of the property. While the solar PV farm will result in environmental impacts through disturbance to in situ vegetation, in the medium to long-term, it is possible that due to the creation of microclimates created beneath the solar panel arrays, a higher nett primary production may result, effectively increasing the

grazing capacity of the land. This aspect will be quantitatively monitored through an ecological management plan.

- The original preferred development footprint identified during the Scoping phase which was approximately 876ha was refined in order to avoid sensitive areas and identified no go areas as per the various specialist's studies (biodiversity, heritage, visual, aquatic etc). This exercise reduced the preferred alternative development footprint to approx.650 ha

<u>Question 8:</u>

Would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF as agreed to by the relevant authorities?

Explanation (Question 8 and 9):

If the development is to occur in the proximity of an urban area, clarity must also be provided whether or not it will be situated within or outside of the urban area, with the impacts associated with its location in relation to the urban area to be specifically considered and reported on.

- No. Given the rural nature of the site there will be no impact on and credible municipal IDP and SDF.
- The proposed project is in line with the initiatives of the Emthanjeni IDP to support economic growth, create job opportunities for local communities and establish De Aar as a Renewable Energy Hub.
- Further, the Emthanjeni IDP, indicates that energy consumption will potentially increase by 10% and a similar strategy for alternative energy will have to be identified for both cooling in summer and heat in winter. The alternative of solar energy will be needed to relieve electricity.

<u>Question 9:</u>

Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g., as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?

- No.
- The Emthanjeni Local Municipality does not have an EMF in place, and sensitivity analyses have been undertaken according to National Biodiversity Planning datasets, and the proposed properties are not deemed as critical biodiversity areas or national protected area expansion strategy areas.
- The properties are however identified as Ecological Support Areas (ESA) in terms of the Northern Cape CBA Map 2016 due to the presence of NFEPA wetlands, an Important Bird Area and vegetation types.
- Terrestrial Biodiversity, Aquatic Biodiversity, Avifauna, Bat, Animal Species and Plant Species specialist's studies have been undertaken. None of the specialist studies have identified any fatal flaws. All specialists' studies have recommended the development subject to proposed mitigation

measures which have been incorporated into the Environmental Management Programme (EMPr)

- Page 19 of the *DoE Integrated Resource Plan Update - Assumptions, Base Case Results and Observations published in Government Gazette No. 40445* states that Solar PV and CSP with storage present excellent opportunities to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Solar technologies also present the greatest potential for job creation and localisation. Incentive programmes and special focused programmes to promote further development in the technology, as well as solar roll-out programmes, should be pursued.

<u>Question 10:</u>

Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context).

- Yes.
- The location factors are favourable for the development of a Solar PV plant including high and good quality solar irradiation (**Figure 3**), flat and gentle slopes and close proximity to existing Eskom infrastructure including powerlines and the N10 for transport links.
- The favourable location factors has attracted the majority of the Solar PV projects and all of the CSP projects. The province, host to 48 of the 92 IPP projects in the country, is expected to contribute 3,566MW to the total procured RE capacity once construction is complete (*State of Renewable Energy in SA, 2015*).

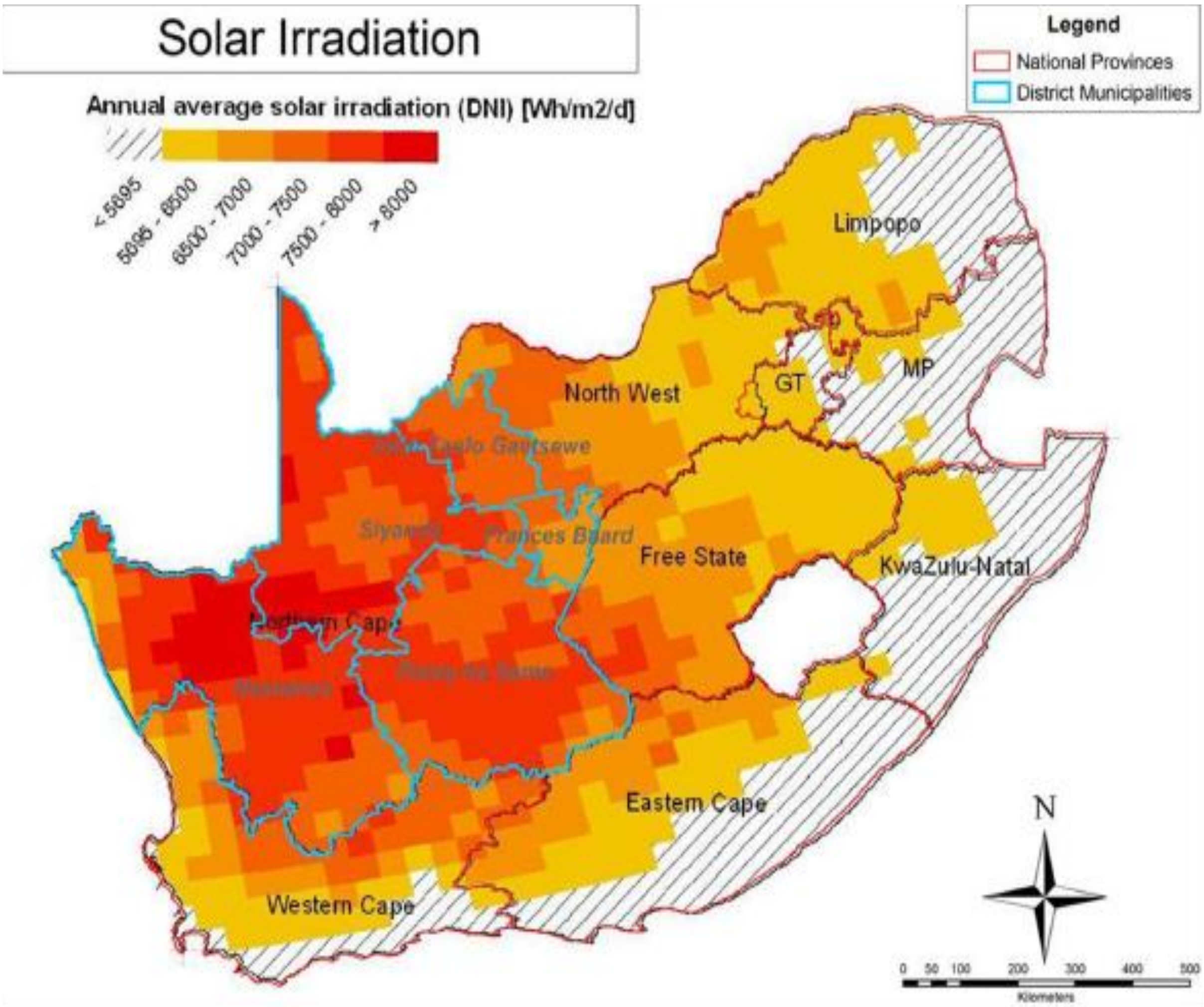

Figure 3. Solar irradiation map indicating the suitability of the Northern Cape for solar related projects (IDP, 2015-2016).

Question 11:

How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?

- The EAP in conjunction with the Project Proponent and landowners has conducted a desk top study using GIS spatial analysis to identify potential development footprints that will have the least impact on the local environment. This exercise was followed up by a site inspection to ground truth the information collected from the desk top study. These findings identified the potential environmental aspects and impacts that were further assessed by the appointed Specialist.
- A Heritage Specialist was appointed to conduct a Heritage Impact Assessment including Archaeology, Palaeontology and Cultural Heritage and delineate sensitive heritage features and areas within the proposed site. All identified heritage sensitive features and areas within the proposed site will be avoided in the design of the solar facility footprint.

- From a Cultural Heritage and Palaeontological point of view, the specialists recommended the development should be allowed to continue once the recommended mitigation measures have been implemented.
- Further, various Specialist were appointed to investigate sensitive elements of the receiving environment (plants, animals, terrestrial biodiversity, aquatic biodiversity, bats and avifauna) that may potentially be impacted on by the proposed development. Highly sensitive ecological features and areas within the proposed site will be avoided in the design of the solar facility footprint.
- As mentioned, the original preferred development footprint identified during the Scoping phase was approximately 876ha. This footprint was refined in order to avoid sensitive areas and identified no go areas as per the various specialist's studies (biodiversity, heritage, visual, aquatic etc). This exercise reduced the preferred alternative development footprint to approx.650 ha.
- Given the proximity of the project from communities, the adverse environmental impacts do not have social or environmental justice implications. Renewable energy is a clean form of energy and benefits the greater society.

Question 12:

How will the development impact on people's health and wellbeing (e.g., in terms of noise, odours, visual character and sense of place, etc)?

- The potential impacts on peoples' health and well-being have been assessed, preliminarily the impact of potential concern is the visual impact that has been assessed by the appointed specialist, who has conducted a full visual impact assessment.
- The visual recommendations from the scoping phase reporting were all incorporated into the layout design, accommodating a wide buffer on the adjacent properties, as well as accommodating wide ecological corridors between the four PV blocks. While the local sense of place will be modified, the impacted visual resources are localised to some degree and are not highly significant. As such, the development was recommended with mitigation.
- The development's socioeconomic impacts were investigated and described in the socio-economic specialist assessment report. None of the social impacts identified are so severe that the project should not continue. Based on the findings of the Socio-economic Impact report, it is recommended that the project continues, on the condition that the mitigation measures are implemented. Measures to avoid, minimise and remedy potential negative socio-economic impacts have been included in the EMPr as required.

Question 13:

Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?

Explanation (Question 13):

Opportunity costs can be defined as the net benefit that would have been yielded by the next best alternative (for example, if farming is the next best alternative for a piece of land, then the forgone benefit of losing the *farming option will be the opportunity cost of any other land use, or if not proceeding with the activity, then the forgone benefits of the proposed activity is the opportunity cost of not proceeding). Opportunity costs also relate to the use of limited resources, for example water. If a limited volume of water is available in an area the most desirable use of the water considering the needs in the area must be determined in order to consider the opportunity costs associated with the different uses of the water. The concept of opportunity costs is applicable to project alternatives as well as policy selection. It is vital information if decision makers are to understand the implications associated with specific development proposals. A key part of considering opportunity costs is commonly to comparatively consider and assess the different alternatives in terms of the benefits and/or disadvantages associated with each alternative. Opportunity cost is a concept that often need not involve monetary values, though where these values can be given, they allow for a more detailed comparison than would otherwise be possible.*

- No ‘unacceptable’ opportunity costs.
- The Soil study found that the site showed low and medium sensitivity from a agricultural perspective with land capabilities ranging from moderate to very low. This has been confirmed with the soil surveys in 2022; extensive grazing with relative low animal numbers is the most suitable agricultural application.
- From a grassland ecological perspective, the opinion of the razing specialist is that the current planned development (and the cumulative effect of 30km from other PV-projects), will not have a significant impact on the determined grazing potential.
- With regards to water, based on the groundwater availability on all sub-catchments for the current setting it is estimated that there is enough groundwater available on a sub catchment level.
- One opportunity cost is the impact on high levels of local Scenic Quality, particularly, the unique agricultural ‘Karoo’ landscape character as experienced by neighbouring landowners. However, restricting the PV system to lower lying valley areas or grasslands and demarcating significant (250 m) massing and visual sensitivity buffers along selected property boundaries, will reduce the massing effects (created by large scale coverage or expanses of solar PV panels in a rural agricultural landscape setting) to within acceptable levels.
- There are also relatively few tourism assets or facilities in the area that could be at risk. Business tourism would receive a significant boost. The project will contribute to livelihood strategies of stakeholders in the area – directly through job creation and secondary economic opportunities.
- The proposed project will generate renewable energy that will feed into the national electricity grid. This is in line with the National Development Plan and sustainable development. As such it is a positive impact.
- South Africa experiences some of the highest levels of solar radiation in the world and this renewable resource holds great potential for the country. The total area of high radiation in South Africa amounts to approximately 194 000 km2, including the Northern Cape, which is one of the best solar resource areas in the world. With electricity production per square kilometre of mirror surface in a solar thermal power station being 30.2 MW, and just 1% of the high radiation area in the country being made available for solar power generation, the generation potential is approximately 64 GW. Solar energy has the potential to contribute quite substantially to South Africa’s future energy needs. This would, however, require large investments in transmission lines from the areas of high radiation to the main electricity consumer centres (*DoE Integrated*

Resource Plan Update - Assumptions, Base Case Results and Observations published in Government Gazette No. 40445).

- Furthermore, as the proposed project will be undertaken and implemented in conjunction with the pre-existing agricultural land use practices, the opportunity costs associated with the combined land uses are greatly improved.
- The potential impacts associated with the proposed project have been assessed by the appointed specialists. None of the specialist studies have identified any fatal flaws. All specialists' studies have recommended the development subject to proposed mitigation measures which have been incorporated into the Environmental Management Programme (EMPr).
- The project is anticipated to provide a positive impact on the local area including electricity from a non-polluting renewable energy source, as well as benefits to job creation and skills development.

Question 14:

Will the proposed land use result in unacceptable cumulative impacts?

Explanation (Question 14):

Cumulative impacts can be defined as:

- *Addictive: the simple sum of all the impacts (e.g., the accumulation of ground water pollution from various developments over time leading to a decrease in the economic potential of the resource).*
- *Synergistic effects occur where impacts interact with each other to produce a total effect greater than the sum of individual effects. These effects often happen as habitats or resources approach capacity (e.g., the accumulation of water, air and land degradation over time leading to a decrease in the economic potential of an area).*
- *Time crowding effects occur when frequent, repetitive impacts occur on a particular resource at the same time (e.g., boreholes decreasing the value of water resources).*
- *Neutralizing effects occur where impacts may counteract each other to reduce the overall effect (e.g., infilling of a wetland for road construction, and creation of new wetlands for water treatment).*
- *Space crowding effects occur where we have a high spatial density of impacts on a particular ecosystem (e.g., rapid informal settlement).*
- *Externalisation of disadvantages occurs when there is no, or insufficient consideration given to the associated social costs that will be borne by the public.*

- Refer to **Section J** of the Draft EIA report which deals with cumulative impacts.
- There are several other renewable energy developments in the wider area and along with the current development, these would potentially generate significant cumulative impacts on habitat loss and fragmentation and negative impact on broadscale ecological processes such as dispersal and climate change resilience.
- However, the location of the proposed solar PV development within mostly low sensitivity habitat and proposed mitigations to fragment the facility into two or more blocks separated by ecological

corridors is seen to reduce the significance of its potential contribution to cumulative impact on the local and regional landscape. The impacts on broad scale ecological processes are likely to remain low if the areas that are likely to be important for the maintenance of broad-scale ecological processes (such as dispersal) will remain free of development.

- The impact assessment shows that almost all identified impacts can be affectively mitigated, indicating that the cumulative impact effect will also be mitigated. Additional impacts and quantification of cumulative impacts has been assessed by the appointed specialists (**Section J**)

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SECTION G: A MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE AS CONTEMPLATED IN THE ACCEPTED SCOPING REPORT

3(1) A EIA report… must include –

(g) a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

Introduction

All environmental impact assessments, which are to be utilised in informing an application for environmental authorisation, must identify and investigate the alternatives to the activity on the environment (Sections 24(4)(b)(i) and 24(4A) of NEMA, 1998) and include a description and comparative assessment of the advantages and disadvantages that the proposed activity and feasible and reasonable alternatives will have on the environment and on the community that may be affected by the activity. If, however, after having identified and investigated alternatives, no feasible and reasonable alternatives exist, no comparative assessment of alternatives, beyond the comparative assessment of the preferred alternative and the option of not implementing the activity (Sections 24(4)(b)(i) and 24(4A) of NEMA), is required during the assessment phase. In this instance, the EAP managing the application must provide the competent authority with detailed, written proof of the investigation(s) undertaken and motivation indicating that no reasonable or feasible alternatives, other than the preferred alternative and the no-go option, exist.

Alternative No. 1: Property (site) and Location (within the site)

Purpose and Requirements

The study area falls within the Nama-Karoo Biome. Considering the Nama-Karoo biome is the second largest Biome in South Africa, after the Savanna Biome (http://pza.sanbi.org/vegetation/nama-karoo-biome), there is plenty of space to investigate alternative properties or sites. However, will all potential sites meet the same purpose and requirements of the proposed activity (**Table 8**)?

The Nama-Karoo Biome occurs on the central plateau of the western half of South Africa, including the Northern Cape Province. It has a summer rainfall between 100 and 520 mm an^{-1}, and the dominant vegetation is a grassy, dwarf shrubland (http://pza.sanbi.org/vegetation/nama-karoo-biome). Consequently, the requirements for (1) at least 4 hours of peak sunlight, (2) a low annual rainfall, (3) flat, clear land, (4) considerable space, and (5) pastoral systems can be met throughout the region.

However, not all properties will be in proximity to a 400 kV Eskom powerline, and not all property owners will have an existing lease agreement with the applicant, Soventix South Africa (Pty) Ltd. In other words, the identification and assessment of alternative sites and locations was limited by land ownership, to ensure consent of use for the undeveloped agricultural land within the vicinity of the national grid (and Phase 1).

Eskom Transmission's Hydra-Poseidon Line 1 400 kV powerline and Hydra-Poseidon Line 2 400 kV powerline intersect Mr Willem Retief's south-western most properties, east of the N10 (**Figure 4**).

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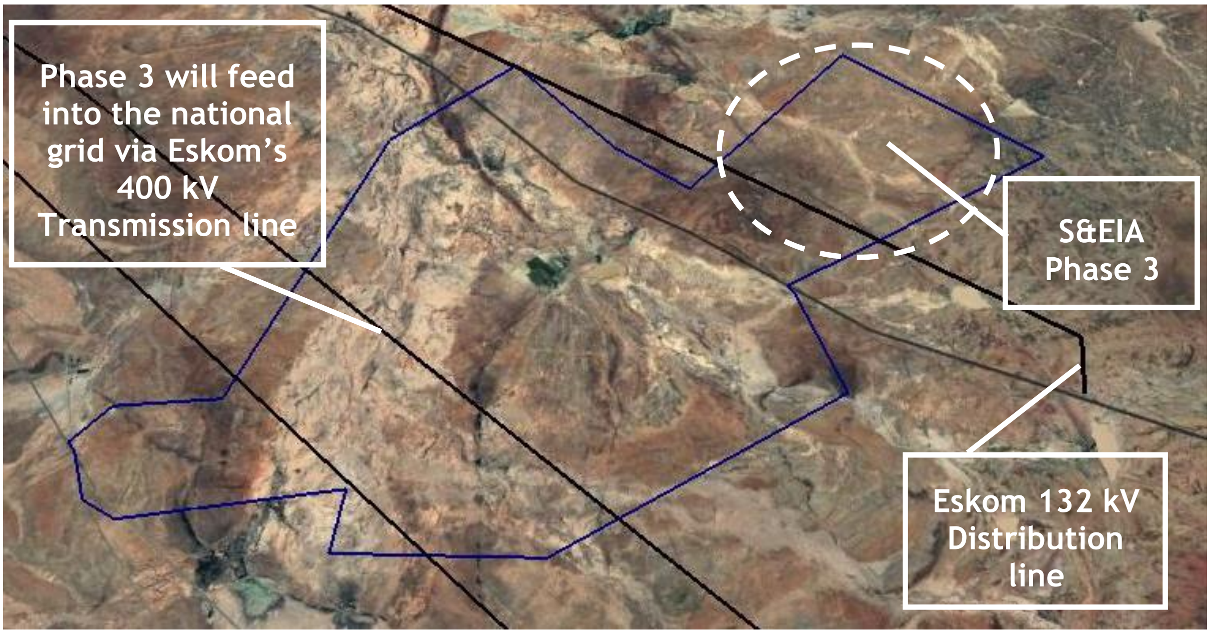

Figure 4: The location of Eskom's Transmission (220 – 765 kV) and Distribution (132 kV) lines (or servitudes) that intersect Mr Willem Retief's properties (contained within the blue boundary), relative to the proposed 400 MW Solar PV facility (Phase 3) on the Remainder and Portion 3 of the Farm Goede Hoop 26C (north-east of Eskom's 132 kV distribution line.

The farmer with whom the applicant has a lease agreement, Mr Willem Retief, owns several properties. These properties were extensively investigated by several specialists (avifauna, ecological, geological, geotechnical, heritage, aquatic and zoological) in 2016/17 when ecoleges undertook a S&EIA for the development of a 225 MW Solar PV facility on the site. Three alternative footprints (PV01, PV02, PV03) were investigated during the assessment process. The central footprint (PV02) was identified as the preferred option because of its lower environmental impact and proximity to an existing 400kV Eskom powerline when compared with PV01 and PV03. The National Department of Environmental Affairs granted an environmental authorisation (DEA Reference: 14/12/16/3/3/2/998) for PV02 on 16th April 2018 (**Phase 1**).

Furthermore, Soventix will be applying for an environmental authorisation to develop an additional 300MW on the PV03 footprint (**Phase 2**) that was considered during the initial S&EIA. It is proposed to connect this second phase to the 400 kV substation that forms part of the authorised facility on PV02.

It turns out, from the specialist assessments that were completed in 2016/17, that most of the properties are environmentally sensitive, leaving only a few isolated pockets of land for further development (**Figure 5**), specifically for **Phase 3**.

Renewable energy systems generally need more space than fossil fuels. One way to compare the different energy systems or resources is to use the concept of power density – the average electrical power produced in one horizontal m^2 of infrastructure. Solar energy yields the highest median power density per renewable energy system (solar, geothermal, wind, hydro, and biomass), but solar and wind power needs around 40-50 times more space than coal. (J. van Zalk & P. Behrens, 2018).

Solar systems require 1,5 ha to generate 1 MW of energy, so the proposed 400 MW solar PV facility for Phase 3 requires an area of 650 ha. Consequently, the only remaining contiguous properties that are large enough for Phase 3 includes the RE and Ptn 3 of the Farm Goede Hoop 26C (**Figure 5**).

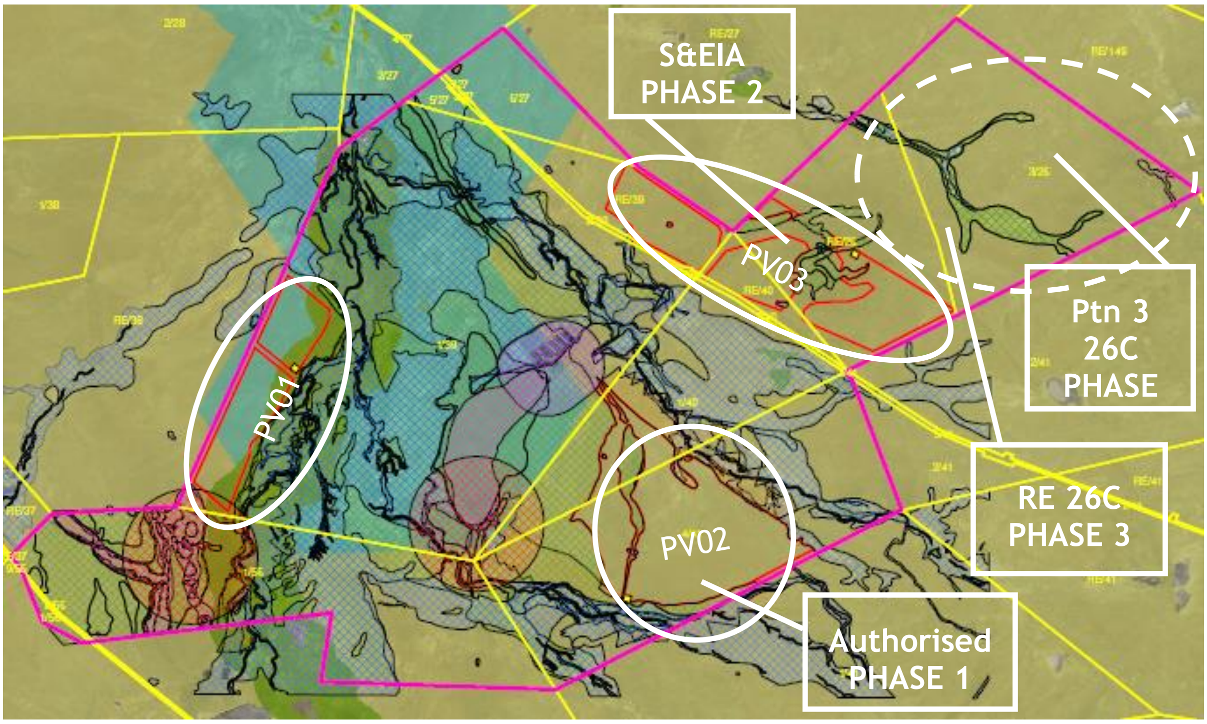

Figure 5: The environmental sensitivity of the landowner's properties (inside the pink boundary) The patterned and coloured areas represents designated "No-Go" zones for development and CBAs, which were identified during the S&EIA process in 2016/17 (Plan number: "Cumulative impact Goedehoop_Solar_Array_v3" prepared by Digital Earth and dated 24/07/2017).

The Remainder of Farm Goede Hoop 26C is 1 502,8325 ha. However, only a fraction of that property is available for Phase 3 because most of it has been set aside for Phase 2 or is ecologically sensitive. Then, Portion 3 of Farm Goede Hoop 26C is 1 015,9683 morgen (SG Diagram). One (1) (South African) morgen = 0.8567 hectare. Therefore, Portion 3 of the Farm Goedehoop 26C is 870,380 ha. Consequently, the combined available surface area of both properties is circa 1 200 ha. Given the proposed 400 MW solar PV facility requires 650 ha, there would theoretically be enough space to consider two alternative locations within the preferred site (The Remainder and Portion 3 of Farm Goede Hoop 26C). However, the area is not homogenous. So, if a person carves out the ecologically sensitive areas that were identified by the specialist(s) during the S&EIA in 2016/17, it becomes clear that there is only space for one location, comprising two adjacent but non-contiguous areas, within the preferred site (**Figure 6**).

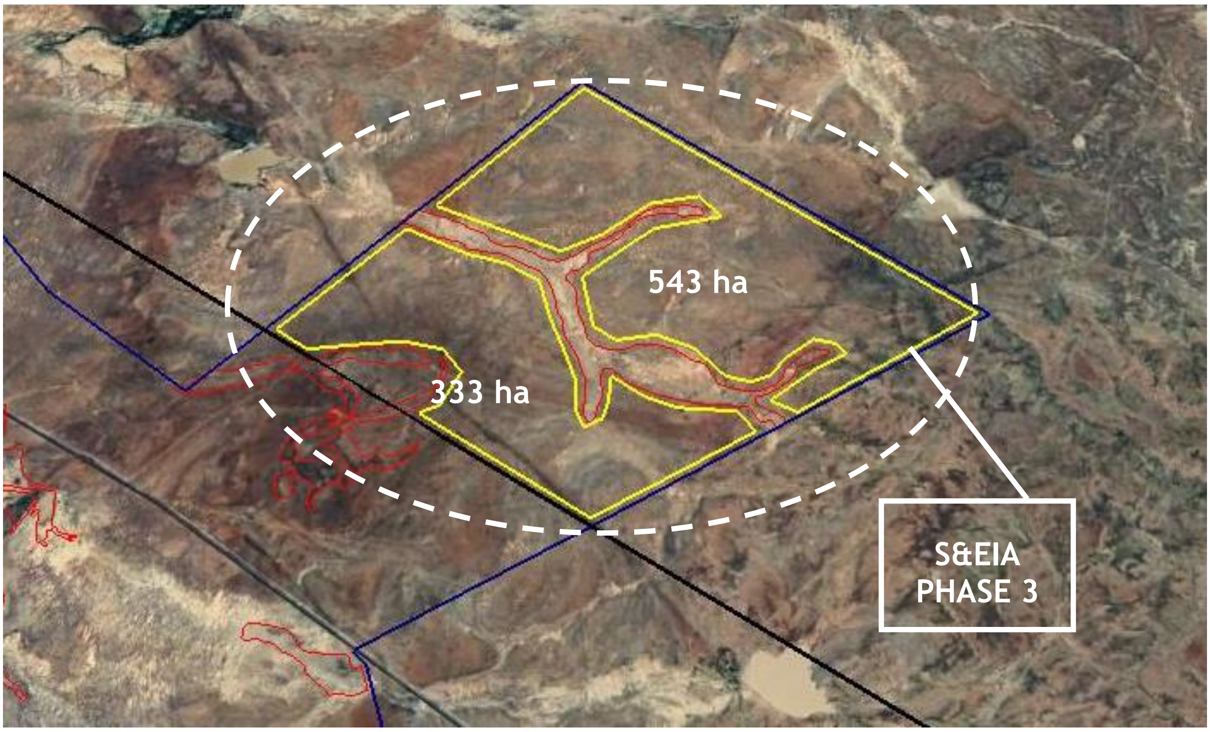

Figure 6: The potentially available surface area (876 ha) for the development of a 650 ha solar PV facility on the Remainder and Portion 3 of the Farm Goede Hoop 26C. The red outlines demarcate ecologically sensitive areas.

Reasoned explanation why an alternative was not found to be reasonable or feasible

The selection of the least sensitive site & location has the largest mitigating effect on environmental impacts to the receiving environment.

Of all the potential properties owned by Mr Willem Retief, only the two contiguous farms, being the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C, are available for the proposed development of Phase 3 because they contain the only consolidated surface area (outside “No-Go” zones and CBAs) that is big enough to support a 650 ha solar PV facility. However, the available surface area for development is still restrictive (876 ha), limiting the assessment to a single preferred location.

Alternative No. 2: No-go Option

The option of not implementing the activity is used as the benchmark against which all impacts associated with the proposed development were assessed. In this case, the no-go option would be to not rezone and develop Phase 3 to operate as an “Agrivoltaic” system (the simultaneous use of land for both solar photovoltaic power generation and agriculture) and retain the land use for grazing sheep only.

Conclusion

No alternatives other than the no-go option were identified for further assessment.

Other criteria that will be considered during the comparative assessment to determine which potentially reasonable and feasible alternative is the Best Practicable Environmental Option, include need and desirability, opportunity costs, the need to avoid negative impact altogether, the need to minimise unavoidable negative impacts, the need to maximise benefits, and the need for equitable distributional consequences. The (development) alternatives must be socially, environmentally, and economically sustainable. They must also aim to address the key significant impacts of the proposed development by maximizing benefits and avoiding or minimising the negative impacts.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
Reg: 2006/023163/23

SECTION H: A FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED DEVELOPMENT FOOTPRINT

3(1) A EIA report… must include –

(h) a full description of the process followed to reach the proposed development footprint within the approved site, as contemplated in the accepted scoping report, including;

(i) Details of all the development footprint alternatives considered;

(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;

(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;

(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

(v) the impacts and risks identified 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;

(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

(viii) the possible mitigation measures that could be applied and level of residual risk;

(ix) if no alternatives development footprints for the activity were investigated, the motivation for not considering such and

(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
Reg: 2006/023163/23

DETAILS OF ALL THE DEVELOPMENT FOOTPRINT ALTERNATIVES CONSIDERED

3(1) A EIA report… must include –

(h) a full description of the process followed to reach the proposed development footprint within the approved site, as contemplated in the accepted scoping report, including;

(i) Details of all the development footprint alternatives considered;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

No alternative development footprints were considered other than the preferred alternative (**Figure 7**) and no-go option.

The EIA phase provided the findings of appointed specialists within the scoping phase furnishing insight into the preferred development footprint from a physical, geographical, biological, cultural and socio-economic perspective.

To narrow down the preferred alternative, all the specialists GIS shapefile information was overlaid, combining all the sensitive information into a consolidated sensitivity map (**Appendix A: Annexure F, G and H**)

The outcome of this revealed the original preferred development footprint identified during the Scoping phase which was approximately 876ha needed to be refined in order to avoid these sensitive areas and identified no go areas as per the various specialists' studies. This exercise reduced the preferred alternative development footprint to approx.650 ha (**Figure 8**).

In summary, following the combination of the preferred alternative development footprint selection matrix exercise, impact assessment and cumulative impact assessment using the specialist findings, Interested and Affected Parties' comments and the EAPs judgement, has provided the motivation for the preferred alternative development footprint.

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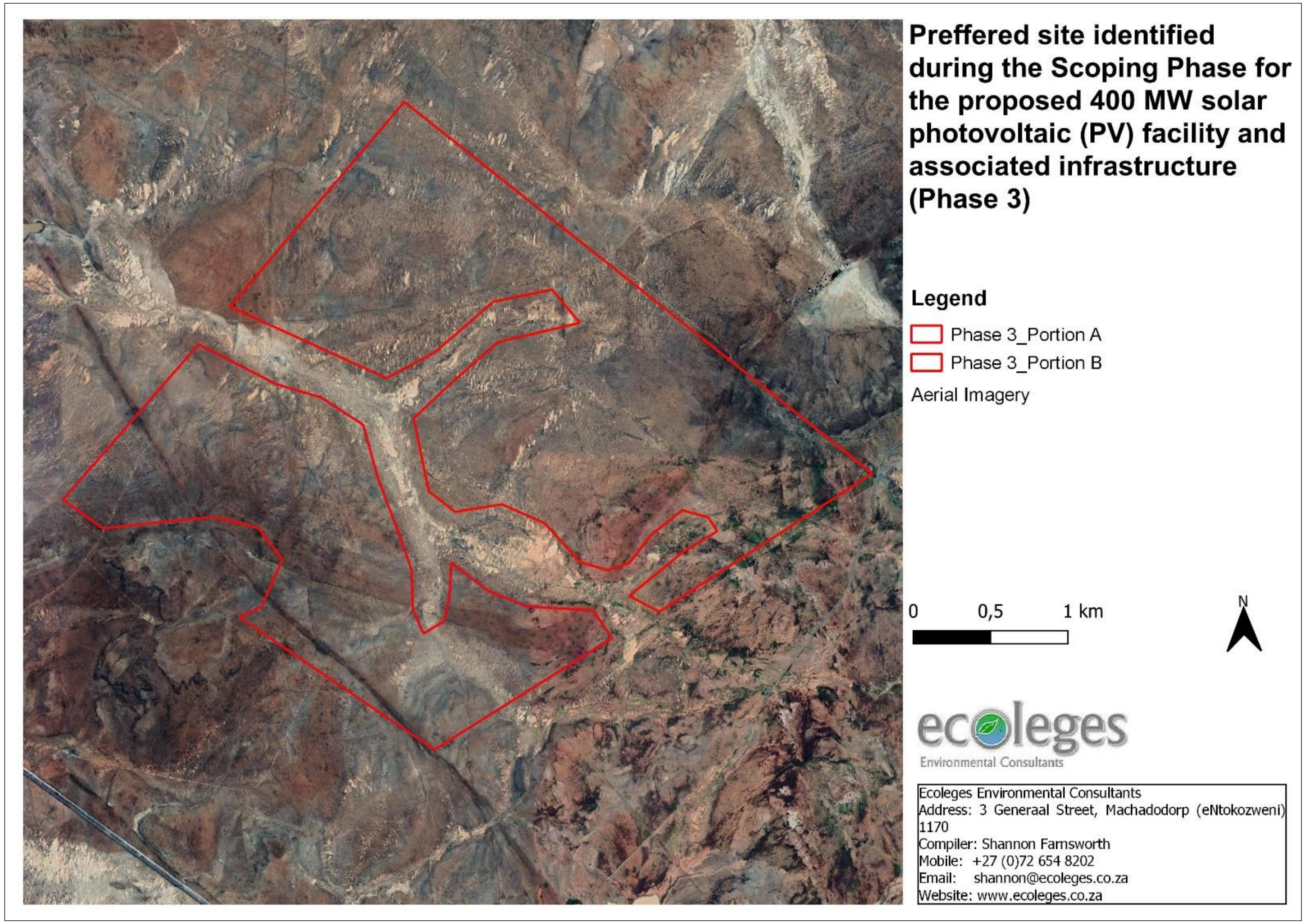

Figure 7: Preferred alternative development footprint as identified during the Scoping Phase (876ha).

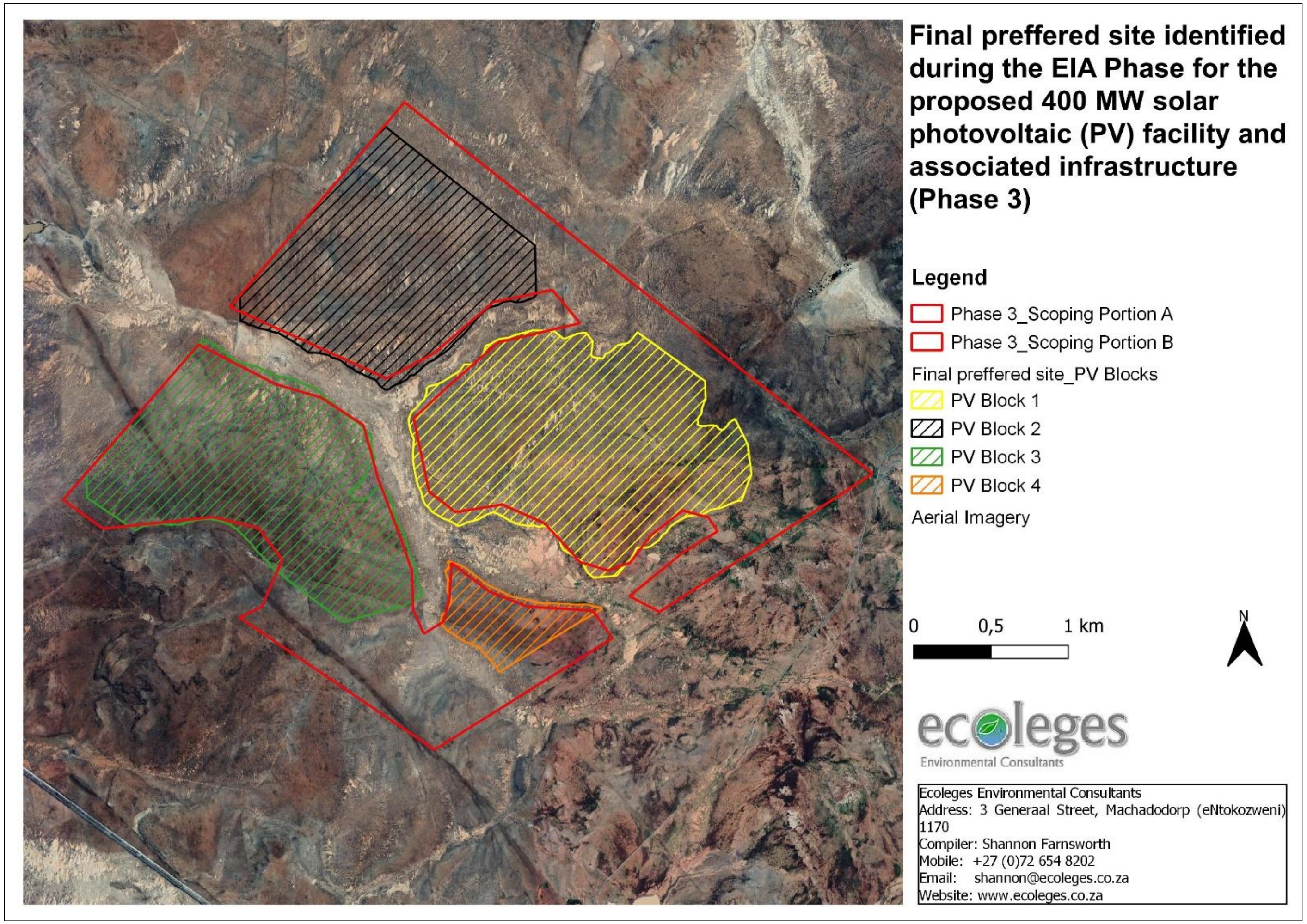

Figure 8: Final preferred alternative development footprint as per the specialist's findings (650ha)

DETAILS OF PUBLIC PARTICIPATION

3(1) A EIA report… must include –

(h) a full description of the process followed to reach the proposed development footprint within the approved site, as contemplated in the accepted scoping report, including;

(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended.

Regulation	Yes	No
If the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land.	X	
Report submitted in terms of regulation 21 and the environmental impact assessment report and EMPr submitted in terms of regulation 23; was subjected to must give all potential or registered interested and affected parties, including the competent authority, a period of at least 30 days to submit comments on each of the basic assessment report, EMPr, scoping report and environmental impact assessment report, and where applicable the closure plan, as well as the report contemplated in regulation 32, if such reports or plans are submitted at different times.	X	
The public participation process contemplated in this regulation must provide access to all information that reasonably has or may have the potential to influence any decision with regard to an application unless access to that information is protected by law and must include consultation with- (a) the competent authority; (b) every State department that administers a law relating to a matter affecting the environment relevant to an application for an environmental authorisation; (c) all organs of state which have jurisdiction in respect of the activity to which the application relates; and (d) all potential, or, where relevant, registered interested and affected parties.	X	
The person conducting a public participation process must take into account any relevant guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of an application or proposed application which is subjected to public participation by-	X	
(a) fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of-	X	

(i) the site where the activity to which the application or proposed application relates is or is to be undertaken; and (ii) any alternative site;		
(b) giving written notice, in any of the manners provided for in section 47D of the Act, to- (i) the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken; (ii) owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken; (iii) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area; (iv) the municipality which has jurisdiction in the area; (v) any organ of state having jurisdiction in respect of any aspect of the activity; and (vi) any other party as required by the competent authority;	X	
(c) placing an advertisement in- (i) one local newspaper; or (ii) any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations; (d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and (e) using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to- (i) illiteracy; (ii) disability; or (iii) any other disadvantage.	X	
(3) A notice, notice board or advertisement referred.to in subregulation (2) must-	X	

(a) give details of the application or proposed application which is subjected to public participation; and (b) state- (I) whether basic assessment or S&EIR procedures are being applied to the application; (ii) the nature and location of the activity to which the application relates; (iii) where further information on the application or proposed application can be obtained; and (iv) the manner in which and the person to whom representations in respect of the application or proposed application may be made.		
(4) A notice board referred to in sub regulation (2) must- (a) be of a size at least 60cm by 42cm; and (b) display the required information in lettering and in a format as may be determined by the competent authority.	X	
(5) Where public participation is conducted in terms of this regulation for an application or proposed application, sub regulation (2)(a), (b), (c) and (d) need not be complied with again during the additional public participation process contemplated in regulations 19(1)(b) or 23(1)(b) or the public participation process contemplated in regulation 21(2)(d), on condition that- (a) such process has been preceded by a public participation process which included compliance with sub regulation (2)(a), (b), (c) and (d); and (b) written notice is given to registered interested and affected parties regarding where the- (I) revised basic assessment report or, EMPr or closure plan, as contemplated in regulation 19(1)(b); (ii) revised environmental impact report or EMPr as contemplated in regulation 23(1)(b); or (iii) environmental impact report and EMPr as contemplated in regulation 21(2)(d); may be obtained, the manner in which and the person to whom representations on these reports or plans may be made and the date on which such representations are due.	X	
(6) When complying with this regulation, the person conducting the public participation process must ensure that- (a) information containing all relevant facts in respect of the application or proposed application is made available to potential interested and affected parties; and	X	

(b) participation by potential or registered interested and affected parties is facilitated in such a manner that all potential or registered interested and affected parties are provided with a reasonable opportunity to comment on the application or proposed application.		

Level of Public Participation

Introduction

The Public Participation Process (PPP) was undertaken in accordance with Chapter 6 of the Environmental Impact Assessment (EIA) Regulations, 2014, as amended, and took the Public Participation 2017 Guideline Document (DEA, 2017) into consideration.

Objectives of the public participation

The level of public participation was determined by taking into account the scale of the anticipated impacts of the proposed development, the sensitivity of the affected environment and the degree of controversy of the project, and the characteristics of the potentially affected parties. Based on the findings of the above considerations, and taking cognisance of the Covid-19 pandemic, it was decided to fulfil the minimum requirements of the public participation process outlined in the EIA Regulations, 2014 whilst taking precautions that avoid public gatherings. These precautionary measures are discussed in more detail under 4.1(e) of this report.

Identification of interested and affected parties

Over and above the erection of site notices at key intersections and on the property's boundary fence, placing an advert in the local newspaper and distributing a written notice to those I&APs identified in Regulation 41(2)(b), certain stakeholders, such as the Square Kilometre Array (SKA), were specifically approached and invited to participate in the Environmental Impact Assessment process.

Additional means of identifying potential stakeholders included:

- property and deeds search to identify all adjacent landowners and include them as directly affected I&APs; and
- a network or chain referral system according to which key stakeholders were asked to assist in identifying other stakeholders, including requesting in the circulated BID document: "Please can you be so kind as to distribute the attached notice(s) to other interested and affected parties falling under your jurisdiction, authority, control, or administration, such as other owners, persons in control or occupiers of common land. The third attachment entitled "Notice occupiers" has been abbreviated for the occupiers of land, including for example, the local labour or work force. Otherwise, you are welcome to provide their contact details to us, and we shall inform them directly."

Notification of interested and affected parties

All potential and registered interested and affected parties have the right to be informed early and in an informative and proactive way regarding proposals that may affect their lives or livelihoods. Early communication aims to build trust among participants, allow more time for public participation, and improve community analysis.

It also increases opportunities to modify the proposed development to effectively address relevant issues and comments received during the public participation process.

To this affect potential and registered interested and affected parties were first notified about the proposed development on **18th February 2022** and given at least 30 days before the submission of the Application to register for the public participation process.

Method of notification

In terms of Regulation 41(2), notice of the application will be given to all potential interested and affected parties by -

a. fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of –

   i. the site where the activity to which the application relates is or is to be undertaken; and

   ii. any alternative site.

Three site notice boards were placed at various visible locations on the 16th February 2022, namely: Site notice board No. 1 was placed on the boundary fence at the corner of portion 3 of Farm Goede Hoop 26 and Portion 2 of the Farm Taaiboschfontain 41 (Latitude: 30°50'12.64"S Longitude: 24°23'19.70"E). Site notice board No. 2 was placed on the entrance gate to the Remainder of Farm Goede Hoop 26 C (Latitude: 30°50'54.64"S & Longitude: 24°19'29.00"E). Site notice board No. 3 was placed at the intersection of the N10 highway with the District road to Burgerville (Latitude: 30°52'31.61"S & Longitude: 24°13'27.31"E). There are no alternative sites. See **Annexure A of the PPP Report attached as Appendix C:** Site Notice Board Locations and **Annexure B of the PPP Report attached as Appendix C:** Site Notice Boards

b. giving written notice to –

   i. the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is to be undertaken, and to any alternative site where the activity is to be undertaken,

   ii. owners, persons in control of, and occupiers of land adjacent to the site where the activity is to be undertaken and to any alternative site where the activity is to be undertaken,

   iii. the municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area,

   iv. the municipality which has jurisdiction in the area,

   v. any organ of state having jurisdiction in respect of any aspect of the activity, and

   vi. any other party as required by the competent authority.

The written notice was prepared in two different formats. The full format (**Annexure D1 of the PPP Report attached as Appendix C**) or Background Information Document (BID), was

intended for landowners, whereas the simplified and abbreviated version (**Annexure D2 of the PPP Report attached as Appendix C**) was intended for the occupiers of land, e.g., farm workers. An English and Afrikaans version of each format was prepared.

Email distribution of the written notices (**Annexure D3 of the PPP Report attached as Appendix C**) to the owners or persons in control of land adjacent to the application site commenced on 17th February 2022. Email submissions included a request for a “delivery receipt” and a “read receipt.” Landowners or persons in control were kindly requested to provide copies of the abbreviated format to any occupiers of their land or land under their control.

The proponent or applicant, Soventix South Africa (Pty) Ltd (represented by Jean Paul de Villiers) is not the owner (or person in control) of the site. The landowner, De Bad Familie Trust (represented by Willem Retief), was included in the distribution of the written notice and requested to forward the notice to any occupiers of the site.

Additional recipients of the written notices included *inter alia* the municipal councillor of the ward, any organisation of ratepayers, the Emthanjeni Local Municipality, Pixley Ka Seme District Municipality and State departments that administer a law relating to a matter affecting the environment relevant to this application, such as the regional Department of Water and Sanitation (Orange Proto Catchment Management Agency) and the South African Heritage Resources Agency (a case No. 17965 was created and the BID was uploaded on their online platform called SAHRIS - **Annexure D4 of the PPP Report attached as Appendix C**).

A full list of identified potential I&APs is not included in this report in terms of the Protection of Personal Information Act, 2013 (POPIA), but is available to the Department upon request.

On the other a hand, the register of registered I&APs is readily available in **Annexure G of the PPP Report attached as Appendix C**.

c. placing an advertisement in –
   i. one local newspaper; or
   ii. any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;

An advertisement was published on the inner back page of a local newspaper in De Aar, called the “The/Die Echo” on 18th February 2022 (**Annexure C of the PPP Report attached as Appendix C**)

A link to the advertisement was also provided to Mr JR Ranelo (lranelo@emthanjeni.co.za) at the Emthanjeni Local Municipality so that he could post it on the municipal Facebook page (Email sent on Monday, 21 February 2022 14:05)

d. placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it will be undertaken.

The proposed activity shall not have an impact that extends beyond the boundaries of the local or district municipality in which it will be undertaken.

e. using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to illiteracy, disability or any other disadvantage.

Public meetings will be avoided. Any person or official desirous of a meeting will be hosted individually. Hard copies of reports will not be printed and placed in public places. Instead, digital copies will be distributed electronically. A hard copy will be posted to any person or official desirous of a hard copy. "Afrikaans is the home language of almost two thirds of the residents in Ward 6" (Social Scoping Report April 2022 prepared by Equispectives Research & Consulting Services). Considering that Afrikaans is widely spoken in the De Aar Area, the written notice or Background Information Document (BID) shall be prepared and distributed in both English and Afrikaans. "About two fifths of the people in Ward 6 aged 20 years or older have no schooling or only some primary education. This is higher than on local, district or provincial level. These high levels of illiteracy should be taken into consideration when consulting with farmworkers or communities on the project" (Social Scoping Report April 2022 prepared by Equispectives Research & Consulting Services) – A simplified English and Afrikaans version of the Background Information Document (BID) shall be made available to landowners during the email distribution of the BID, specifically for the attention of their farmworkers. A Social Impact Assessment shall be undertaken by Equispectives Research & Consulting Services, using methodologies which ensure the affected communities are consulted in a way that is most appropriate to the community.

In terms of Regulation 42, all organs of state which have jurisdiction in respect of the proposed activity and all persons who submitted written comments, attended meetings with the applicant, proponent or EAP, or who requested, in writing, to be registered will be placed on a register of interested and affected parties (**Annexure G of the PPP Report attached as Appendix C**).

Proof of notification

Proof of Notification via email for the Background Information Document (17 February 2022), the Draft Scoping Report (13 June 2022) as well as acknowledgment from the Competent Authority (DFFE) on the online submission of the Application for Environmental Authorization and DSR onto the SFiler system which was uploaded on 10 June 2022.

The Final Scoping Report (FSR) was uploaded onto the DFFE online SFiler system on 22 July 2022.

Proof of Notification via email is provided in **Annexure D3 of the PPP the Report attached as Appendix C**.

Notification of interested and affected parties of reports and other studies

Reports, including specialist studies were made available to registered I&APs by loading the documents onto our website (www.ecoleges.co.za) and then emailing the link and password to them. Proof of Notification via email is provided in **Annexure D3 of the PPP Report attached as Appendix C**.

Proof of Open Communication with Adjacent Landowners

Due to security concerns in the area, it was important to maintain ongoing and open communication with adjacent landowners with regards to activity in the area as a result of various specialists who will be in the area conducting site assessments. Email notification was provided to adjacent landowners regarding the presence of various specialists in the area (**Annexure D5 of the PPP Report attached as Appendix C**).

Furthermore, neighbours whose concerns were brought to us by a third party were also pro-actively approached and their comments addressed in the Comments and Response Report (**Annexure H of the PPP Report attached as Appendix C**).

Comments from interested and affected parties

Registered I&APs were given access to, and the opportunity to comment on, all written submissions via email, fax and/or registered mail. Email submissions included a request for a “delivery receipt” and a “read receipt,” The tracking number of any registered mail was sent to the I&AP via sms and/or WhatsApp to facilitate receipt of the document. All comments received from interested and affected parties (**Annexure E of the PPP Report attached as Appendix C**) were responded to and recorded in the Comments and Response Report (**Annexure H of the PPP Report attached as Appendix C**).

Final Notification of Decision

Once a decision has been made, all registered interested and affected parties will be notified via email, fax and/or registered mail. The decision may also be provided to local councilors in a notice format to erect on community notice boards.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
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SUMMARY OF THE ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

3(1) A EIA report… must include –

(h) a full description of the process followed to reach the proposed development footprint within the approved site, as contemplated in the accepted scoping report, including;

(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

A Summary of the Main Issues raised by Interested and Affected Parties

Neighbours:

1) Safety and crime due to the development.
2) Nigh-time illumination of the area for 'security reasons.'
3) View impairment - the view will no longer be a nature scenery.
4) Decrease in property value
5) Road conditions
6) Risk of veld fires caused by workers during the construction of the plant.
7) Risk of solar panels being damaged during the hunting season
8) Heat generation and reflection by the thousands of black solar panels, angled directly in our direction, namely due north.

Government Departments:

1) Department of Forestry, Fisheries and Environment (DFFE) comments on DSR (06 July 2022) as it relates to the Application Form for the DSR, Layout and Sensitivity Maps, Assessment of Alternatives, Public Participation Process, Specialists Assessments, Cumulative Assessment and General (**Annexure H and I of the PPP Report attached as Appendix C**).
2) Department of Forestry, Fisheries and Environment (DFFE) acceptance letter of the FSR dated 02 September 2022 (**Annexure I of the PPP Report attached as Appendix C**).

A Summary of the Response from the Practitioner to the Issues raised by the Interested and Affected Parties

Neighbours:

1) Security during construction
    - Security during construction will be mitigated by erecting the perimeter fence first to prevent any movement out of the development footprint.

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- No accommodation shall be provided for contractors and sub-contractors on the construction site.
- Furthermore, the number of construction workers will be limited by building the facility in sequential phases of 100 MW blocks as opposed to trying to build the 400 MW facility in one go.
- Security will be appointed throughout construction. All contractors and workers will need to wear photo identification cards and vehicles will need to display vehicle logos, making it easier for surrounding landowners (farmers) to identify strangers. Furthermore, it will be proposed that the applicant communicate with the landowners before the construction phase commences to formalise and familiarise the local farmers with the aforesaid security arrangements.
- An induction programme that includes a Code of Conduct for all contractors and sub-contractors shall be developed.

<u>Security during operation</u>

- Security will be appointed throughout operation to discourage criminal elements. The facility will also be fenced off with a 2.5 m high wire mesh security fence with controlled access using a security gate. Furthermore, the perimeter fence line will be secured using multiple FLIR PTZ security cameras which have a 2km range in absolute darkness.

2) There will be no to minimum lighting (the exceptions being the substation as it is an Eskom requirement, and key operational areas like the security control room and gate). The fence line will be secured using multiple FLIR PTZ cameras which have a 2km range in absolute darkness.
3) A Landscape/Visual Impact Assessment will be undertaken during the EIA process. The appointed specialist undertaking the Landscape/Visual Impact Assessment is Stephen Stead of Visual Resource Management Africa. The site assessment for the above specialist assessment is scheduled for 14 March 2022. Stephen will contact you beforehand for permission to access your farm so that he can investigate your concern. We will keep you updated on the findings and any proposed mitigation measures proposed by the appointed visual specialist during the EIA process.
4) A Socio-economic Impact Assessment will be undertaken during the EIA process. We have asked the specialist to as far as is possible research the validity of the said claim that solar PV facilities in rural areas reduce the property value of farms. We will keep you updated on the findings and any mitigation measures proposed by the appointed specialist during the EIA process.
5) The applicant shall maintain any deterioration to the district gravel roads resulting from increased traffic during construction.

   A Traffic Impact Assessment shall be undertaken. Specialist Assessment and a Terrestrial Biodiversity Assessment will be undertaken during the EIA process. We will keep you updated on the findings and any mitigation measures proposed by the appointed specialist during the EIA process.
6) Risk of veld fires both during the construction and operational phases has been identified as a potential impact. It should be noted that no accommodation shall be provided for contractors and sub-contractors on the construction site. Nonetheless, we intend on addressing this concern by proposing the following mitigations.

   i. Open fires are prohibited;

ii. Burning of waste is prohibited; and

iii. Maintenance of firebreaks around the perimeter of the proposed development.

7) Your concern is a real risk and very much appreciated. We welcome any suggestions that will improve the safety of neighbouring landowners and their property during the hunting season, such as identifying no shooting zones, notifying neighbouring properties of imminent hunts, hunters taking out the appropriate insurances, etc.

8) Heat generation is something we will be researching; it is a phenomenon called the heat island effect but should be localised to the footprint where the sun's energy is absorbed.

Government Departments:

1) The EAP responded to each comment submitted by DFFE on the DSR via a letter dated 15 July 2022 (**Annexure H and I of the PPP Report attached as Appendix C**).

ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PREFERRED SITE AND LOCATION ALTERNATIVE

3(1) A EIA report… must include –

(h) a full description of the process followed to reach the proposed development footprint within the approved site, as contemplated in the accepted scoping report, including;

(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

The receiving environment referred to as “environmental attributes” or “aspects” which have been assessed as part of the environmental impact assessment process (**Appendix D**) is described in **Table 12**.

Table 12. Aspects to be assessed as part of the environmental impact assessment process.

Aspect	Legal system	Biological				Physical			Geographic		Socio-economic								Heritage & Culture
		Terrestrial & Avian fauna	Terrestrial flora	Aquatic fauna	Aquatic flora	Soil and Rock	Ground & Surface water	Atmosphere	Terrestrial & Avian Ecosystem	Aquatic Ecosystem	Economical	Social	Property	Land Use	Health & safety	Security	Public services	Visual aesthetics	

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Legal system

The legal aspect that is to be assessed includes other authorisations, permits and/or licenses that may also be required for activities associated with the proposed development. The purpose is to ensure ongoing compliance and avoid project delays.

Biological (Terrestrial & Avian fauna, Terrestrial flora, Aquatic fauna and flora)

Consideration of the biological aspect focuses on whether there will be a change in the number of threatened and/or protected animals or plants resulting from either a loss (e.g., emigration, death) or gain (e.g., reproduction, immigration) in individuals.

Physical (Soil and rock, and Ground and surface water)

Consideration of the physical aspect focuses on whether there will be a change in the quantity, e.g., through erosion, sedimentation, abstraction, etc. and/or quality of soil or water, e.g., through pollution. The effects of changes to surface water hydrology, e.g., storm water run-off, in-stream flow, etc., particularly on the bed and banks of a watercourse, are also considered under this aspect.

Physical (Atmosphere)

Consideration of this physical aspect focuses on whether there will be a change in the quality of air, e.g., through pollution. Somatosensory (perception of touch, as well as temperature), auditory and olfactory signals that impact people, such as noise, smell and warming, are also assessed under this aspect.

Geographic (Terrestrial and Aquatic ecosystems)

Consideration of these geographical aspects focuses on whether there will be a change in the quantity (area) of threatened and/or protected ecosystems, whether there will be a transformation of habitat to an alternate state following a change in species composition (fauna and/or flora) and structure (relative heights, and whether there will be fragmentation when a habitat is broken up and no longer contiguous, impacting ecological connectivity and the river continuum concept.

Socio-economic

Consideration of the socio-economic aspect takes into account economical (or financial) implications, as well as other attributes such as social (general well-being), property (land, infrastructure and other assets), land use, health and safety, security, public services, and visual aesthetics.

Heritage and Culture

Consideration of heritage and culture focuses on whether there will be a chance of damage to or loss of cultural heritage resources as a result of the proposed development.

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Geographical Aspects

De Aar is situated in the Northern Cape Province, with an approximate population of 23 760 people (census 2011). De Aar situated within the Emthanjeni Municipality, is renowned for its central location on the main railway line between Johannesburg, Cape Town, Port Elizabeth and Namibia. The Municipality is further situated in the Pixley ka Seme District Municipality with an approximate population of 186 351 people (census 2011), this represents 16, 2% of the Northern Cape population. The Municipality is also approximately 300km south west of Kimberley, 440 km south east of Upington, 300 km north east of Beaufort West and 300 km south west of Bloemfontein.

Hanover lies approximately 65 km east of De Aar on N1 main north to south route. Britstown is situated about 55 km west of De Aar on the N12 route. Both these main routes link Johannesburg and Cape Town. The towns of Emthanjeni lie in an extensive stock farming area with the emphasis on sheep, mutton and wool farming, especially Merino's. Emthanjeni Municipality, specifically De Aar, is the seat of Pixley ka Seme District Municipality; the Municipality further hosts all Government Departments. Emthanjeni Municipality covers an area of approximately 13 471.96 km².

Physical Aspects

Climate

The average yearly temperature for the project area ranges from 15 to 36 ºC (high) and -4 to 16 °C (Low). The study area is situated in a cold semi-arid (steppe) climate as per the Köppen Climate Classification (Kottek, et al., 2006). Hence, the area receives more rainfall in the high-sun half of the year (October through March in the Southern Hemisphere). The area falls within a spring to summer rainfall area.

Wind generally blows from all directions, with predominant stronger winds more frequently coming from ESE, ENE and W directions.

The average rainfall is in the order of 320 mm/year with a Mean Annual Evaporation (MAE) ranging from 2 000 to 2 150 mm/year.

Frost occurs most years, 30 days on average, between late May and early September. The climatic restrictions (namely very low rainfall) means that this part of the Northern Cape is best suited for grazing, although the grazing capacity is low. The only means of cultivation would be by irrigation. The region is subject to periodic droughts which have a serious impact on the surrounding farming areas and on the economy of the towns. The area has a low prevailing agricultural potential.

Topography

The topography of the study area is generally flat with elevations on the site typically ranging from 1310 to 1370 metres above mean sea level (mamsl). Drainage is towards the north-west in the form of a multitude of non-perennial drainage lines, which drains towards the non-perennial Brak River, situated approximately 6km downstream west of the site (**Figure 9**).

The main water feature in the area is tributaries to the Brak River, a seasonal tributary within the Orange River System which flows in an arc from south-east to north-west, eventually feeding into the Orange River basin. The ephemeral drainage line running through the project area is an unnamed tributary to the D62D – 05610 tributary with its confluence just downstream of the Project Area.

The river flows to the north of the study area with a number of its tributaries crossing the area as it flows in a northerly direction.

The drainage systems are predominantly classified as ephemeral, which means that the stream flows briefly in direct response to precipitation in the immediate vicinity, and the channel is at all times above the ground-water reservoir. These ephemeral tributaries are tributaries of the Brak River and considered to be in a largely natural ecological state.

All the small tributaries in the area are ephemeral or intermittent and with no clear associated vegetation. These systems have a far less predictable flow regime compared to perennial or seasonal rivers and are frequently dry for long periods in arid regions.

The ephemeral drainage system of the De Aar Phase 3 Solar PV facility project area consists of one major ephemeral drainage channel which are fed by upstream catchment areas beyond the project area fence line. Three smaller tributaries are feeding into the main drainage line in the project area.

The delineated ephemeral drainage line in the project area has been identified as having the conservation importance relating to the Freshwater Ecosystem Protected Areas (FEPA) category. The entire sub-quaternary catchment indicates that the surrounding land and smaller stream network need to be managed in a way that maintains the good condition (A or B ecological category) of the river reach.

Groundwater

Based on the groundwater data collected, it is confirmed that three (3) aquifers exist in the area:

- Unconfined aquifers associated with alluvium, of the non-perennial streams associated with the project area.
- A shallower semi-unconfined aquifer system associated with weathered Beaufort sediments; and
- A deeper confined intergranular and fractured aquifer network is associated with the older Beaufort sediments and Karoo basement rock.

The aquifer underlying the project area is classified as a Major Aquifer system (Parsons, 1995). This means that the aquifer is generally targeted for commercial, residential, and agricultural use, in the absence of their being surface water and/or sustainable alternatives.

This aquifer underlying the site can be regarded as a moderate-yielding aquifer, with reported yields ranging from 0.5 to 2 l/sec - Class D3 aquifer.

According to WR2012 (Bailey & Pitman, 2015) and DWAF GRAII (DWAF, 2006) data, the groundwater level in the study area on average is in the order of 6.9 mbgl (metre below ground level). Available hydrocensus data suggest the water table ranges from 0.2 to 25.6 mbgl, and on average is in the order of 5.7 mbgl.

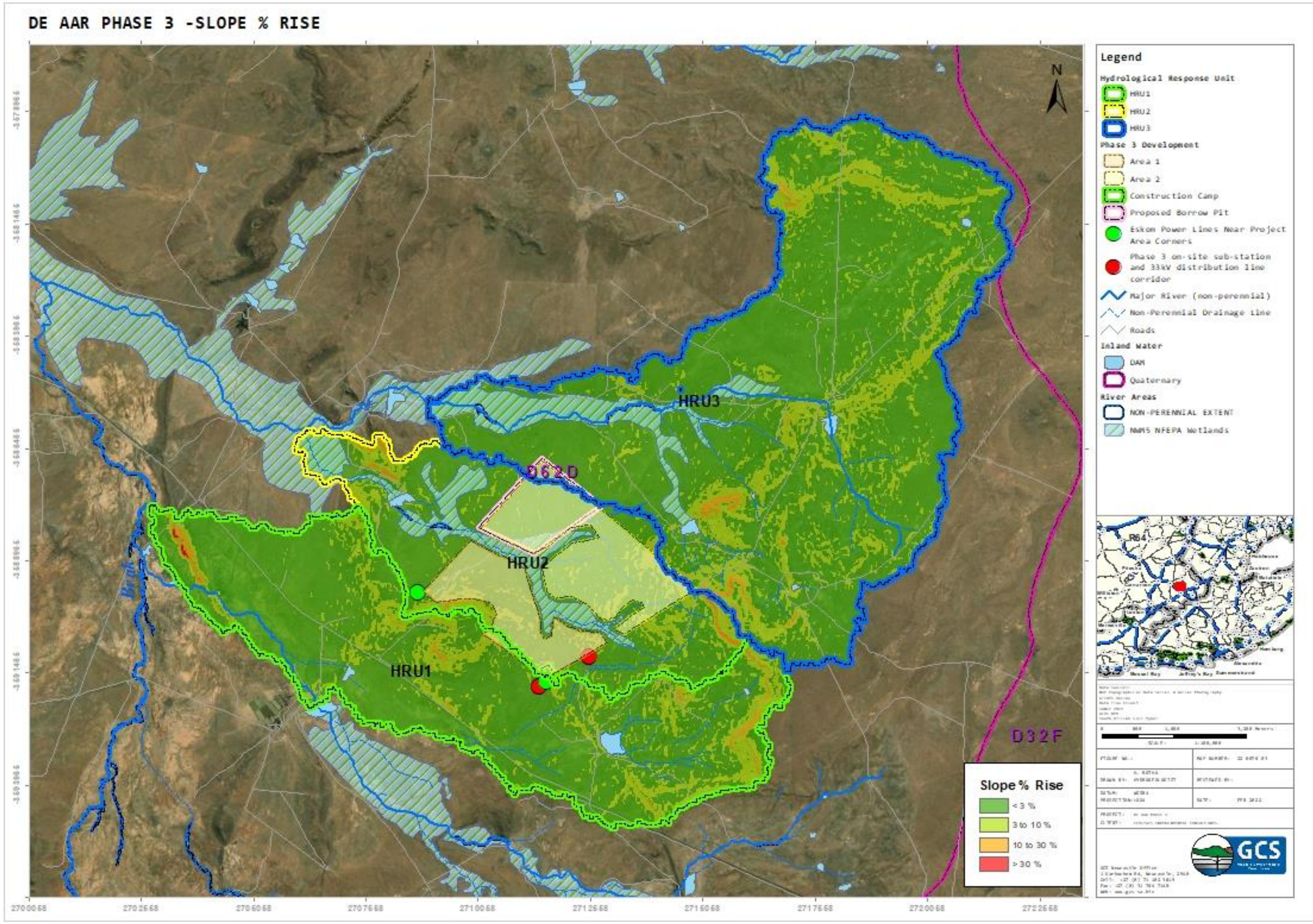

Figure 9: Sub-catchment slope rise (%).

Geology and Soils

Bedrock: Sediments and Dolerite

The bedrock of the region consists of sediments (mostly fine to medium-grained sandstone but also siltstone and mudstone in parts) of the Adelaide Subgroup, Beaufort Group, Karoo Supergroup.

A number of dolerite sheets of Karoo age have been intruded into the sediments on the site. Dolerite in general has a slow weathering rate compared to that of sediments and often forms local topographical high points. However, the more common very narrow dykes (measurable in metres), do not have such a pronounced effect on topography as that of the wider dykes or the sills.

Several dykes and one sill occur on the Phase 3 site. A dyke running sub-parallel to the south-western boundary is the most prominent with a width of up to 50 metres in parts and has a visible influence on the terrain topography by forming a linear ridge.

A dolerite sill underlies part of the site, the width of the sill however varies substantially from roughly 50 to 100 metres in parts to less than 10 metres. Furthermore, in parts the sill appears to have been virtually weathered away, with only baked sediments remaining or split into dolerite outcrop or cobbles separated by sandstone outcrop.

The planned overhead powerline route crosses a dolerite dyke (roughly perpendicular) at the southernmost corner of Phase 3 and where it enters the Phase 2 footprint.

Soils

The entire site has very thin soils and either bedrock sub-outcrop at less than 0,5 metres depth below ground surface or bedrock outcrop/dispersed outcrop. The thickest soils of 1,0 to 1,2 metres thickness over minor parts occur in areas of either gully wash material, alluvial deposits or pediplain positions (at low landscape localities). These soils are generally of a silty sand to clayey sand nature.

Biological Aspects

Terrestrial Biodiversity

Although there are no Critical Biodiversity Areas (CBAs) within the affected area, the whole of the Soventix Phase 3 site falls within an extensive Ecological Support Area (ESA). According to the reasons layer that accompanies the CBA map, the ESA is based on the selection of the area as Northern Upper Karoo, the Platberg - Karoo Conservancy Important Bird Area, the presence of natural wetlands, rivers, and wetland FEPAs. However, the aquatic features listed above have been excluded from the development footprint, with the result that the impact of the development on these features would be minimal.

The Northern Upper Karoo is a very extensive vegetation type and the loss of the area within the PV footprint would have a negligible impact on the availability of this vegetation type for future conservation purposes.

The impact of the development on the IBA would also be minimal as the PV footprint represents a very small (>>1%) of the IBA and would not represent significant habitat loss within the IBA. However, most importantly, the primary purpose of ESAs is to ensure the broad-scale maintenance of ecological processes and within the site, the primary ecological features and associated processes would be around the drainage features of the site and the corridors associated with the drainage systems linking the wetlands and artificial dams of the site.

As these would be outside of the PV footprint, the processes associated with these features would not be compromised by the development of the PV facility.

It would however be important to ensure that erosion within the development areas and consequent siltation of the nearby drainage systems does not occur. As such, an erosion plan and a runoff management system for the site would be important to ensure that the development does not negatively impact the adjacent hydrological features.

In terms of other conservation planning priorities and features or the site, there are no formal declared conservation areas within the site or NC-PAES focus areas. Not surprisingly, there are no forests or protected trees within the site.

Given the low transformation rate and extensive nature of the affected vegetation type, the development would have minimal impact on the future ability to meet conservation targets for this vegetation type. The overall impact of the development on the ability to meet future conservation targets would therefore be minimal

<u>Flora</u>

Northern Upper Karoo is one of the most extensive vegetation types in the country and occupies over 40 000km^2 of the interior Karoo. The vegetation consists of shrubland dominated by dwarf Karoo shrubs, grasses and *Acacia mellifera* subsp. *detinens*, and other low trees particularly on the sandy soils. Four plant species are known to be endemic to the vegetation type, *Lithops hookeriana, Stomatium pluridens*, *Galenia exigua* and *Manulea deserticola*. Northern Upper Karoo has not been significantly affected by transformation and is still approximately 96% intact and is classified as Least Threatened.

Within the study area, the vegetation consists of a mosaic of grassy and more shrubby areas, with shrubs being more prevalent on the stony and shallow soils of the site. No indigenous trees are present within the site and the vegetation consists of low grassland shrubland. Dominant and common species include *Lycium cinereum*, *Rhigozum trichotomum*, *Rosenia humilis*, *Pentzia incana*, *Asparagus glaucus*, *Berkheya annectens*, *Eriocephalus ericoides*, *E. spinescens*, *Felicia muricata*, *Melolobium candicans*, *Pegolettia retrofracta, Plinthus karooicus, Hertia pallens, Aristida adscensionis, A. diffusa, Enneapogon desvauxii, Eragrostis lehmanniana, E. obtusa, Fingerhuthia africana, Tragus berteronianus* and *T. koelerioides*.

<u>Fauna</u>

Mammals

As many as 63 terrestrial mammals are listed for the wider study area in the MammalMap database. This includes the listed Black-footed Cat *Felis nigripes* (VU), South African Hedgehog *Atelerix frontalis* (NT) and the Brown Hyena *Hyaena brunnea* (NT). While these species are known from the broader area, their regular presence on the site is considered unlikely. Species that were observed in the area include Cape Porcupine *Hystrix africaeaustralis*, Steenbok *Raphicerus campestris*, Duiker *Sylvicapra grimmia*, Springbok *Antidorcas marsupialis*, Aardvark *Orycteropus afer*, Rock Hyrax *Procavia capensis*, Cape Hare *Lepus capensis*, Hewitt's Red Rock Rabbit *Pronologus saundersiae*, South African Ground Squirrel *Xerus inauris*, Springhare *Pedetes capensis*, Namaqua Rock Mouse *Aethomys namaquensis*, Black-backed Jackal *Canis mesomelas*, Bat-eared Fox *Otocyon megalotis*, Yellow Mongoose *Cynictis penicillata* and African Wild Cat *Felis silvestris*.

No listed mammals were observed on either occasion within the site and the Soventix Phase 3 site is therefore considered low sensitivity for terrestrial mammals.

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Reptiles

According to the distribution maps available in the literature and the SARCA database, as many as 31 reptiles could occur at the site. Species observed on the site include Bibron's Gecko *Chondrodactylus bibronii*, Southern Rock Agama *Agama atra*, Karoo Girdled Lizard *Karusasaurus polyzonus*, Spotted Sand Lizard *Pedioplanis lineoocellata lineoocellata*, Western Three-striped Skink *Trachylepis occidentalis*, Variegated Skink *Trachylepis variegata*, Marsh Terrapin *Pelomedusa subrufa*, Verrox's Tent Tortoise *Psammobates tentorius verroxii*, Cape Cobra *Naja nivea* and Leopard Tortoise *Stigmochelys pardalis*. No listed species are known from the immediate area and no listed species were observed at the site.

Amphibians

Eleven frog species are known from the broad area around the site and does not include any listed species. The majority of species known from the area are toads and sand frogs which are relatively independent of water except for breeding purposes, which reflects the aridity of the area. There are some natural pans and man-made shallow water bodies present in the area and are confirmed as breeding sites for amphibians. The major freshwater features in close proximity to the Soventix Phase 3 site have been avoided and appropriate buffers have been included so as to limit potential negative impacts of the development on amphibians and their habitats.

Avifauna

The proposed solar farm occurs in the Platberg-Karoo Conservancy (SA037) Important Bird and Biodiversity Area (IBA). The Platberg-Karoo Conservancy IBA covers c. 1240 000 ha and is located in the Northern Cape Province with a protected status of "Unprotected". The folding process has forged several large peaks and plateaus in this area. The IBA encompasses a continuous chain of mountains and includes several State forests, mountain catchment areas and provincial nature reserves. A total of 289 bird species have been recorded in the IBA during SABAP2. With regards to the conservation, the IBA contributes greatly to the large terrestrial bird and raptor species. The priority species includes Blue Crane (Anthropoides paradiseus), Ludwig's Bustard (Neotis ludwigii), Kori Bustard (Ardeotis kori), Blue Korhaan (Eupodotis caerulescens), Black Stork (Ciconia nigra), Secretarybird (Sagittarius serpentarius), Martial Eagle (Polemaetus bellicosus), Verreauxs' Eagle (Aquila verreauxii) and Tawny Eagle (Aquila rapax).

84 bird species were observed within and around the Combined Project Area out of an expected total of 104 species, based on previous surveys, the SABAP Pentad analysis and habitat suitability, based Probability of Occurrences.

The observed avian species richness and abundance is considered low to moderate for an area of this size in the South African context although the proportion of observations related to SCC was considered high, as was the overall SCC diversity.

Notable Priority Species recorded during walked transects included Blue Cranes, Verreaux's Eagle, Ludwig's Bustards that were often flushed from foraging positions as well as numerous Northern Black Korhaans and Karoo Korhaans.

Bats

Three bat species out of a potential eight species were recorded over the proposed Phase 3 footprint namely:

- Tadarida aegyptiaca (Egyptian Free-tailed bat),
- Laephotis capensis (Cape Serotine), and
- Miniopterus natalensis (Natal Long-fingered bat)

All three species are widespread and abundant and are classified as "Least Concern" on the IUCN Red Data List (IUCN 2021) and the Red List of Mammals of Southern Africa, Lesotho and Swaziland (refer to **Table 2.** Species identified according to echolocation calls, conservation status, distribution, habitat preference, foraging ecology, roost type and profile.)

Aquatic invertebrate

The fauna of the more seasonal and ephemeral ecosystems is not well known, but they have been found to provide aquatic habitat to a diverse array of faunal species that depend on brief periods of inundation for hatching, mating, feeding and refuge. For instance, many frogs of the Karoo region breed in temporary pools associated with watercourses and wetlands, this includes the Karoo Toad *Vandijkophrynus gariepensis* and Karoo Dainty Frog *Cacosternum Karooicum*.

A great number of other organisms are not confined to these temporary systems, but derive crucial benefits from them, like migratory birds and many invertebrates that migrate from permanent to temporary habitats on a regular basis.

The shallow water level, brief presence of surface water and the lack of flows, reflected in the macro-invertebrate scores, resulting in "Fair" SASS scores and low number of families. Most of the taxa recorded had low sensitivity scores, with the highest scores of 5, indicating the low sensitivity of the assemblage, mostly air-breathers.

Visual Aspect

It is the recommendation that the proposed development should commence with mitigation for the following key reasons:

- Moderate Zone of Visual Influence with no tourism activities or tourist view-corridors.
- The area is remote, with few receptors were identified, but two adjacent farms have indicated sensitivity to landscape change.
- Wide buffer areas and fragmented design elements have been utilised to reduce the massing effects of a single large area PV blocks. Four smaller PV Blocks with wide corridors between them reduce visual intensity to some degree.
- Intervisibility between the Phase 1(Authorised unbuilt) and Phase 2 (in assessment process) is limited by making use of topographic elements to reduce visual prominence. The low ridgeline between the proposed Phase 2 and Phase 3 would assist in reducing intervisibility between the two PV projects.
- Due to the remote locality, Medium to High Post Mitigation Impacts are likely where residual effects could degrade *local* landscape resources.

The visual recommendations from the scoping phase reporting were all incorporated into the layout design, accommodating a wide buffer on the adjacent properties, as well as accommodating wide ecological corridors between the four PV blocks. While the local sense of place will be modified, the impacted visual resources are localised to some degree and are not highly significant such that a No-go Option would be preferred. Goede Hoop Farmstead (Remainder of Farm 149) *could* experience partial views of the panels at 4.5 km (the dwelling is at the fringe of the viewshed analysis), with direct views from Skilpadskuil Farmstead (Portion 2 of Taaibosch Fountain 41) screened by local vegetation. As such, the Preferred PV development option is recommended with mitigation.

It is important to note that should the project be authorised, the Relevant Authority would need to recognise that the existing Medium to High levels of Scenic Quality of the locality would be degraded in the Foreground distance area around the PV site, with potential for further degradation should PV development become more established in the area.

Social Aspect

Administrative context

The proposed project will be located in Ward 6 of the Emthanjeni Local Municipality that falls under the Pixley Ka Seme District Municipality in the Northern Cape Province. For the baseline description of the area, data from Census 2011, Community Survey 2016, municipal IDP's and websites were used. The Emthanjeni Local Municipality is the seat of the district and is located centrally on the main railway line between Johannesburg, Cape Town, Port Elizabeth and Namibia. It covers an area of 13 472 km^2. The main towns in the area are Brits, De Aar and Hanover.

Population and population groups

According to the Community Survey 2016, the population of South Africa is approximately 55,7 million and has shown an increase of about 7.5% since 2011. The household density for the country is estimated on approximately 3.29 people per household, indicating an average household size of 3-4 people (leaning towards 3) for most households, which is down from the 2011 average household size of 3.58 people per household. Smaller household sizes are in general associated with higher levels of urbanisation.

The greatest increase in population since 2016 has been on local level (**Table 13**), although the increase is still below the national average. Population density refers to the number of people per square kilometre. In all the areas in the study area the population density has increased slightly since 2011.

Table 13: Population density and growth estimates (sources: Census 2011, Community Survey 2016)

Area	Size in km^2	Population 2011	Population 2016	Population density 2011	Population density 2016	Growth in population (%)
Northern Cape Province	372,889	1,145,861	1,193,780	3.07	3.20	4.18
Pixley Ka Seme DM	103,410	186,351	195,595	1.80	1.89	4.96
Emthanjeni LM	13,472	42,356	45,404	3.14	3.37	7.20

The number of households in the study area has increased on all levels (**Table 14**), while the average household size has shown a decrease. This means there are more households, but with less members.

Table 14: Household sizes and growth estimates (sources: Census 2011, Community Survey 2016)

Area	Households 2011	Households 2016	Average household size 2011	Average household size 2016	Growth in households (%)

Northern Cape Province	301,405	353,709	3.80	3.38	17.35
Pixley Ka Seme DM	49,193	56,309	3.79	3.47	14.47
Emthanjeni LM	10,457	11,923	4.05	3.81	14.02

The study area of Ward 6 almost half of the population belongs to the Coloured population group, with just over two fifths of the population belonging to the Black population group. Ward 6 has a higher proportion of people belonging to the Black population group than on local or district level. The average age in all the municipal areas are around 28 years, with the lowest average age (28.24) in Ward 6. Just below a third of the population in Ward 6 is aged 14 years or younger, with almost half aged 24 years or younger. Such a young population place a lot of pressure on resources and infrastructure of the area, and a great demand for future infrastructure and creation of livelihoods can be expected.

Education

About two fifths of the people in Ward 6 aged 20 years or older have no schooling or only some primary education. This is higher than on local, district or provincial level. These high levels of illiteracy should be taken into consideration when consulting with farmworkers or communities on the project.

Employment

Ward 6 has the highest proportion of people aged between 15 – 65 years that are employed. Just over half of the people who are employed in Ward 6, are employed in the formal sector. This is much lower than on local or district level. About a quarter of the employed work in the informal sector, which is proportionately higher than on local or district level.

Economic Aspects

Agriculture forms the backbone of the economy of the Emthanjeni LM (Emthanjeni LM IDP, 2021/22) and accounts for the largest labour/employment contributor to date. There is a big abattoir in De Aar that solely for sheep with a capacity of 1 000 carcasses a day. The area is famous for ‘Karoo’ mutton. Sheep, wool, and mutton are the main farming activities in the Britstown area while hunting of small game is also very popular. Wool is exported to Gqeberha (formerly Port Elizabeth). Besides sheep farming, cattle, goat, pig, and game are also being farmed. The town of Hanover is well endowed with construction industry artisans. The manufacturing sector shows potential for growth through the introduction of renewable energy projects in De Aar and the surrounding areas. There are also stone crushers in the area that specialise in the manufacturing of sand, bricks cement and rocks. Other economic activities include services, retail, transport, and tourism.

Heritage Aspects

Palaeontological Resources

The area is underlain by Middle to Late Permian sedimentary rocks of the Karoo Supergroup that are intruded by Early Jurassic dolerites. The area is largely underlain at depth by Permian continental (fluvial / laBased on rare dinocephalian cranial fossil remains recorded by Almond (2021), it is likely that the Adelaide Subgroup succession represented in the present project area belongs to the upper part of the Abrahamskraal Formation of late Middle Permian age (cf Day & Rubidge 2014, 2020). Thin kimberlite dykes of Jurassic to Cretaceous age are mapped in the broader study region, including just north of the present study areacustrine) sediments of the Adelaide Subgroup (Lower Beaufort Group) (Pa).

The great majority of the Beaufort Group and Karoo dolerite outcrop area is obscured by thick, pervasive Late Caenozoic superficial sediments of probable Pleistocene to Holocene age, as well as by karroid shrub and grassy vegetation.

Fossil tetrapod remains appear to be generally very rare in this portion of the Permian Adelaide Subgroup outcrop area. The only fossils previously recorded here comprise locally common, generally small blocks of reworked petrified wood within older alluvial deposits and surface gravels as well as possible low-diversity invertebrate trace fossil assemblages (Almond 2017, 2021).

Archaeological/Heritage Resources

The Upper Nama Karoo (Nku3) vegetation of the region is limited by the low annual rainfall (ca. 190 - 200 mm/a) and is dominated by flat plain areas and hills with rocky outcrops.

The geology is mostly Dwyka/Ecca shales overlaid with shallow sandy soils that drain well.

In general, the topography of the study area is flat and open, with some rocky ridges/outcrops and low hills surrounding present.

Tree cover is scarce, but fairly dense ground cover (grass/shrubs/bushes) in some sections did hamper visibility on the ground during the assessment. The focus of the field assessment was therefore on large open patches of soil and erosion dongas, as well as the rocky ridges and outcrops. Just before and during the June 2022 assessment the area experienced unseasonal high rainfall, resulting in large sections of the study area being waterlogged and impassable. The water cover in these sections also limited visibility and the identification of possible archaeological sites, features, and material in these locations.

In general the area has not been disturbed by modern developments, except for a railway line, existing 132kV Eskom Powerline corridors that cuts through the areas and have had some impact, with the largest other type of impact being agricultural activities (sheep/cattle; grazing and limited crop growing and ploughing). Farmsteads and related infrastructure are also present, but these will not be directly impacted by the proposed development actions.

A number of Heritage Impact Assessments have been undertaken in the larger geographical area. No Grade I or II sites (National or Provincial Heritage Sites) have been identified in close proximity to the proposed development area as yet.

Karoo Sedimentary Rocks

The Beaufort Group contains fossils of diverse terrestrial and freshwater tetrapods of Tapinocephalus and Lystrosaurus genere (amphibians, true reptiles, synapsids – especially therapsids), palaeoniscoid fish, freshwater bivalves, trace fossils (including tetrapod trackways) and sparse vascular plants (Glossopteris Flora, including petrified wood) that dates to the Late Permian – Early Triassic Periods (c. 266 – 250 Ma). The area of the proposed development where this geological signature occurs is regarded as highly sensitive with regards to palaeontological heritage.

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Karoo Dolorites

No fossil heritage has been recorded in these intrusive dolerites (dykes, sills) and associated diatremes. The dolorite dykes and sills within the area of the proposed development are not palaeontologically significant.

Stone Age

The Stone Age is the period in human history when lithic (stone) material was mainly used to produce tools. The Stone Age is well represented in the area by the archaeological remains associated with Stone Age hunter gatherers and herders and includes cave shelters and surface sites. Erosion gullies and river/streambeds and dolerite outcrops are usually associated with stone tool assemblages. These occurrences cover represent the Early, Middle and Later Stone Ages.

A number of Stone Age sites were identified and recorded during the 2017 & 2021 assessments for the Soventix Solar PV Project, with further sites also identified and recorded during the recent June 2022 Phase 3 assessment.

Iron Age

The Iron Age is the name given to the period of human history when metal was mainly used to produce metal artifacts**.**

The Iron Age is not represented in the general area of the development. No sites were found during the assessment as well, although one of the sites recorded during the February 2021 assessments could represent a proto-historic pastoralist structure similar to those described by Sampson.

Historical Age

Signs of historical occupation is common in the general area and includes abandoned sheep kraals and homestead ruins. Old railway infrastructure (housing, old railway lines and foundations) was also recorded (at nearby Burgervilleweg (Becker 2012).

The proximity of the railway means that material traces may exist alongside that relate to its construction, maintenance and use, and its protection by way of blockhouses, as a major transport route for British forces further inland during the Anglo-Boer War.

A number of historical sites, features and artifacts related to the above was identified and recorded during the 2017 assessment in the larger area, while a few was identified and recorded in the Phase 3 study area during the June 2022 assessment.

Cultural Aspects

De Aar

Is the second-most important railway junction in the country, situated on the line between Cape Town and Kimberley. The junction was of particular strategic importance to the British during the Second Boer War. De Aar is also a primary commercial distribution centre for a large area of the central Great Karoo. Major production activities of the area include wool production and livestock farming. The area is also popular for hunting, although the region is rather arid. De Aar is also affectionately known as " Die SES " deriving its nickname from the six farms that has surrounded De Aar since the 1900.

Hanover

Hanover claims to be the country's most central place. It is equidistant from Cape Town and Johannesburg, centrally positioned between Cape Town and Durban as well as Port Elizabeth and Upington and it is the hub of an arc formed by Richmond, Middelburg and Colesberg.

Historic figures were at the centre of life here, people like Olive Schreiner, author and women's rights champion, and the tempestuous Rev. Thomas Francois Burgers. Among its residents were the wealthy and eccentric. The town's chief constable was the grandson of Lord Charles Somerset, the magistrate's clerk a son of Charles John Vaughan, Dean of Llandaff, well-known churchman and devotional writer of his day, and the local doctor was the son of a former Solicitor-General of Jamaica. Well-known people of today hailing from Hanover includes Zwelinzima Vavi, the General Secretary of the Congress of South African Trade Unions.

Today the busy Karoo N 1 route cuts through the veld between the town and its cemetery. But during the last century all roads converged in Hanover and all travellers passed through the town. It was on an important stop for stage coaches carrying passengers to the Diamond Fields, and the Free State mail was carried through by post cart. Daily life bubbled with people ever on the move. But then in 1884, the advent of the railway deprived the town of much of its through traffic and its character slowly changed.

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Level of sensitivity of environmental attributes

The level of sensitivity (or sensitivity rankings) relating to the environmental attributes of the preferred alternative site relative to the no-go option (**Table 15**) was assessed using the results from the various specialists' assessments undertaken as part of the EIA process.

Table 15. Sensitivity of the environmental attributes associated with the preferred alternative site and no-go option.

Aspect→ Alternative↓	geographical	physical	biological	social	economic	Heritage and cultural
Alternative Site No. 1 (preferred)	Low	Very High	High	Very High	Medium	Very High
No-go option	Low	Very High	High	Very High	Medium	Very High

Legend	Very High	High	Medium	Low

References (Source of information) used to designate levels of sensitivity in Table 15

Geographical aspect:
Strategic Areas

- The study area is located within a Strategic Transmission Corridor according to the Screening Report (and GN No. 113 in GG No. 41445 of 16 February 2018, as well GN No. 383, GG No. 44504 of 29 April 2021).
    - In terms of GN No. 113 dated 16 February 2018, "Applications for an environmental authorisation for large scale electricity transmission and distribution facilities, where such facilities trigger 9 of the Environmental Impact Assessment Regulations Listing Notice 2 of 2014 and any other listed and specified activities necessary for the realisation of such facilities, and where the greater part of the proposed facility is to occur in one or more such Strategic Transmission Corridors, must follow the basic assessment procedure contemplated in Regulation 19 and 20 of the Environmental Impact Assessment Regulations, 2014 in order to obtain environmental authorisation, as required in terms of the Act." – **The proposed development which is the subject of this application does fall within the "Central Corridor" but does not trigger LA 9 of LN2.**

- The study area is not located within a (REDZ).
    - Renewable Energy Zones together with the procedures to be followed when applying for environmental authorisation for a large-scale wind and solar facility within these areas were published under GN No. 114, GG No. 41445 of 16 February 2018, as well as GN No. 786 of 17 July 2020 - **The proposed development which is the subject of this application does not fall within any of the eleven (11) identified Renewable Energy Development Zones.**
    - In terms of GN No. 145 dated 26 February, 2021, "The scope of this notice applies to …an application for environmental authorisation when triggering the following activities related to the development of electricity transmission and distribution infrastructure (Activity 11 of Listing Notice 1 and Activity 9 of Listing Notice 2)… where the greater part of the activity is undertaken within a Renewable Energy Development Zone…" – **Whilst the proposed development which is the subject of this application does trigger Activity 11 of Listing Notice 1, the proposed development footprint does not fall within a Renewable Energy Development Zone.**

Radio Frequency

- The **Medium** Radio Frequency Interference (RFI) theme according to the Screening Report was disputed in the Site Sensitivity Verification Report as being **Low**.
- Although the site area falls within an Astronomy Advantage Area (AAA) under the Astronomy Geographic Advantage (AGA) Act, 2007 (Act No. 21 of 2007), the South African Radio Astronomy Observatory (SARAO) undertook a high-level impact assessment and determined that the project represents a low risk of interference to the SKA radio telescope (including MeerKAT) with a compliance surplus of 57.02 dBm/Hz. (Response Letter from Mr Selaelo Matlhane, Spectrum & Telecommunication Manager of the South African Radio Astronomy Observatory (SARAO) and dated 16 March 2022)

Protected Areas

- Study area is not within a protected area or within 5 km of a protected area according to the Protected Area Register (PAR).
- The study area is not within the core area or within 5 km of the core area of a Biosphere Reserve according to the PAR.
- The study area is not within a National Protected Area Expansion Strategy Focus Area according to the National Protected Area Expansion Strategy (2016).
- The study area is not within a sensitive area in terms of an EMF as there is no EMF.

Physical aspect:
Atmosphere

- The study area is not within an Air Quality Priority Area.

Geology

- The study area is part of the Beaufort Group of the Karoo Supergroup of geology in South Africa and consist mainly of sandstones and shales dominated by the Mispah soil form. Sub dominant soil forms are Swartland and Oakleaf forms. Dolerite koppies also form a small but conspicuous part of the landscape.

Wetlands

- The clayey soils and most noticeably the Swartland and Valsrivier soils may restrict vehicle movement during the wet season. During the rainy season terrain mobility on high clay soils in low lying areas with drainage lines will be difficult and might increase soil erosion when drainage lines are disturbed.
- The study area is not within an area identified in terms of an international convention, such as a RAMSAR site.
- The drainage systems are predominantly classified as ephemeral drainage lines and not wetlands.

Surface Water (Hydrology)

- The project area is located within a Strategic Water Source Area.
- The project area falls within quaternary catchment D62D and the Orange Water Management Area. (Hydrology Assessment)
- The ephemeral drainage line running through the project area is an unnamed tributary to the D62D – 05610 tributary with its confluence just downstream of the Project Area. (Plan of Study prepared by Dr Andrew Deacon)
- The project area contains 3 Hydrological Response Units (HRU). Ninety-six percent (96%) of the project area falls within HRU2. The average slope of HRU2 (21,738 km2) is 0,56%. Sixteen percent (16,51%) of HRU2 has a 3-10% slope, which is mostly restricted to the western and eastern corners of the project area. Consequently, the topography of the study area is generally flat with elevations on the site typically ranging from 1 335 to 1 370 m above mean sea level. (Hydrology Assessment)
- Drainage is generally towards the north-west via multiple non-perennial drainage lines towards the ephemeral Brak River, approximately 6,6 km further downstream. (At least) Three small capacity in-stream dams occur within the development area. (Hydrology Assessment)
- However, the drainage channels or flow paths are not clearly defined. Sheet flow occurs from micro sub-catchments towards lower topographical areas or isolated depressions forming temporarily flooded areas. Irregular occurrences of ponded water were visible across the project area, even in areas with no defined drainage lines or stream channels. (Hydrology Assessment)
- In the absence of clearly defined drainage channels or streams the area is prone to exhibit ponded flood occurrence zones. Micro sub-catchment sheet flow towards lower-lying areas within the non-perennial river flood plains is likely to dominate flood propagation, and isolated flooded areas are predicted

to occur. The flood line determination suggests a low flooding risk as no clearly defined drainage lines occur. As such, no clearly defined exclusion zones or protection buffer areas could be mapped or recommended. (Hydrology Assessment)

- The project area falls within a spring to summer rainfall area (October to April), ranging from 112,4 to 738,9 mm/yr but averaging 320 mm/yr. The Mean Annual Evaporation (2 000 – 2 150 mm/yr) exceeds the Mean Annual Precipitation (MAP) by about 85%, so non-perennial streams and rivers will only have water when there are flooding events. (Hydrology Assessment)
- Considering run-off is directly related to rainfall intensity, and longer precipitation events, both monthly rainfall and run-off, peak from January to April. The run-off during these peak months, ranges from 0,3 to 1,1 mm/yr over the surface area of quaternary catchment D62D. The annual run-off from natural (unmodified) catchments in D62D is approximately 0,9% of the MAP. (Hydrology Assessment)
- Accounting for changes in soil type, slope angle and rainfall intensity, ground cover beneath solar arrays was found to have the most significant impact on run-off rates. So, if vegetation cover beneath the solar arrays is maintained, no significant increase in surface water run-off (run-off volumes, peak rates or time to peak rates) is anticipated compared to greenfield run-off rates. (Hydrology Assessment).

Groundwater (Geohydrology)

- De Aar is dependent on groundwater for agriculture and drinking water (District Municipality's Climate Change Response Plan).
- Almost a third of the households in Ward 6 get their water from a borehole, a much higher proportion than on local, district or provincial level, while just over 60% get their water from a regional or local water scheme (much lower than on local, district or provincial level). (Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022)
- A Geohydrological Assessment was commissioned to determine if there is enough groundwater to support demand during construction and operation under normal conditions and under drought years/climate change scenarios, as well as investigate the feasibility of drilling an additional borehole should it be required.
- A geophysical investigation aimed to identify likely dolerite contact zones, as these are known preferential flow paths for groundwater movement, revealed two high-feasibility drilling positions which can be considered for future water supply: T1 and T2 located in the southwestern corner of Phase 3.
- If the combined sustainable abstraction yield for both boreholes (336.67 m^3/day for 8 hours of pumping) is used as the Proposed Use in the water balance calculation for the HRU2 sub-catchment (Phase 3), there will be a surplus amount of 54 824.94 m3/yr (or 150.21 m3/day) available after the allocation of existing uses, basic human needs, base flow (to surface water streams) and PU (refer to Table 5-4 of the Geohydrological Assessment Report).
- However, if the PU is substituted for the estimated demand during construction (including the period when construction and operation overlap), that is 216 m3/day, there will be a greater surplus of 98 869,79 m3/yr (or 270,87 m3/day)

- It is therefore estimated that there is enough groundwater available on a sub-catchment level to sustain the proposed 8-hour abstraction from the designated boreholes and the sub- catchments they fall in. Provided the surplus estimates are not exceeded, the impact on the groundwater reserve will likely be minimum.
- The base case water balance will be different under the forecasted climate change scenario for 2050. If the combined sustainable abstraction yield for both boreholes (336.67 m^3/day for 8 hours of pumping) is used as the Proposed Use (PU) in the water balance calculation under the climate change scenario (lower rainfall and effective recharge to the aquifer), there will be a deficit amount of -29 954.96 m3/yr (or -82.07 m3/day) available after the allocation of existing uses, basic human needs, base flow (to surface water streams) and PU (refer to Table 5-4 of the Geohydrological Assessment Report). Based on the climate change predictions, HRU2 will therefore not be able to meet the demand for water uses by 2050. Water abstraction rates, or specifically the PU, would need to be considerably decreased nearing the 2050 mark. The potential deficit must be avoided by reducing water usage during operation and substituting the PU with the estimated demand during operation, that is 150 m3/day, in which case there will be a surplus of 38 180 m3/yr (or 140,60 m3/day).
- Although forecasted production rates (to support the development and operation of the Solar PV facility) under current and future climate change scenarios, are/can be sustainable, groundwater is a very important resource for locals in the area, so care should be taken not to overproduce from boreholes chosen for this project, and to ensure that there is a limited impact on existing livestock/domestic watering already implemented.
- Almost a third of the households in Ward 6 get their water from a borehole, a much higher proportion than on local, district or provincial level, while just over 60% get their water from a regional or local water scheme (much lower than on local, district or provincial level).
- The project area overlies a moderate to high yielding aquifer (median yields of 0,5 to 2 L/sec), on average 6,9 m below ground level, and generally in bedding planes in shale or interbedded sandstone of the Beaufort Group and jointed and fractured contact zones between sedimentary rocks and dolerite dykes. (Hydrology Assessment)
- However, the landowner, Willem Retief has indicated that each windmill pump yields approximately 1 200l/hr from both (two) boreholes in the project area for Phase 3. This is equivalent to 0,33 L/s, which falls at the bottom of the range (0.5 to 2 L/s – Class D3 Intergranular & Fractured Aquifer System) that is considered the median aquifer yield of the project area (Meyer, P.S., Chetty, & T., Jonk, F., 2002). Furthermore, Willem observed the water table dropped by at least 3 ms over the last few years during the drought.
- The electrical conductivity (EC) for the underlying aquifers generally ranges from 70 to 300 mS/m and the pH ranges from 6 to 8. Consequently, groundwater can generally be used for domestic and recreational use. (Hydrology Assessment)
- Water scarcity in the arid Pixley Ka Seme District Municipality is expected to be exacerbated by climate change, specifically drought. Most of the province receives minimal summer rainfall ranging from 50 mm to 400 mm depending on the location. Under a low climate change mitigation scenario (Climate Change Adaptation Response Strategy for the Northern Cape, 2016), model simulations indicated an average temperature increase by 2.3 °C, an increase of 16.1 in the total number of heat waves experienced and a decrease in rainfall to 17 mm - 74.3 mm annually.

- It is advised that all groundwater boreholes (4 identified within proximity of the solar farm) be monitored for the decline in water levels/yields, as well as water quality. It is known that the boreholes are used as the main water supply for livestock / domestic use. (Hydrology Assessment)
- Geohydrological Assessment Report (Final Rev 3) prepared by GCS Water and Environmental Consultants dated 10th August 2022 (GCS Project Number: 22-0401).
- It is advised that water be pumped to dedicated storage tanks from the boreholes to build up a reserve, whereafter the boreholes are only used to top up the storage tanks. Allowing boreholes to rest and recover between pumping cycles will help to decrease the impact on the aquifer reserve.
- He (Willem Retief, Landowner) also mentioned that the water table dropped by at least 3 metres over the last few years, due to the drought. So the question is how effective are the windmills, for if the water table drops below the intake pump the mill will spin, but no water will be abstracted?" (pers. comm. Henri Botha, Hydrologist).
- Dust Suppression - Assuming four litres of water on every square meter, the access road from the N10 to the main entrance of the facility (a road roughly 18,5 km long and 6 m wide) would require the use of roughly 444 m3 of water for dust suppression or control.
- Total permissible abstraction for the project area, that is both properties combined is 109 +107 = 216 m3 per day.

Terrestrial Biodiversity

- The **Very High** Terrestrial Biodiversity theme according to the Screening Report and owing to the study area being within an ESA – Northern Cape CBA Map (2016) (SANBI BGIS), was confirmed in the Site Sensitivity Verification Report. ESAs must be in a systematic biodiversity plan adopted by the CA or a bioregional plan. The Critical Biodiversity Areas of the Northern Cape: Technical Report (2016) by Dr Stephen Holness & Enrico Oosthuysen, has been adopted (pers. comm. Elsabe Swart, DENC). There is no Bioregional Plan for the Pixley Ka Seme District Municipality District (pers. comm. Elsabe Swart, DENC).
- **Why was this area identified as an ESA... what ecological processes do we need to take into consideration?**
  ESAs are meant to support the ecological functioning of CBAs through its provision of supporting ecological processes (along ecological process pathways) or even meet biodiversity targets for ecological processes that have not been met in the CBA. So, ESAs and CBAs are inextricably linked. Logically then, the nature and life history strategies of the biodiversity features (- that are the subject of the biodiversity targets, which need to be met in a CBA) will influence the nature of the supporting ecological processes that need to be protected in the ESA. <u>As long as a person doesn't know what ecological processes (and pathways) need to be protected, one cannot assess the impacts of the proposed solar facility on this ESA and come up with appropriate mitigations, to avoid, minimise, etc., and then determine the residual impact.</u>
  Answer
  "The Northern Cape CBA Map identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) which, together with protected areas, are important for the persistence of a viable representative sample of ecosystems and species, as well as the long-term

ecological functioning of the landscape as a whole. The "reasons" layer is based on the planning units used in the spatial analysis and provides a list of biodiversity and ecological features found in each planning unit, which contribute to the biodiversity target." (**Northern Cape CBA "reasons" spatial data, SANBI BGIS**)

The planning units that occur on the Phase 3 study area (Unit ID: 5605, 5701, 5702, 5798 and 5895) have the following biodiversity features:

  - Eastern upper Karoo veg type
  - Northern Cape Upper Karoo veg type
  - IBA area
  - NFEPA wetlands and rivers
  - FEPA catchment

- Although there are no CBAs within the affected area, the whole of the Soventix Phase 3 site falls within an extensive ESA. According to the reasons layer that accompanies the CBA map, the ESA is based on the selection of the area as Northern Upper Karoo, the Platberg - Karoo Conservancy Important Bird Area, the presence of natural wetlands, rivers, and wetland FEPAs. However, the aquatic features listed above have been excluded from the development footprint, with the result that the impact of the development on these features would be minimal.
- There are no impacts associated with the development of the Soventix Phase 3 site on terrestrial biodiversity that cannot be mitigated to an acceptable level.
- Northern Upper Karoo is one of the most extensive vegetation types in the country and occupies over 40 000km2 of the interior Karoo. The vegetation consists of shrubland dominated by dwarf Karoo shrubs, grasses and Acacia mellifera subsp. detinens, and other low trees particularly on the sandy soils. Four plant species are known to be endemic to the vegetation type, Lithops hookeriana, Stomatium pluridens, Galenia exigua and Manulea deserticola. Northern Upper Karoo has not been significantly affected by transformation and is still approximately 96% intact and is classified as Least Threatened.

Aquatic Biodiversity

- The **Very High** Aquatic Biodiversity theme according to the Screening Report and owing to the study area being within a Strategic Water Source Area, as well as (National Freshwater Ecosystem Priority Areas) "Wetlands and Estuaries", was confirmed in the Site Sensitivity Verification Report.
- In terms of the regional vegetation and aquatic habitat composition, there is very little discernible riparian vegetation, which consists of a relatively dense low shrubby system, often visible by the formation of smaller washes and dense encroachment by spiny shrubs. Nonetheless, the vegetation integrity score is 93.9% which represents an Ecological Class A (90-100%), which is considered an "Unmodified, natural." status.
- The only aquatic habitat present to sample, was a series of isolated pools in the system, filled with rainwater but not flowing. These pools are certainly very temporary and the habitats available were overhanging grass and a sandy pool bottom with loose pebbles and stones. The Integrated Habitat Assessment

System (IHAS) and Habitat Quality Index (HQI) scores were mostly "Poor" due to the shallow water level, brief presence of surface water and the lack of flow.

- The aquatic macro-invertebrates were sampled at the project pools. The shallow water level, brief presence of surface water and the lack of flows, reflected in the macro-invertebrate scores resulted in "Fair" SASS scores and low number of families (5). The assemblage of taxa, mostly air-breathers, had a low sensitivity. Furthermore, no fish species are able to inhabit and survive in the system due to its ephemeral nature, the lack of flows and absence of surface water. Even during the short-lived surface flows, the distance from permanent water and brief inundation of the system, rules out the presence of these assemblages.
- However, these ephemeral ecosystems have been found to provide aquatic habitat to a diverse array of faunal species that depend on brief periods of inundation for hatching, mating, feeding and refuge. For instance, many frogs of the Karoo region breed in temporary pools associated with watercourses and wetlands, this includes the Karoo Toad Vandijkophrynus gariepensis and Karoo Dainty Frog Cacosternum Karooicum.

Table 16. Applicable biodiversity features or other sensitivity categories with definitions and desired management objectives.

Biodiversity Feature	Description	Desired State and compatible land uses
ESA – Technical Guidelines for CBA Maps (2017) (SANBI)	An ESA is an area that must retain its ecological processes in order to: • meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; • meet biodiversity targets for representation of ecosystem types or species of special concern when it is not possible to meet them in CBAs; • support ecological functioning of a protected area or CBA (e.g., protected area buffers); or a combination of these). See **Figure 10** below.	To be managed to maintain near natural landscapes with minimal loss in ecosystem integrity and functioning. Spatially explicit corridors must be managed to maintain function and structure, especially for aquatic systems. Buffers to be managed to limit transformation with particular emphasis on maintaining ecological process that require large areas. For ESAs currently in good or fair ecological condition: Maintain in at least fair (semi-natural) condition. For ESAs currently in severely modified ecological condition: No further deterioration in ecological condition (e.g., through intensification of land use).
Strategic Water Source Area.	Strategic Water Source Areas (SWSAs) are defined as areas of land that either:	The protection and restoration of strategic water source areas is of direct benefit to all downstream users. This dependence needs to be

	(a) supply a disproportionate (e.g., relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important; or (b) have high groundwater recharge and where the groundwater forms a nationally important resource; or (c) areas that meet both criteria (a) and (b). They include transboundary Water Source Areas that extend into Lesotho and Swaziland.	considered in decisions relating to these primary headwater catchments. The protection of both water quantity (flows) and quality must be addressed. Any failure to address impacts on water quality or quantity will have impacts on the water security of all those depending on that water downstream. Groundwater is the main or only source of water for numerous towns and settlements across the country so protecting the capture zone, specifically for municipal supply well-fields, the recharge area, and the integrity of the aquifers is important as well.
NFEPA Rivers and Wetlands	NFEPA River - achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species, and were identified in rivers that are currently in a good condition NFEPA Wetland - important or sensitive wetlands and wetland clusters that are required to achieve biodiversity targets	Their FEPA status indicates that they should remain in a good condition to contribute to national biodiversity goals and support sustainable use of water resources. Wetland FEPAs currently in a good ecological condition should be managed to maintain this condition. Those currently not in a good condition should be rehabilitated to the best attainable ecological condition.

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CBA Map category	Description	Desired state	Examples of compatible land uses
Protected area	Areas that are formally protected in terms of the Protected Areas Act. Each protected area has a management plan.	As per each protected area's management plan.	• Conservation-related land uses
Critical Biodiversity Area 1 (CBA 1)	Areas that are irreplaceable for meeting biodiversity targets. There are no other options for conserving the ecosystems, species or ecological processes in these areas.	Maintain in natural or near natural ecological condition.	• Open space • Low impact ecotourism or recreation
Critical Biodiversity Area 2 (CBA 2)	Areas that are the best option for meeting biodiversity targets, in the smallest area, while avoiding conflict with other land uses.		
Ecological Support Area 1 (ESA 1)	Areas that support the ecological functioning of protected areas or CBAs, or provide important ecological infrastructure.	Maintain in at least semi-natural ecological condition.	• Low impact ecotourism or recreation • Sustainably managed rangelands • Certain forms of low density housing
Ecological Support Area 2 (ESA 2)		No further intensification of land use.	• Intensive agriculture
Other natural area (ONA)	Natural or semi-natural areas that are not required to meet biodiversity targets or support natural ecological processes.	Best determined through multi-sectoral planning processes.	From a biodiversity perspective, these areas can be used for a range of intensive land uses
No natural remaining (NNR)	Areas in which no natural habitat remains.		

Figure 10: CBA Map category descriptions and desired state with associated land uses (Technical Guideline for CBA maps – SANBI, 2017).

Biological aspect:

Ecosystem/Vegetation Type

- The De Aar area falls within the Nama Karoo biome.
- Not a critically endangered or endangered ecosystem in terms of SANBI's latest NBA (2018). The ecosystem threat status as per the NBA 2018 data provides a holistic view of the vegetation type, the threatened species associated with the ecosystem and the overall land use currently in the area. The National vegetation type is Northern Upper Karoo and is considered Least Threatened in the National List of Threatened Ecosystems (NBA, 2018).
- Northern Upper Karoo has not been significantly affected by transformation and is still approximately 96% intact and is classified as Least Threatened.
- Within the study area, the vegetation consists of a mosaic of grassy and more shrubby areas, with shrubs being more prevalent on the stony and shallow soils of the site. No indigenous trees are present within the site and the vegetation consists of low grassland shrubland.
- There are no threated vegetation types or specialised plant communities present within the site.
- No plant species of conservation concern were observed within the site and overall, the site is considered low sensitivity from a Plant Species Theme perspective.

Bats

- The layout of the solar footprint could fall into sensitive bat areas which should be avoided or mitigated. Limited data has indicated that bat activity over a solar development was lower than over the natural areas. The impact of the development extends beyond the alteration of habitat and available resources that would affect bat activity, abundance and diversity but during the operational phase, the impacts of artificial light pollution (flood lights for security reasons), associated with the solar project, could change behaviour and abundances of bat species within the bat community including alteration of commuting routes and preferred foraging habitat. (Plan of Study prepared by Dr Dawn Cory-Toussaint)
- Seasonal water bodies (for example ephemeral pans) are important as surface water is a scarce resource in arid and semi-arid regions that is important for the survival of many animals. These pans are key drinking and foraging resources for bats and must be protected. 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.
- Linear structures in the landscape such as vegetation edges and rocky outcrops/ridges, are known to be used by some bats as landmarks to navigate across the landscape.
- Three bat species out of a potential eight species were recorded over the proposed Phase 3 footprint namely: Tadarida aegyptiaca (Egyptian Free-tailed bat), Laephotis capensis (Cape Serotine), and Miniopterus natalensis (Natal Long-fingered bat). All three species are widespread and abundant and are classified as "Least Concern" on the IUCN Red Data List (IUCN 2021) and the Red List of Mammals of Southern Africa, Lesotho and Swaziland.

Important Bird Area

- The **Low** Avian theme according to the Screening Report was disputed in the Site Sensitivity Verification Report as being at least **High**
- 84 bird species were observed within and around the Combined Project Area out of an expected total of 104 species, based on previous surveys, the SABAP Pentad analysis and habitat suitability, based Probability of Occurrences.
- The observed avian species richness and abundance is considered low to moderate for an area of this size in the South African context although the proportion of observations related to SCC was considered high, as was the overall SCC diversity. Many of the birds observed are generally considered to be common, widespread and adaptable species which were observed within their expected habitats.
- Multiple nests of multiple raptor species were located within the project footprint with two SCC nests located within the combined project are. The Combined Project Area was confirmed to support resident and / or breeding populations of SCC.
- Generally, small passerine flight activity was surprisingly low and flight paths mainly low, short and local with very few higher-flying commuting individuals observed. However, observations of medium to larger species, including large flocks of commuting waterfowl and cranes were observed, as were ground congregations of species such as Blue Cranes and Northern Black Korhaan. Abundances of powerline collision-prone species such as Ludwig's Bustard and Kori Bustard were moderate.
- Notable Priority Species recorded during walked transects included Blue Cranes, Verreaux's Eagle, Ludwig's Bustards that were often flushed from foraging positions as well as numerous Northern Black Korhaans and Karoo Korhaans. Raptors and korhaans were the most frequently recorded priority species during drive transects.
- Due to its abundance and conservation status, the Blue Crane and Ludwig's Bustard is a priority species of concern since it may be prone impacts at certain times (e.g., when commuting between roosting and feeding sites, following rainfall events, invertebrate outbreaks (locusts) or commuting after farming activities which increase food availability).
- Blue Cranes were observed throughout the study area but especially in association with drainage lines and artificial water points.
- Ludwig's Bustards were in frequent in their observations and were mostly observed close to koppies, drainage lines, adjacent to roadsides and in adjacent livestock fields. Larger raptors persisted throughout the survey area but were often congregated near perching habitat (pylons).
- Due to the high diversity and density of the above mentioned Red-Listed species recorded during the survey, (including regionally and globally listed Endangered and Vulnerable birds), the region as a whole is considered to be an area of very high avifaunal importance and activities should be managed in a holistic manner at a policy level, prioritising mitigation and monitoring of avifaunal species of conservation concern.
- Bird nesting sites and roosts varied from artificial structures such as pylons and windmills to some trees within the project footprint and infrastructure development will be associated with the destruction or disturbance of such roosts.

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- The study area is within an Important Bird Area (IBA) called Platberg-Karoo Conservancy (unprotected). The following information was taken off the BirdLife website (https://www.birdlife.org.za/iba-directory/platberg-karoo-conservancy - page last updated Friday 13th February 2015).

  IBA trigger species

  - Globally threatened species are Blue Crane, Ludwig's Bustard, Kori Bustard, Secretary bird, Martial Eagle, Blue Korhaan, Black Harrier (*Circus maurus*) and Denham's Bustard (*Neotis denhami*). Regionally threatened species are Black Stork, Lanner Falcon (*Falco biarmicus*), Tawny Eagle, Karoo Korhaan and Verreauxs' Eagle.
  - Biome-restricted species include Karoo Lark (*alendulauda albescens*), Karoo Long-billed Lark (*Certhilauda subcoronata*), Karoo Chat (*Cercomela schlegelii*), Tractrac Chat (*C. tractrac*), Sickle-winged Chat (*C. sinuata*), Namaqua Warbler (*Phragmacia substriata*), Layard's Tit-Babbler (*Sylvia layardi*), Pale-winged Starling (*Onychognathus nabouroup*) and Black-headed Canary (*Serinus alario*). Congregatory species include Lesser Kestrel and Amur Falcon.

  Conservation Issues/Threats

  - Renewable energy developments are a new threat. Thirteen wind and solar developments have been approved for development within this IBA. All the large trigger species are highly susceptible to collisions with wind turbines, as are large flocks of Lesser Kestrels and Amur Falcons. All the trigger species are predicted to be moderately susceptible to the various impacts of solar-energy facilities.
  - Numerous existing and new power lines are significant threats to trigger species. Power lines kill substantial numbers of all large terrestrial bird species in the Karoo, including threatened species (Jenkins et al. 2011, Shaw 2013). The planned Eskom central corridor for future power-line developments includes the northern half of this IBA. There is currently no completely effective mitigation method to prevent collisions.
  - Climate change scenarios for the region predict slightly higher summer rainfall by 2050, and increased rainfall variability. Droughts are expected to become more severe. The Blue Crane's diet depends largely on the timing and amount of rainfall, and climate change is predicted to have both positive and negative consequences for its populations. Increased summer rainfall could improve survival, and conversely drought years can lower long-term average survival. Large, mainly resident species dependent on rainfall are also more vulnerable to climate change. This would include the slow-breeding Verreauxs' Eagle, Tawny Eagle and Martial Eagle, which also exhibit extended parental care. Severe hailstorms kill hundreds of roosting Lesser Kestrels and Amur Falcons and could become more frequent.

  Conservation actions

  - The major threat of power-line collisions was initially investigated by the Eskom/EWT partnership and MD Anderson, including the impact of power lines on populations of large terrestrial bird species and evaluated the effectiveness of earth-wire marking devices (Eskom's Transmission Bird Collision Prevention Guideline - Revision 1 and Eskom's Utilization of Bird Flight Diverters on Eskom Overhead Lines (Revision 1) authorised date July 2015).

  - Ludwig's Bustard was listed as globally Endangered on the IUCN Red List in 2010 as a result of potentially unsustainable collision mortality, but there is no evidence for a population decrease over the past 20 years despite extremely high annual power line mortality rates (41% of the Ludwig's Bustard population) (Shaw, J. 2013. Power line collisions in the Karoo conserving Ludwig's bustard. University of Cape Town).
  - This species is classified as Endangered as the population is projected to have undergone a very rapid population decline due to collisions with power lines, a trend which is set to continue into the future as the power grid in southern Africa expands and successful mitigation measures are yet to be implemented (BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 30/03/2022; http://datazone.birdlife.org/species/factsheet/ludwigs-bustard-neotis-ludwigii.

- The DFFE Screening Tool identified the Soventix Phase 3 site as having a low sensitivity. The site verification confirmed the low sensitivity and it is unlikely that any red-listed fauna are present within the site.
- There are no threated vegetation types or specialised plant communities present within the site.
- No plant species of conservation concern were observed within the site and overall, the site is considered low sensitivity from a Plant Species Theme perspective

Table 17. Applicable biodiversity features or other sensitivity categories with definitions and desired management objectives.

Biodiversity Feature	Description	Desired State and compatible land uses
Important Bird Area Platberg-Karoo Conservancy (unprotected)	IBAs are sites of global significance for bird conservation, identified nationally through multi-stakeholder processes using globally standardised, quantitative, and scientifically agreed criteria. Essentially, these are the most important sites for conserving.	IBAs are sites for conservation action and obtaining formal protection. Activities in IBA should be aligned to conservation outcomes of the protected area and should include developments such as low-impact eco-tourism.
Aves-Neotis ludwigii (EN) BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 30/03/2022 (http://datazone.birdlife.org/species/factsheet/ludwigs-bustard-neotis-ludwigii)	Endangered and Vulnerable species in terms of the Conservation of Nature (IUCN) Red List of Threatened Species. Levels of threat are determined against quantitative threshold-based criteria. South Africa uses the latest version of the IUCN Red List Categories and Criteria, version 3.1.	Building solar arrays (a linked assembly of heliostats) outside known water bird flightpaths. Constructing new powerlines in such a way that they have minimal impact on birds (e.g., bird-friendly designs, appropriate wire marking devices).

	(IUCN, 2012a). Protection level of species measures progress towards effective protection of a population persistence target for each species. The indicator consists of two components: (1) The first measures how well represented each species is within the protected area network, based on the number of individuals of a species or area of suitable habitat protected relative to the persistence target set for that species. (2) Component two includes a measure of how well a protected area is mitigating threats to each species and when combined with protected area representation provides an overall (effective) protection level measure for each species.	

Social aspect:

- The project area is located in Ward 6 of the Emthanjeni Local Municipality that is located in the Pixley Ka Seme District Municipality in the Northern Cape province. The towns in the area are small and the proposed site is located between the towns of Hanover and De Aar. About 74% of the people in Ward 6 live in urban areas while the remaining 26% (one quarter) live on farms. There are no areas under traditional leadership in the district and the site is surrounded by commercial farms. (Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022)
- At a local municipal level, the number of households increased (between 2011 and 2016) along with population density (per km^2), but the average household size has decreased (more households but with fewer members) possibly due to children leaving home and starting families of their own. Almost half the population in Ward 6 and the local municipality is 24 years or younger. Such a young population places a lot of pressure on resources and infrastructure of the area, and a great demand for future infrastructure as well as the creation of livelihoods can be expected. (Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022)
- The intensity of poverty and the poverty headcount is used to calculate the SAMPI score. A higher score indicates a very poor community that is deprived on many indicators. Despite a slight decrease in poverty intensity (average proportion of indicators in which poor households are deprived), the increased poverty headcount (the proportion of households that can be defined as multidimensionally poor) at a local municipal level, has effectively doubled the

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SAMPI score from 0,01 in 2011 to 0,02 in 2016. This means that more households are deprived on a number of dimensions that mostly relate to access to basic services. Education levels are low (About two fifths (17,8%) of the people in Ward 6 aged 20 years or older have no schooling or only some primary education). In Ward 6, 45,3% of people aged between 15 – 65 years are employed, with about half of those people in the formal sector. Ward 6 has the lowest proportion of people (6,7%) with no annual household income. There are very few employment opportunities. (Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022)

- The South African Multidimensional Poverty Index (SAMPI) (Statistics South Africa, 2014) assess poverty on the dimensions of health, education, standard of living and economic activity using the indicators child mortality, years of schooling, school attendance, fuel for heating, lighting, and cooking, water access, sanitation, dwelling type, asset ownership and unemployment. (Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022).

Visual

- The **Very High** Landscape (Solar) theme according to the Screening Report and owing to the eastern-most corner of the study area falling within "mountain tops and high ridges" was confirmed in the Site Sensitivity Verification Report.
    - Furthermore, a neighbouring landowner has submitted written objections to the proposed activity for *inter alia* the visual impact or massing from 3.3 m solar PV panels located 50m from his farm boundary ('massing' refers when the landscape becomes dominated by a particular theme – in this case, large covering of solar PV panels that result in strong change to the local landscape character).

- Although there is visual and biodiversity impact assessment reports that suggest mitigation, it must be acknowledged that the sense of place will be altered permanently and given the personal experience of this impact from some stakeholders, successful mitigation is extremely hard to do. In the eye of the affected parties the only thing that will not alter the sense and spirit of the place in this instance is to avoid any further development.
- The visual recommendations from the scoping phase reporting were all incorporated into the layout design, accommodating a wide buffer on the adjacent properties, as well as accommodating wide ecological corridors between the four PV blocks. While the local sense of place will be modified, the impacted visual resources are localised to some degree and are not highly significant such that a No-go Option would be preferred. Goede Hoop Farmstead could experience partial views of the panels at 4.5 km (the dwelling is at the fringe of the viewshed analysis), with direct views from Skilpadskuil Farmstead screened by local vegetation.

Civil

- The **Low** Civil Aviation theme according to the Screening Report and owing to no major or other types of civil aviation aerodromes was confirmed in the Site Sensitivity Verification Report.

Defence

- The **Low** Defence theme according to the Screening Report was confirmed in the Site Sensitivity Verification Report.

Economic aspect:

- The study area is zoned as Agriculture Zone 1 (not open space or conservation).
- Agriculture (mostly 'Karoo' mutton, sheep and wool, with some hunting of small game) forms the backbone of the economy of the Emthanjeni LM and accounts for the largest labour/employment contributor to date. (Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022).
- Soils are unsuitable for most types of agriculture.
- From a grassland ecological perspective, the opinion is that the current planned development (and the cumulative effect of 30km from other PV-projects), will not have a significant impact on the determined potential grazing potential.
- There is no evidence to show that Solar PV facilities will affect rural agricultural property values.
- A solar PV facility of this size (400 MW), particularly when considered together with Phases 1 and 2 (1 GW in total), will make a significant contribution to our country's power deficit when supply falls behind demand. Rolling scheduled and controlled shutdowns (known as load shedding) as well as unplanned and unpredictable outages or blackouts are impacting human well-being. The positive impact of the Solar PV facility on human wellbeing does not require further investigation or mitigation.

Heritage and cultural aspect:

Archaeology

- The study area is not within a World Heritage Site or within 10 km of a World Heritage Site according to the PAR.
- The **Low** Archaeological and Cultural Heritage theme according to the Screening Report was disputed in the Site Sensitivity Verification Report as being **High**.
- A total of 31 sites were identified during the 2022 assessment in the study and development area (Sites 26-31 are located outside of the proposed development footprint). They included a fairly larger number of open-air Stone Age surface sites (with varying degrees of density), a recent stone kraal and some stone cairns that are most likely associated with an old road.
- Although the age, origin and function of this possible old road is not known, it could date to the late 19th/early 20th century, with some cultural material dating to this period found in association (Martini Henry cartridge). This was likely an old wagon road linking farmsteads with each other, as well as these with Hanover and other towns. From this point of view this road and related features (cairns) are relatively significant from a Cultural Heritage point of

view and at least should in part be preserved. Stone cairns can be demolished in sections where they cannot be avoided by development actions. The exact age and historical origin should also be researched.

Palaeontology

- The **Very High** Palaeontology theme according to the Screening Report was confirmed in the Site Sensitivity Verification Report.
- The project area is underlain at depth by potentially fossiliferous continental bedrocks of the Lower Beaufort Group (Karoo Supergroup) of Middle Permian age that have yielded sparse but scientifically important vertebrate remains in the Hanover area as well as commoner petrified wood. Also present are unfossiliferous dolerite intrusions and Late Caenozoic superficial sediments (e.g., alluvium, surface gravels) which might contain important fossil mammal and other remains as well as reworked fossil wood blocks. Satellite imagery suggests that bedrock exposure is limited but not insignificant within all three study sites. *Dr. John Almond, NATURA VIVA cc Palaeontological Impact Assessments & Heritage Management, Natural History Education, Tourism, Research Budget Proposal dated 20 January 2022.*
- “The most likely outcome, based on comparable project areas in the Hanover - De Aar region of the Great Karoo, is that comparatively few scientifically useful fossil sites will be recorded, while No-Go palaeontological areas are very unlikely to be designated. Most Karoo fossil sites are of limited extent and can be effectively mitigated in the pre-construction phase, so palaeontological constraints on the project footprint are not anticipated, although they cannot be completely excluded in advance.” *Dr. John Almond, NATURA VIVA cc Palaeontological Impact Assessments & Heritage Management, Natural History Education, Tourism, Research Budget Proposal dated 20 January 2022.*

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IDENTIFICATION (AND ASSESSMENT) OF IMPACTS AND RISKS FOR EACH ALTERNATIVE

3(1) A EIA report… must include –

(h) a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping, including –

(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of such identified 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;

(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

(viii) the possible mitigation measures that could be applied and level of residual risk.

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

No alternative development footprints were considered other than the preferred alternative and no-go option.

Please refer to the impact assessment of the preferred alternative and no-go option as contained in **Appendix D of the Final Scoping Report and Appendix D of the Draft EIA report.**

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Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks

Ecoleges sets out to identify, predict and evaluate impacts and risks firstly by identifying the activities that are to be undertaken during the development, and where applicable, related operation of a listed or specified activity. Once the activities and associated environmental aspects, or elements of the contractor's activities that interact or can interact with the environment, are identified, e.g., air emissions, it is possible to identify the potential environmental impact and risks, considering that an impact is any change to the environment resulting from the contractor's environmental aspects. This process of identification is facilitated by a Leipold Matrix, which considers the possible outcomes of each aspect and the cause of that aspect (or activity) within the context of the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment. Other critical inputs are received from Interested & Affected Parties, and, where applicable, the findings contained in specialist studies.

Impacts versus Risks

It is our opinion that a risk is nothing more than a potential impact, meant to encourage people to think beyond the obvious impact and consider (1) variable driving forces, and (2) uncertain outcomes, to identify potential or indirect impacts so that specific actions can be taken in response to that risk.

(1) Variable driving forces

Some variable driving forces include nature, human behaviour, and exposure scenario.

An **environmental aspect** is described in BS EN ISO 14001 as an "element of an organisation's activities, products or services that interacts or can interact with the environment"

An **environmental impact** is an "adverse or beneficial change to the environment resulting from the organization's environmental aspects."

For example, if an activity is driving a covered coal truck on a surfaced road, then one aspect of that activity is emissions to air, including greenhouse gases, and the impact is global warming. If a person changes the exposure scenario to a dirt road, then another emission to air is dust, and the potential impacts or risks include dust fall on vegetation, and the inhalation of dust by people. It would not have been possible to identify the potential risks if one did not consider an alternative exposure scenario.

(2) Uncertain outcomes

Uncertain outcomes relate to the nature and extent of an outcome most often because of a lack of information, data or understanding about, for example, stressors, responses and distributions over space and time.

For example, a lack of meteorological data would make it difficult to assess the affects of wind on dust emissions, and how it can influence the certainty of the impact.

So, the determination of an impact versus risk is based on whether an activity can be exposed to variable driving forces or generate uncertain outcomes. The methodology used in assessing impacts and risks is the same as described below. However, the legislated precautionary principle is adopted when identifying mitigations for risks.

Motivation for the methodology

A **significant impact** means, "an impact that may have a notable effect on one or more aspects of the environment, or may result in non-compliance with accepted quality standards, thresholds or targets, and…"

According to the EIA Regulation's definition, there are two measures of significance: (1) a notable effect on the environment, and (2) non-compliance with standards, thresholds, or targets.

(1) A notable effect on the environment
An impact can be significant based on a measurable effect to the environment.

(2) Non-compliance with standards, thresholds, or targets
An impact can be significant based on non-compliance, which is basically a failure to act in accordance with formal requirements such as a law, regulation, term of a contract, rule or in this context, environmental standards, thresholds, and targets.

(a) An example of a standard is the General Authorisation for Section 21(f) water uses relating to the "discharge of waste or water containing waste into a water resource…" published in GN No. 665 of 2013. It contains a table of wastewater limit values applicable to the discharge, including such parameters as Chemical Oxygen Demand, pH, Suspended Solids, and the concentration of other dissolved elements.
(b) An example of a threshold is $300m^2$ in the case of Listed Activity 12 of Listing Notice 3 relating to the clearance of indigenous vegetation in an identified geographical area.
(c) An example of targets are the biodiversity targets for ecosystems, species, or ecological processes that CBAs are required to meet.

Consequently, the methodology differentiates between two measures of significance, namely **Impact Magnitude** and **Impact Importance**. Impact Magnitude relates to a notable effect on the environment and Impact Importance refers to non-compliance. Significance is assessed using both approaches. If either one is, or both are, significant, then the impact is significant. However, **Impact Importance** prevails over **Impact Magnitud**e. In other words, a significant magnitude is deemed to be at a cost that is acceptable to society in large IF the importance is Low.

Each approach entails assigning ranks, usually Low, Medium, or High, to a set of judgemental criteria, that is criteria that are based on clearly defined value judgements (or descriptors) that have been adapted to the South African EIA context.

This requirement is written into the second part of the EIA Regulation's definition of **significant Impact**. It continues, "…and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as **duration**, **magnitude**, **intensity** and **probability** of occurrence."

So, not only does the definition identify four key criteria that we need to consider, but it also requires that these criteria are ranked, implying levels of severity determined by the EAP's judgement.

Additional criteria identified by the EIA Regulations (see Resources used to inform methodology above) for inclusion in the assessment process include **nature**, **significance**, **consequence**, and **extent**.

In total, eight different criteria must be taken into consideration when undertaking an impact and risk assessment. However, which criteria should be used to evaluate **Impact Magnitude** and which criteria should be used to evaluate **Impact Importance**?

Description of the criteria

The "**Nature**" of something means the basic or inherent features, character, or qualities of something. However, considering that identified potential environmental impacts should as far as possible be quantified, the nature of an impact should be evaluated by predicting those attributes that are measurable, or at least prone to minimal subjectivity during their judgment, such as intensity, extent, duration, and status.

The "**Status**" of an impact identifies whether it is a positive (or beneficial), negative (or adverse), or neutral impact. Status is not mentioned as a criterion in the EIA Regulations, 2014 as amended, but the Regulations do refer to the inclusion of both positive and negative effects. So, status has been incorporated into the assessment process as a criterion and specifically with reference to evaluating the nature, or determining the inherent qualities, of an impact.

In summary, nature is a composite score that combines four different impact values: (1) **intensity** or severity, (2) geographic **extent** or spatial scale, (3) **duration** (and if applicable frequency), and (4) status.

Once the nature of an impact has been considered together with the **probability**, likelihood of occurrence or, also called, degree of certainty, then a person will arrive at **Impact Magnitude**, which is a separate and standalone measure of significance.

The other measure of **significance** is Impact Importance. Impact importance is effectively a value judgement placed on the degree of change by affected parties and is determined by combining a criterion called "**Level of Acceptability**" with the probability or likelihood of exceeding a threshold of sorts.

Although the Level of Acceptability is not identified as a criterion in the EIA Regulations, it is alluded to in the definition of "significant impact" as non-compliance with standards, thresholds, or targets, e.g., non-compliance with a threshold is unacceptable, and if highly probable, then it constitutes a significant impact.

In fact, the Level of Acceptability is very likely synonymous with, and achieves the same intent as, "**Consequence**."

A single impact can have multiple consequences, e.g., the consequences of global warming are many, ranging from rising sea levels to earlier flowering seasons. So, consequence is an extension of impact. Some consequences may be significant. Some may be insignificant. It is simply not possible to pick up on any significance if not by considering all the context-specific consequences. Therefore, considering that potential consequences are so many and varied, the only way of ranking a consequence is through its level of acceptability.

The Level of Acceptability criterion measures the degree of change in an environmental resource against (1) quantitative thresholds provided by legal requirements and scientific standards, and which represent that point at which a project's potential environmental effects become significant, and (2) qualitative thresholds of social acceptability informed by *inter alia* the Public Participation Process.

Furthermore, the Level of Acceptability criterion, if considered properly in its formulation, also allows for the findings from undertaking a need and desirability to be brought into the impact and risk assessment process, e.g., the answers to the questions in the Need and Desirability Guideline document should be used to inform the Level of Acceptability for applicable impacts.

Value Judgement

Significance, being an anthropocentric concept, is a value judgement, dependant on the nature of the impact expressed in terms of both biophysical and socio-economic values (**Impact Magnitude**), and its acceptability to affected communities (**Impact Importance**).

Considering value judgements can vary greatly amongst different stakeholders, professional judgement, such as that of the EAP, shall be used in conjunction with the different value judgements expressed by various stakeholders. In other words, significance shall 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, thresholds of significance were as far as possible based on / determined by reference to legal requirements, accepted scientific standards or social acceptability (**Table 21**).

Significance is relative and must always be set in a context to show whose values they represent. The selected criterion, “Level of Acceptability,” provides such a context, taking all three forms of recognition into account by asking whether impacts are legally, publicly, and professionally recognized as important.

Natural environmental, socio-economic, and cultural heritage impacts were identified systematically by considering how the activities to be undertaken during the development phase will interact with all elements of the receiving environment, as well as inputs received from I&APs and specialists.

Once identified, natural environmental, socio-economic, and cultural heritage impacts were then assessed using the approach outlined below. All impacts, including those identified by I&APs and Specialists, are measured against the current land-use activity (the no-go option / option of not implementing the activity) and assessed by ranking a suite of generic criteria. The criteria, as well as the descriptors that are used to assign specific rankings for each criterion, provide a consistent and systematic basis for the comparison and application of judgements. Consequently, this methodology has been distributed to the specialists to avoid inconsistency between the EAP and specialists when determining impact significance.

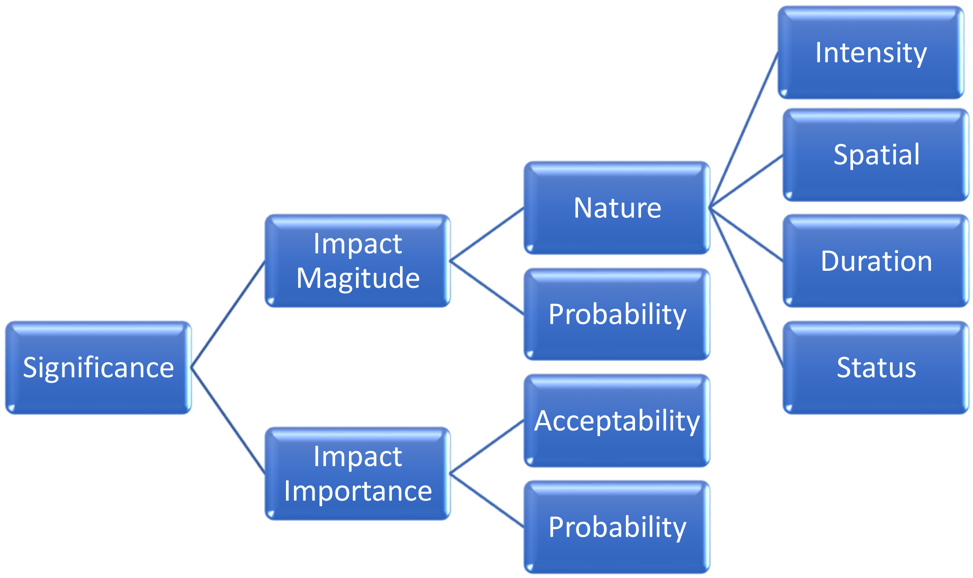
Methodology

The methodology comprises two phases: (1) Phase 1 involves an assessment of significance without mitigation, and (2) Phase 2 involves an assessment with mitigation. If the outcome of a Phase 1 assessment is not significant, then the impact(s) are omitted from further assessment. However, if either or both Impact Magnitude and Impact Importance are significant, then the impact needs to proceed to the Phase 2 assessment. During Phase 2 either or both Significance ranks (Impact Magnitude and/or Impact Importance) are considered together with the following three criteria to determine whether a phase 1-

assessment should be repeated with mitigation or whether the proposed activity needs to be refused or redesigned: Reversibility, Irreplaceable Loss of Resources, and Mitigatory Potential.

Important Note: Non-significant impacts are omitted from further assessment, that is no phase 2-assessment. There is one exception, that is impacts with a positive **Status**. Impacts with a positive status are assessed according to their mitigatory potential to identify further opportunities for enhancing positive effects.

(1) Phase 1-Assessment without mitigation



Impact Magnitude and Impact Importance ratings are predicted as described below. However, the outcomes of the phase 1-assessment (rankings) should still be verified within the context of the descriptors described in **Table 18**.

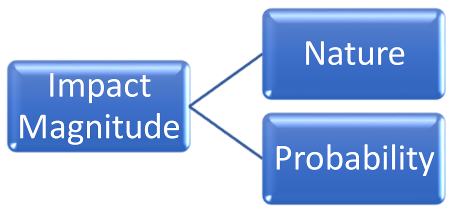
Table 18. Significance Criterion (Impact Magnitude and Impact Importance Rating).

Ranks	Description
High	• Of a substantial or the highest order possible within the bounds of impacts that could occur. • In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or some combination of these. • Social, cultural, and economic activities of communities are disrupted to such an extent that these come to a halt.
Medium	• Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. • In the case of adverse impacts, mitigation is both feasible and easily possible. • Social, cultural, and economic activities of communities are changed, but can be continued (albeit in a different form). • Modification of the project design or alternative action may be required.

	• In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost and effort.
Low	ro impact or impact is of a low order and therefore likely to have little real effect. the case of adverse impacts, mitigation is either easily achieved or little will be required, both. cial, cultural, and economic activities of communities can continue unchanged. the case of beneficial impacts, alternative means of achieving this benefit are likely to easier, cheaper, more effective and less time-consuming.

(a) **Impact Magnitude (Significance)**

Impact Magnitude is a composite score that is made up of the following two criteria: (1) Nature (composite score), and (2) Probability, likelihood of occurrence or degree of certainty.



The possible composite scores for Impact Magnitude are:

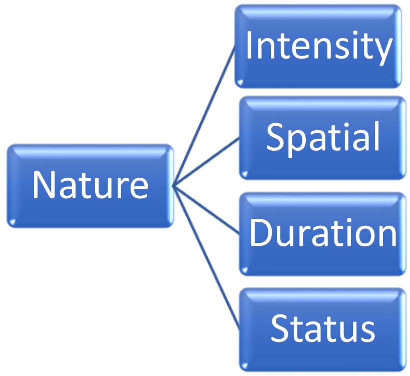
IMPACT MAGNITUDE		**Probability**		
		High	**Medium**	**Low**
Nature	**High**	±1	±1	±0
	Medium	±1	±1	±0
	Low	±0	±0	±0

Assumption: If the Nature and/or Probability is low, then Impact Magnitude is non-significant.

Significant	±1	Non-significant	±0

i. **Nature**

Nature is a composite score that is made up of the following four criteria: (1) Intensity or severity, (2) Geographic extent or spatial scale, (3) Duration and frequency, and (4) Status (positive/beneficial, negative/adverse, or neutral).



The possible composite scores for Nature are:

Nature		Intensity		
		High	**Medium**	**Low**
Spatial and Duration	**High**	±1	±1	±1
	Medium	±1	±1	±1
	Low	±1	±1	±0

Assumption: if any one of the criteria are Medium or High, then Nature is significant.

Significant	±1	Non-significant	±0

Table 19. Criteria used in evaluating Impact Magnitude (Significance).

Criteria	Ranks and Descriptors		
	Low	**Medium**	**High**
Intensity or Severity	• No disturbance or the disturbance of degraded areas, which have little conservation value. • Zero to a minor change in species occurrence or variety. • Natural function and processes are not affected, or if affected, then not modified. • Social, cultural, and economic activities of communities can continue unchanged, or they are changed, but can be continued (albeit in a different form) without stakeholder consultation.	• Disturbance of areas that have potential conservation value or are of use as resources. • Moderate change in species occurrence and variety. • Modified processes will continue. • Social, cultural, and economic activities of communities are changed, but can be continued (albeit in a different form) with stakeholder consultation.	• Disturbance of pristine areas that have important conservation value. • Complete change in species occurrence and variety/Destruction of rare or endangered species. • Functioning of processes will cease. • Social, cultural, and economic activities of communities are disrupted to such an extent that these come to a halt. • Sensitive environmental receptors with a low capacity (tolerance) to accommodate the change.
Geographical extent or special scale (the boundaries at local and regional extents will be different for biophysical and social impacts)	• Within site boundary. • Distribution within a population. • Within one property.	• Beyond site boundary. • Distribution across populations • Traverses several properties. • Local area.	• Widespread. • Far beyond site boundary. • Distribution across ecosystems • Crosses municipal or provincial boundaries. • Regional, national international scale.
Duration and frequency (Long term (High),	• Immediate, once-off • Temporary - quickly reversible. • Less than the project lifespan.	• Delayed, intermittent • Temporary - reversible over time. • Lifespan of the project.	• Continuous • Permanent.

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Medium term (Medium), Short term (Low))	• 0 to 5 years (or for rehabilitation <1yr, restricted to a season).	• 5 to 15 years (or for rehabilitation >1yr, extending into other season cycles).	• Beyond closure or decommissioning. • More than 15 years (or for rehabilitation >2yr, extending into multiple season cycles).
Status (-ve (High), neutral (Medium), +ve (Low))	• Beneficial effects • Net gain of resources	• Neutral • Indifferent • No net loss or gain	• Adverse effects • Costs • Net loss of resources
Probability (Definite (High), Probable (Medium), Improbable (Low))	• The impact will not occur, or it is highly unlikely that the impact will occur. • Limited useful information on and understanding of the environmental factors potentially influencing this impact (uncertainty) or a high degree of certainty that it will not occur. • Low probability or negligible - less than 1:20 chance of occurrence *(P<0.05)* of an impact occurring.	• There is a chance/risk of the impact occurring. • Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. • Moderate probability (5-95%) of a particular fact or the likelihood of an impact occurring.	• Impact will occur regardless of prevention measures. Substantial supportive data exist to verify the assessment. • Wealth of information on and sound understanding of the environmental factors potentially influencing the impact. • Definite or high probability (>95%) of a particular fact or the likelihood of an impact occurring.

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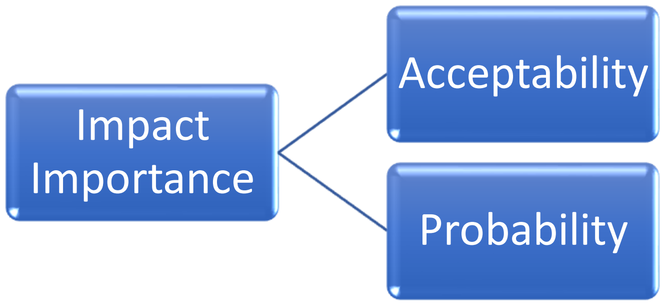
ii. Impact Importance (Significance)

Impact Importance is a composite score that is made up of the following two criteria: (1) Level of acceptability/consequence, and (2) Probability, likelihood of occurrence or degree of certainty.



The possible composite scores for Impact Importance are:

IMPACT IMPORTANCE		Probability		
		High	**Medium**	**Low**
Level of Acceptability	**High**	±1	±1	±0
	Medium	±1	±1	±0
	Low	±0	±0	±0

Assumption: If the Level of Acceptability and/or Probability is low, then Impact Importance is non-significant.

Significant	±1	Non-significant	±0

Table 20. Probability Criterion used in evaluating Impact Importance.

Ranks	Description
High (H) Definite	• Wealth of information on and sound understanding of the level of acceptability. • High degree of certainty. Definite or high probability (>95%) of a particular fact or the likelihood of a level of acceptability.
Medium (M) Probable	• Reasonable amount of useful information on and relatively sound understanding of the level of acceptability. • Moderate degree of certainty or probability (5-95%) of a particular fact or the likelihood of a level of acceptability.
Low (L) Improbable	• Limited useful information on and understanding of the level of acceptability. • Low degree of certainty or probability or negligible - less than 1:20 chance *(P<0.05)* for a level of acceptability.

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Table 21. Level of Acceptability Criterion used in evaluating Impact Importance.

Ranks	Description Source of information: Quantitative thresholds (legal requirements, scientific standards, international standards), qualitative thresholds (social acceptability expressed during PPP), Need & Desirability, Specialist Assessments

High (Unacceptable)	Consequence of impact or risk:
	• Need & Desirability results relating to this impact or risk, and within the context of a specific aspect of the environment, indicate that it is **unnecessary and/or undesirable**.
	• Environmental quality standards (e.g., GA for S21(f) with wastewater discharge limit values), thresholds (e.g., in listing notices) and targets (e.g., for biodiversity, species and ecological processes that CBAs are required to meet) **will be exceeded**.
	• Normative thresholds of impacts or resource use that are clearly established by social norms, usually at the local or regional level and often tied to social or economic concerns.
	• Non-compliance
	ENVIRONMENT
	• Extinction of biological species, loss of genetic diversity, rare or endangered species, critical (CR, EN) habitat.
	• Critically Endangered Species
	  ○ lead to a long-term decrease in the size of a population,
	  ○ reduce the area of occupancy of the species,
	  ○ fragment an existing population into two or more populations,
	  ○ adversely affect habitat critical to the survival of a species, or
	  ○ disrupt the breeding cycle of a population.
	• Critically Endangered Ecological Communities
	  ○ lead to a long-term adverse effect on an ecological community,
	  ○ reduce the extent of a community,
	  ○ fragment an occurrence of the community, or
	  ○ adversely affect habitat critical to the survival of an ecological community.
	• Listed Migratory Species
	  ○ substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species,

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	○ result in invasive species that is harmful to the migratory species becoming established in an area of important habitat of the migratory species, or ○ seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population. • Disruption of food webs. • Discharges or release of persistent and/or toxic chemicals, microbiological agents, nutrients (nitrogen, phosphorous), radiation or thermal energy (e.g., cooling wastewater). SOCIO-ECONOMIC • Appropriate and justifiable social and economic outcomes, including meeting basic needs and equity, **cannot be achieved, <u>and</u> will be exacerbated,** e.g., increase in unemployment or shrinkage in the economy. • Social **outrage <u>and/or</u> widespread condemnation** expressed during PPP. • Negative effects on human health, well-being or quality of life, e.g., reduction of the quality or quantity of recreational opportunities or amenities or detrimental change in the current use of lands and resources for traditional purposes by aboriginal persons. • Negative effects on cultural, heritage (incl. architectural), archaeological, or palaeontological resources. <u>Required action:</u> • Abandon project in part or in its entirety. • Redesign project to remove or avoid impact or risk.
Medium (Manageable)	<u>Consequence of impact or risk:</u> • Need & Desirability results relating to this impact or risk, and within the context of a specific aspect of the environment, indicate that it is **unnecessary or undesirable, but is manageable to the extent that it is neutral**. • Conflict with policies or land-use plans. • Environmental quality standards (e.g., GA for S21(f) with wastewater limit values), thresholds (e.g., in listing notices) and targets (e.g., biodiversity, species and ecological processes that CBAs are required to meet) **may be exceeded**. • Controversial thresholds of impacts or resource use that are highly controversial, or which are sources of conflict between various individuals, groups or organizations. ENVIRONMENT • **Threat** of extinction of biological species, loss of genetic diversity, rare or endangered species, critical habitat. • **Threat** of disruption of food webs. • Some loss of threatened (VU) habitat. • Loss of populations of or damage to commercial biological species.

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	• Spread of biological disease, pests, feral animals or weeds can be avoided with mitigation. • **Threat** of discharges or release of persistent and/or toxic chemicals, microbiological agents, nutrients (nitrogen, phosphorous), radiation or thermal energy (e.g., cooling wastewater). SOCIO-ECONOMIC • Appropriate and justifiable social and economic outcomes, including meeting basic needs and equity, **may be achieved**. • **Legitimate** concerns expressed by individuals or groups during the PPP **are manageable to the satisfaction of those concerned**. • Increases level of risk on human health, well-being or quality of life, e.g., potential reduction of the quality or quantity of recreational opportunities or amenities, or for detrimental change in the current use of lands and resources for traditional purposes by aboriginal persons. • **Threat** of negative effects on cultural, heritage (incl. architectural), archaeological, or palaeontological resources. <u>Required action:</u> • Implement regulatory and/or management controls (with the project proponent's commitments). • Adequate compensation must be given to affected communities.
Low (Acceptable)	<u>Consequence of impact or risk:</u> • Need & Desirability results relating to this impact or risk, and within the context of a specific aspect of the environment, indicate that it is **needed and desirable, or neutral.** • Environmental quality standards (e.g., GA for S21(f) with wastewater discharge limit values), thresholds (e.g., in listing notices) and targets (e.g., biodiversity, species and ecological processes that CBAs are required to meet) **will not be exceeded**. • Preference thresholds of impacts or resource use that are preferences for individuals, groups, or organizations only, as distinct from society at large. • Compliance ENVIRONMENT • **No** extinction of biological species, loss of genetic diversity, rare or endangered species, critical habitat. • **No** disruption of food webs. • Some loss of populations and habitats of non-threatened species. • Modification of landscape without downgrading special aesthetic values. • Emissions demonstrably less than the carrying capacity of the receiving environment. • **Zero** discharges or release of persistent and/or toxic chemicals, microbiological agents, nutrients (nitrogen, phosphorous), radiation or thermal energy (e.g., cooling wastewater).

	SCIO-ECONOMIC • Appropriate and justifiable social and economic outcomes, including meeting basic needs and equity, **will be achieved or at least remain unaffected**. • Project is **welcomed by I&APs, <u>or</u> they are indifferent**. • Zero risk or positive effects on human health, well-being, or quality of life, e.g., improvement of the quality or increase in the quantity of recreational opportunities or amenities. • Zero or positive effects on cultural, heritage (incl. architectural), archaeological, or palaeontological resources. • Positive, beneficial, or neutral, that is no risk of harm to the biophysical, economical, or social (incl. cultural heritage and public health) environments. <u>Required action:</u> • Enhance beneficial impacts or risks.

(2) Phase 2-Assessment with mitigation

Once an impact has been identified, predicted, and evaluated to determine significance, the EIA Regulations, 2014 as amended, further require one to determine the degree to which these impacts (1) can be reversed, (2) may cause irreplaceable loss of resources, and (3) can be avoided, managed, or mitigated.

The fact these requirements are written as a separate provision in the EIA Regulations implies that they are not considered as part of the evaluation of significance but are rather to be considered afterwards.

Furthermore, the fact that the EIA Regulations require “the degree” to be determined also implies that rankings must be assigned to each of these considerations.

Reversibility, irreplaceability and mitigatory potential, when considered together with the outcome of the outcome of the Phase 1 assessment, will decide on whether the activity responsible for an impact should be refused or can be entertained further by re-assessing the impact with mitigation to confirm whether the activity may proceed.

So, during Phase 2 either or both Significance ranks (Impact Magnitude and/or Impact Importance) are considered together with the following three criteria; Reversibility (**Table 22**), Irreplaceable Loss of Resources (**Table 23**), and Mitigatory Potential (**Table 24**), to determine whether (1) a phase 1-assessment should be repeated with mitigation, or (2) the proposed activity needs to be refused or redesigned.

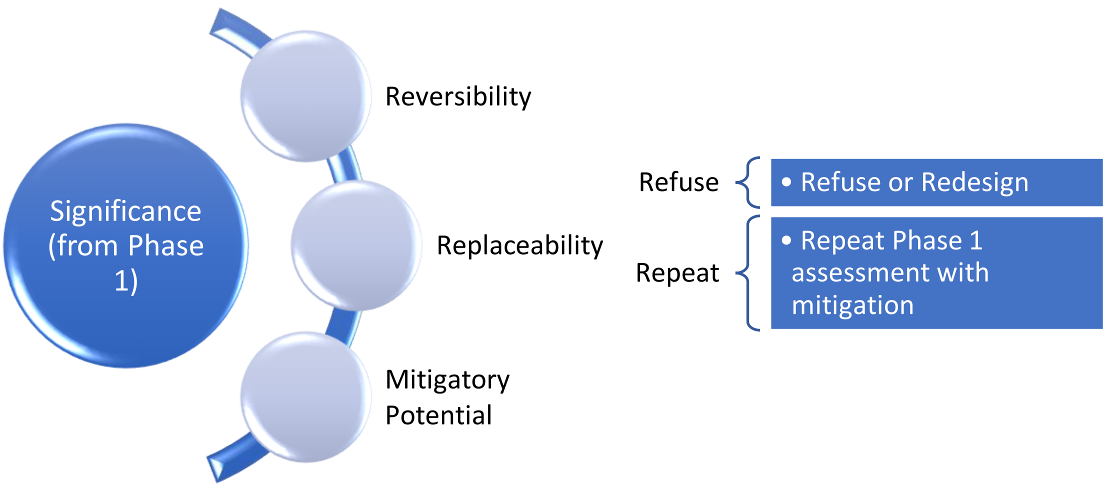

Table 22. Reversibility Criterion.

Ranks	Description
No to low degree	• If functional thresholds established for resource use are exceeded, the impacts will disrupt the functioning of an ecosystem sufficiently to destroy resources important to the nation or biosphere irreversibly and/or irretrievably. • Impacts are irreversible and/or the costs of human intervention are unaffordable.
Moderate degree	• Impacts are reversible with moderate to high (but affordable) human intervention.

High degree	• Impacts are naturally reversible, e.g., do not require any or only little human intervention.

Table 23. Irreplaceability Criterion.

Ranks	Description
Low degree to irreplaceable	• If functional thresholds established for resource use are exceeded, the impacts will disrupt the functioning of an ecosystem sufficiently to destroy resources important to the nation or biosphere irreversibly and/or irretrievably.
Moderately replaceable	• Large scale loss of productive capacity of renewable resources. • Moderate scale loss of productive capacity of non-renewable resources.
High degree of replaceability	• Low to moderate loss of productive capacity of renewable resources. • Low scale loss of productive capacity of non-renewable resources.

Table 24. Mitigatory Potential (for negative and positive impacts or risks) Criterion.

Ranks	Description
Low	• Little or no mechanism for mitigation and/or achieving the objectives. • No possible mitigation that could offset the impact or mitigation is difficult, expensive, time-consuming or some combination of these.
Moderate	• Moderate potential (few mechanisms) to mitigate negative impacts, but there remains a risk of the objectives not being met and/or the implementation of mitigation measures may still not prevent some negative effects. • Mitigation is both feasible and possible.
High	• High potential to mitigate negative impacts to the level of insignificant effects and achieve objectives. • Mitigation is either easily achieved or little will be required, or both.

Important Note: provide mitigation objectives that would result in a measurable reduction in the impact or risk (using expertise and/or experience). Mitigations must be realistic, that is reasonable and feasible. Quantifiable standards (performance criteria) for reviewing or tracking the effectiveness of the proposed mitigation action should be provided where appropriate.

Residual Risk

Finally, the level of residual risk after mitigation is determined.

If adequate mitigations are applied, then the residual risk should be at a level of acceptable risk, meaning either the consequences of the impact will be below the quantitative or qualitative thresholds prescribed by legal, scientific, or social acceptability or the magnitude will be low.

If the mitigated risk is not at a level of acceptable risk, then the mitigations are lacking, or if all reasonable mitigations have been exhausted, then the activity responsible for the impact must be refused.

Residual risk also includes the consideration of other factors that could prevent the desired outcomes of the proposed management measures and mitigations.

MOTIVATION FOR NOT CONSIDERING ALTERNATIVE DEVELOPMENT FOOTPRINT

3(1) A EIA report… must include –

(h) a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping, including –

(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

Alternative No. 1: Property (site) and Location (within the site)

Purpose and Requirements

The study area falls within the Nama-Karoo Biome. Considering the Nama-Karoo biome is the second largest Biome in South Africa, after the Savanna Biome (http://pza.sanbi.org/vegetation/nama-karoo-biome), there is plenty of space to investigate alternative properties or sites. However, will all potential sites meet the same purpose and requirements of the proposed activity (**Table11**)?

The Nama-Karoo Biome occurs on the central plateau of the western half of South Africa, including the Northern Cape Province. It has a summer rainfall between 100 and 520 mm an^{-1}, and the dominant vegetation is a grassy, dwarf shrubland (http://pza.sanbi.org/vegetation/nama-karoo-biome). Consequently, the requirements for (1) at least 4 hours of peak sunlight, (2) a low annual rainfall, (3) flat, clear land, (4) considerable space, and (5) pastoral systems can be met throughout the region.

However, not all properties will be in proximity to a 400 kV Eskom powerline, and not all property owners will have an existing lease agreement with the applicant, Soventix South Africa (Pty) Ltd. In other words, the identification and assessment of alternative sites and locations was limited by land ownership, to ensure consent of use for the undeveloped agricultural land within the vicinity of the national grid (and Phase 1).

Eskom Transmission's Hydra-Poseidon Line 1 400 kV powerline and Hydra-Poseidon Line 2 400 kV powerline intersect Mr Willem Retief's south-western most properties, east of the N10 (**Figure 4**).

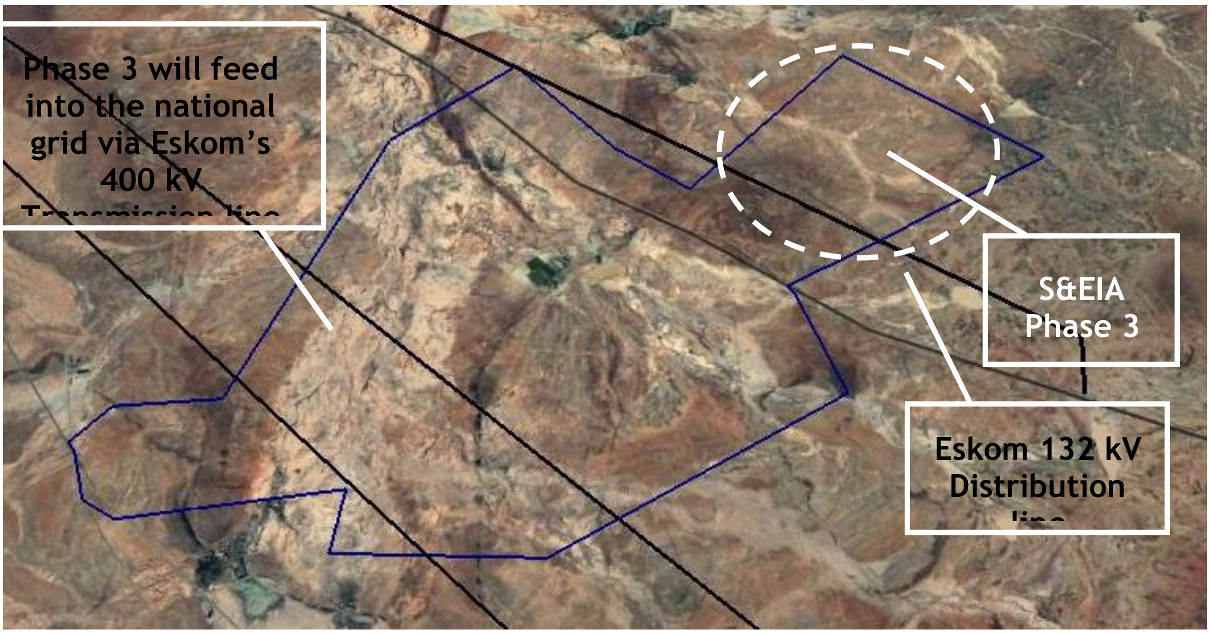

Figure 4: The location of Eskom's Transmission (220 – 765 kV) and Distribution (132 kV) lines (or servitudes) that intersect Mr Willem Retief's properties (contained within the blue boundary), relative to the proposed 400

MW Solar PV facility (Phase 3) on the Remainder and Portion 3 of the Farm Goede Hoop 26C (north-east of Eskom's 132 kV distribution line.

The farmer with whom the applicant has a lease agreement, Mr Willem Retief, owns several properties. These properties were extensively investigated by several specialists (avifauna, ecological, geological, geotechnical, heritage, aquatic and zoological) in 2016/17 when ecoleges undertook a S&EIA for the development of a 225 MW Solar PV facility on the site. Three alternative footprints (PV01, PV02, PV03) were investigated during the assessment process. The central footprint (PV02) was identified as the preferred option because of its lower environmental impact and proximity to an existing 400kV Eskom powerline when compared with PV01 and PV03. The National Department of Environmental Affairs granted an environmental authorisation (DEA Reference: 14/12/16/3/3/2/998) for PV02 on 16th April 2018 (**Phase 1**).

Furthermore, Soventix will be applying for an environmental authorisation to develop an additional 300MW on the PV03 footprint (**Phase 2**) that was considered during the initial S&EIA. It is proposed to connect this second phase to the 400 kV substation that forms part of the authorised facility on PV02.

It turns out, from the specialist assessments that were completed in 2016/17, that most of the properties are environmentally sensitive, leaving only a few isolated pockets of land for further development (**Figure 5**), specifically for **Phase 3**.

Renewable energy systems generally need more space than fossil fuels. One way to compare the different energy systems or resources is to use the concept of power density – the average electrical power produced in one horizontal m^2 of infrastructure. Solar energy yields the highest median power density per renewable energy system (solar, geothermal, wind, hydro, and biomass), but solar and wind power needs around 40-50 times more space than coal. (J. van Zalk & P. Behrens, 2018).

J. van Zalk & P. Behrens (2018). The spatial extent of renewable and non-renewable power generation: A review and meta-analysis of power densities and their application in the U.S., Energy Policy, Volume 123, Pages 83-91, ISSN 0301-4215, https://doi.org/10.1016/j.enpol.2018.08.023. (https://www.sciencedirect.com/science/article/pii/S0301421518305512)

Solar systems require 1,5 ha to generate 1 MW of energy, so the proposed 400 MW solar PV facility for Phase 3 requires an area of 650 ha. Consequently, the only remaining contiguous properties that are large enough for Phase 3 includes the RE and Ptn 3 of the Farm Goede Hoop 26C (**Figure 5**).

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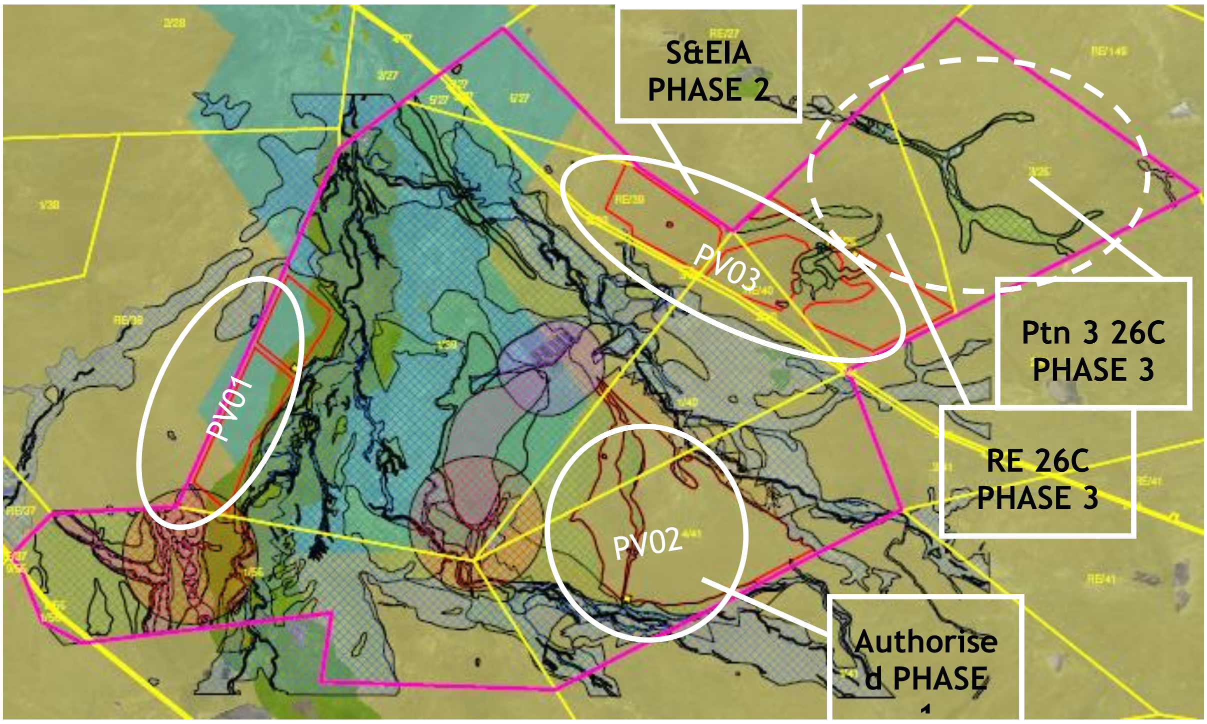

Figure 5: The environmental sensitivity of the landowner's properties (inside the pink boundary) The patterned and coloured areas represents designated "No-Go" zones for development and CBAs, which were identified during the S&EIA process in 2016/17 (Plan number: "Cumulative impact Goedehoop_Solar_Array_v3" prepared by Digital Earth and dated 24/07/2017).

The Remainder of Farm Goede Hoop 26C is 1 502,8325 ha. However, only a fraction of that property is available for Phase 3 because most of it has been set aside for Phase 2 or is ecologically sensitive. Then, Portion 3 of Farm Goede Hoop 26C is 1 015,9683 morgen (SG Diagram). One (1) (South African) morgen = 0.8567 hectare. Therefore, Portion 3 of the Farm Goedehoop 26C is 870,380 ha. Consequently, the combined available surface area of both properties is circa 1 200 ha. Given the proposed 400 MW solar PV facility requires 650 ha, there would theoretically be enough space to consider two alternative locations within the preferred site (The Remainder and Portion 3 of Farm Goede Hoop 26C). However, the area is not homogenous. So, if a person carves out the ecologically sensitive areas that were identified by the specialist(s) during the S&EIA in 2016/17, it becomes clear that there is only space for one location, comprising two adjacent but non-contiguous areas, within the preferred site (**Figure 6**).

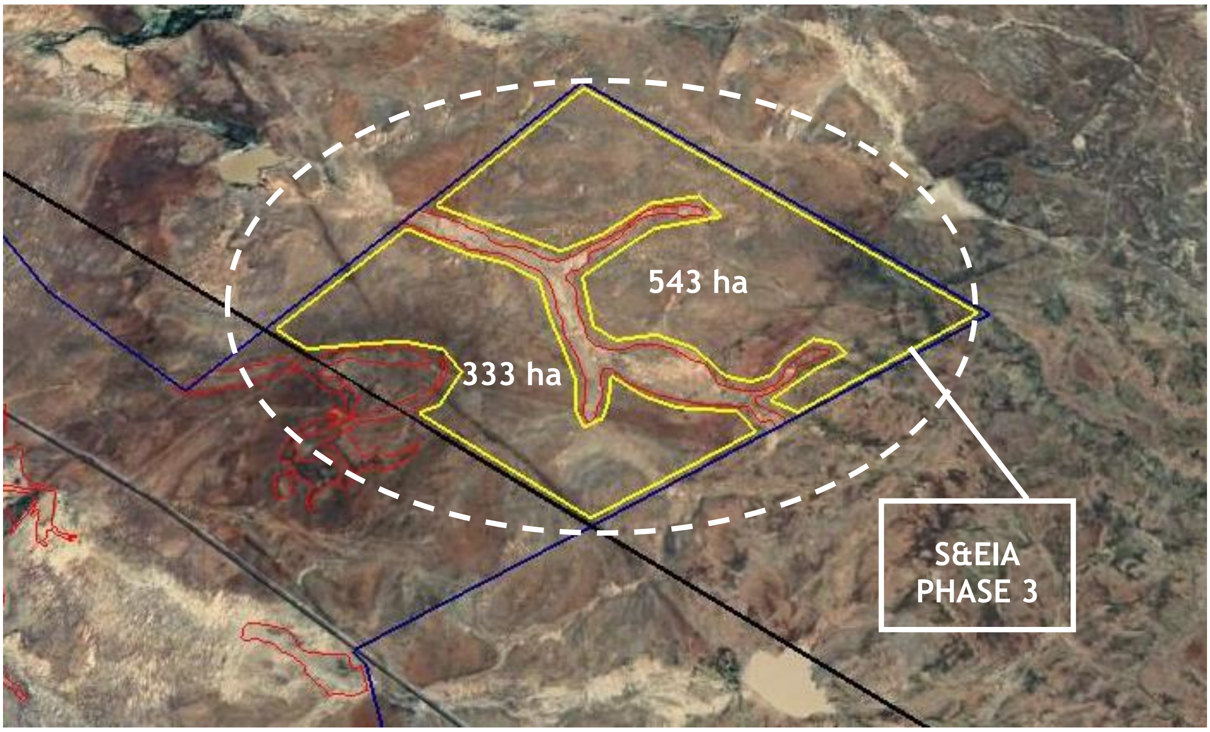

Figure 6: The potentially available surface area (876 ha) for the development of a 650 ha solar PV facility on the Remainder and Portion 3 of the Farm Goede Hoop 26C. The red outlines demarcate ecologically sensitive areas.

- Reasoned explanation why an alternative was not found to be reasonable or feasible

The selection of the least sensitive site & location has the largest mitigating effect on environmental impacts to the receiving environment.

Of all the potential properties owned by Mr Willem Retief, only the two contiguous farms, being the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C, are available for the proposed development of Phase 3 because they contain the only consolidated surface area (outside "No-Go" zones and CBAs) that is big enough to support a 650 ha solar PV facility. However, the available surface area for development is still restrictive (876 ha), limiting the assessment to a single preferred location.

<u>Alternative No. 2: Design and Layout</u>

- Purpose and Requirements

Alternative solar PV plant designs and layouts within the preferred site and location can realistically meet the general purpose and requirements for a solar PV facility. The design and layout parameters of the solar facility are governed by several factors including but not limited to the orientation of the facility, within the preferred site and location, to ensure a predominantly northern orientation, in order to optimise the absorption of, and reduce the reflection of, incoming solar radiation (insolation). Additionally, the layout will be affected by the presence of existing services (servitudes), farm boundaries, building setback lines, access points and routes, possible visual impacts, and ecological buffers from sensitive environmental receptors.

Consequently, and particularly given the modular arrangement of Solar PV facilities, it is far more efficient and effective to identify sensitive environmental attributes and eliminate them from the preferred location to inform the best practicable environmental design/layout (or preferred development footprint) rather than assess different spatial configurations at the onset of the Scoping Phase.

The preferred layout will therefore not be determined by an assessment of alternative configurations, but will instead, be the product of a holistic and multi-disciplinary investigation involving various online spatial planning tools including but not limited to the National web-based environmental screening tool (https://screening.environment.gov.za/screeningtool/), SANBI BGIS platform (http://bgis.sanbi.org/MapViewer), SA Protected Areas and Conservation database (https://egis.environment.gov.za), the Surveyor-General Property Search platform (https://csggis.drdlr.gov.za/psv/), and independent Geographic Information System (GIS) analyses, as well as the site-specific findings and recommendations of all the specialist assessments.

The high-level sensitivities generated for the relevant environmental themes by the Screening Tool were verified on-site as part of the mandatory Site Sensitivity Verification (SSV) Process and Report required in terms of GN No. 320, 20 March 2020 and GN No. 1195, 30 October 2020. The SSV report was provided to the specialists identified in terms of the Screening Report, as part of their Terms of Reference (ToR) to inform the scope of their assessments. The extent of the verified levels of sensitivity from each specialist will then be used in the impact and risk assessment process, inclusive of cumulative impacts, to ultimately identify and motivate the preferred layout alternative.

- Reasoned explanation why an alternative was not found to be reasonable or feasible

Design elements contribute to the power generational efficiency and therefore financial feasibility of the proposed development. Consequently, alternative design elements, such as alternative mounting systems, choice of solar PV modules (or panels), and solar tracking versus fixed modules, were taken into consideration by the applicant, Soventix (Pty) Ltd, using their in-house expertise to determine the most optimal solar PV plant design for the preferred site.

Driven piles as opposed to ballast foundations are preferred but will be determined by the geological conditions of the site. Although tracking systems incur an increased maintenance cost to fixed systems, they increase the performance of the modules compared with a fixed configuration. This improvement is mainly experienced early and late in the day and caters for more of the morning and evening electricity usage peaks. Bifacial Mono Perc solar panels produce power from both sides of the panels, further increasing total energy generation.

Soventix (Pty) Ltd.'s investigation determined that the optimal solar PV plant design for this site should include a single-axis tracker together with Bifacial Mono Perc solar panels, supported on piles rammed into the ground. Consequently, the assessment of alternative designs need not be repeated here.

Furthermore, the preferred layout will not be determined by an assessment of potentially flawed alternative configurations, but will instead, be the product of a holistic and multi-disciplinary investigation, involving various online spatial planning tools and the site-specific findings and recommendations of all the specialist assessments. The aim of the investigation is to identify and eliminate sensitive environmental attributes from the preferred location, and in so doing arrive at the preferred development footprint (or layout).

Alternative No. 3: Type of Activity

- Reasoned explanation why an alternative was not found to be reasonable or feasible

No alternative activity exists within the South African context that is an ongoing energy crisis combined with political commitments to reduce greenhouse gas emissions under the United Nations Framework Convention on Climate Change and its Paris Agreement.

South Africa's electricity infrastructure has been degrading in the past decades, with both scheduled and unscheduled power outages on the increase. Simply put, South Africa cannot make enough electricity to supply its people and economy.

Apart from load shedding, creating an awareness of and implementing power saving initiatives to reduce demand, no alternative exists other than "to rapidly expand our energy generation capacity" (President Cyril Ramaphosa: 2021 State of the Nation Address, 2021 https://www.gov.za/speeches/president-cyril-ramaphosa-2021-state-nation-address-11-feb-2021-0000)

However, most (80%) of our electricity is made by burning coal; Eskom is the country's largest greenhouse gas emitter. Climate change poses a threat to our environmental health, socioeconomic development, and economic growth. So, if South Africa is to transition into a low-carbon economy and climate resilient society, expansion of our energy generation capacity must comprise alternative renewable energy sources, such as solar.

Alternative No. 4: Technology

- Purpose and Requirements

An example of an alternative technology for generating electric power from the sun is Concentrating Solar Power or CSP. Photovoltaic (PV) systems convert sunlight directly to electricity by means of PV cells made of semiconductor materials, whereas CSP systems concentrate the sun's energy using reflective devices such as troughs or mirror panels to produce heat that is then used to generate electricity.

Apart from one exception, CSP can meet the same purpose and requirements as Solar PV (**Table 7**). In fact, current CSP plants can store thermal energy for up to 16 hours, which means that their production profile can match the demand profile (just like a conventional power plant), delivering greater grid stability than PV. PV is not dispatchable, as a feasible commercial energy storage system does not yet exist (https://www.renewableenergyworld.com/storage/how-solar-pv-is-winning-over-csp/#gref and https://www.solarfeeds.com/mag/csp-and-pv-differences-comparison/).

The abovementioned exception refers to the availability of adequate water during operation.

Solar abundance and water constraints converge in arid and semi-arid regions, like the Nama-Karoo. In these regions, water supply is an issue for locating any thermoelectric power plant, not only CSP. In all thermoelectric power plants, whether fossil (coal), nuclear, or CSP, heat is used to boil water into steam, which spins a steam turbine to generate electricity. The exhaust steam from the generator must be cooled prior to being heated again and turned back into steam.

The steam turbines at CSP facilities are generally cooled using water, in a process known as wet cooling. Most of the water is consumed in the cooling process; this cooling water flows to an evaporative cooling tower that dissipates the collected heat energy to the environment as clouds of water vapor.

Admittedly, the choice of cooling technology largely determines how much water is actually consumed at a CSP facility; this cooling can be done with water (wet cooling) or air (dry cooling), or a combination of both (hybrid cooling). Wet cooling of thermal power plants means warmer water is sent out into natural watercourses, whereas with dry cooling air is used as the cooling medium and expelled at a higher temperature than the ambient temperature. Generally, dry cooling using air is less efficient, produces less electric energy and increases the production costs, but the extent will depend on *inter alia* a location's maximum daytime temperatures, the technology employed (e.g., trough versus tower technology) and mitigating factors. Water cooling is the most efficient, but CSP facilities using wet cooling can consume more water per unit of electricity generated than traditional fossil fuel facilities with wet cooling.

In summary, CSP plants using parabolic trough or power tower technologies must use some form of cooling. CSP facilities using wet cooling technology require access to water whereas Solar PV facilities do not require water for cooling.

Apart from those CSP facilities which use wet cooling technology, the other main operational water requirements for both CSP and PV facilities relate to panel/mirror washing, and potable supply for the workforce.

High soiling rates occur in arid regions due to the combination of low precipitation and dusty conditions. In general, dust accumulation on the CSP mirrors results in the light being scattered and absorbed leading to a reduction in reflectance. Dust also reduces performance in PV plants by reducing the solar irradiance that the modules receive. For this reason, regular cleaning of the CSP mirror surfaces and PV module surfaces is required, which needs a considerable amount of water making soiling an important factor for the overall water consumption of these plants. Although CSP mirror and PV module wet cleaning solutions require a similar amount of water, the reflective surface of CSP mirrors typically need to be cleaned more frequently than a PV module surface because its performance is more sensitive to soiling (Haack & Schlecht, 2019). In other words, while a small amount of dust may slightly hinder the performance of a PV plant, the same amount of dust can greatly affect the performance of a CSP plant. Given the greater 'robustness' of Solar PV panels, a further reduction in the total water consumption is possible if dry cleaning is applied to the PV system (pers. comm JP De Villiers, Managing Director, Soventix).

Reference: L. Haack & M. Schlecht. Water saving potential of CSP-PV hybrid plants. AIP Conference Proceedings 2126, 220003 (2019); https://doi.org/10.1063/1.5117762 Published Online: 26 July 2019

- Reasoned explanation why an alternative was not found to be reasonable or feasible

The applicant is Soventix South Africa (Pty) Ltd, a subsidiary of Soventix GmbH in Germany, which specialises in the design (engineering), procurement of components and construction of solar PV systems up to large-scale solar facilities (www.soventix.co.za). As such, it is unreasonable to expect the applicant to employ an alternative technology that is outside their field of expertise. Furthermore, the proposed development of a 400 MW Solar PV facility (Phase 3) is effectively the expansion of an already authorised 300 MW Solar PV facility in the same area (DEA Reference: 14/12/16/3/3/2/998, dated 16th April 2018). Considering the cost of building a 400 kV substation (circa R750 mil.) to tie the authorised facility into the national (Eskom) grid, Phases 2 and 3 are necessary to make the entire project financially feasible (pers. comm. JP De Villiers, Managing Director, Soventix).

Notwithstanding the aforesaid, water resource constraints within the Nama-Karoo prompt the adoption of more freshwater-efficient technologies or decisions not to site CSP facilities. It is sufficient to surmise that a CSP using wet cooling technology would require significantly more water during operation for cooling and maintenance (washing mirrors) compared with a Solar PV facility, increasing the potential for depleting limited groundwater resources within the region.

Note: Given the number of environmental and technological variables within the CSP space, and therefore outcomes, it is unreasonable to expect an investigation of all potential combinations to make a meaningful comparison of water consumption with the proposed preferred Solar PV facility, the subject of which would be sufficient for a thesis. Another aspect worth researching is the "heat island effect" of CSP versus PV.

Alternative No. 5: No-go Option

The option of not implementing the activity is used as the benchmark against which all impacts associated with the proposed development were assessed. In this case, the no-go option would be to not rezone and develop Phase 3 to operate as an "Agrivoltaic" system (the simultaneous use of land for both solar photovoltaic power generation and agriculture) and retain the land use for grazing sheep only.

Conclusion

No alternatives other than the no-go option were identified for further assessment.

Other criteria that will be considered during the comparative assessment to determine which potentially reasonable and feasible alternative is the Best Practicable Environmental Option, include need and desirability, opportunity costs, the need to avoid negative impact altogether, the need to minimise unavoidable negative impacts, the need to maximise benefits, and the need for equitable distributional consequences. The (development) alternatives must be socially, environmentally, and economically sustainable. They must also aim to address the key significant impacts of the proposed development by maximizing benefits and avoiding or minimising the negative impacts.

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CONCLUDING STATEMENT

3(1) A EIA report… must include –

(h) a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping, including –

(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended.

The preferred alternative site is located on the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C. The approximate centre of the development footprint is S30° 49' 58.997" and E24° 21' 40.584". Solar PV facilities have a specific suite of requirements limiting site alternatives. The location of this application is further constrained by the fact that it is the third phase of a larger (I GW) development, and therefore needs to be within close proximity to the authorised (Phase 1) development, and specifically the Main Transmission Substation where the electricity will tie into the national grid.

Of all the potential properties owned by Mr Willem Retief, only the two contiguous farms, being the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C, are available for the proposed development of Phase 3 because they contain the only consolidated surface area (outside "No-Go" zones and CBAs) that is big enough to support a 650 ha solar PV facility.

As such, the preferred layout was not determined by an assessment of potential alternative configurations, but was instead, the product of a holistic and multi-disciplinary investigation, involving various online spatial planning tools and the site-specific findings and recommendations of all the specialist assessments. The aim of the environmental impact assessment has been to identify and eliminate sensitive environmental attributes from the preferred site and location, and in so doing arrive at the preferred development footprint (or layout).

The visual recommendations from the EIA phase reporting were all incorporated into the layout design, accommodating a wide buffer on the adjacent properties, as well as accommodating wide ecological corridors and other "no-go" areas. While the local sense of place will be modified, the impacted visual resources are localised to some degree and are not highly significant such that a No-go Option would be preferred.

An impact and risk assessment of the preferred alternative relative to the no-go option (extensive livestock grazing only) was undertaken (**Appendix D**).

Taking into consideration the findings of the Environmental Impact Assessment, the recommendations of the specialists and based on the national and provincial and local policies in terms of renewable energy and socio-economic development, it is the opinion of the EAP that:

- the overall positive impacts of the proposed project would outweigh negative impacts identified during the S&EIR process;
- the significance of any residual impacts can be reduced to low through the implementation of the proposed mitigation measures and monitoring actions, which will effectively avoid or mitigate direct or indirect impact on biological, social, economic, heritage and cultural aspects of the proposed site;
- it is unlikely that any significant residual impacts will remain after mitigation;

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- with the implementation of the proposed mitigation measures and monitoring actions, the proposed project will result in minimal direct loss of significant species and/or habitat, and no significant loss of ecosystem function.

Provided that the recommended mitigation measures and EMPr are applied effectively, it is therefore recommended that the project receive an Environmental Authorisation in terms of the 2014 EIA Regulations (as amended on 7 April 2017) promulgated under the National Environmental Management Act (NEMA).

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SECTION I: DESCRIPTION OF PROCESS TO IDENTIFY, ASSESS AND RANK IMPACTS THROUGH THE LIFE OF THE ACTIVITY.

3(1) A EIA report… must include –

(h) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including-

(i) a description of all environmental issues and risks that were identified during the environmental impact assessment: and

(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures:

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended.

Please refer to the Impact Assessment in **Appendix D.**

Environmental Issues and Risks

Aquatic

- Loss of riparian systems and disturbance of the alluvial water courses
- Areas cleared or disturbed around site might be affected by erosion of topsoil
- Disturbing topsoil might result in increased turbidity, as well as siltation in watercourses
- Alien invasive plants: Prevent the cleared areas from degrading, as invasive non-native plants will spread into degraded areas
- Altered surface water flow patterns, e.g., changing sheet flow (natural open system) to concentrated flows leads to erosion
- Inadequate storm water management and soil stabilisation measures might result in increased suspended solids
- Road crossings interfering with surface- or sub-surface flows
- Removal of vegetation and disturbing topsoil by laying underground pipelines at watercourse crossings
- Chemical pollution of the water resources

Terrestrial Biodiversity

- Clearing of vegetation.
- Disturbance/loss of faunal species especially reptiles and other vulnerable species during vegetation clearing and other construction activities.
- Damage to sensitive environmental areas by machinery and staff.

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- Fauna may fall in exposed holes and become trapped.
- Fencing can cause death/injury to fauna particularly tortoises.
- Impacts on Ecological Support Areas (ESAs) and general ecological processes within the site.
- Collision of traffic with fauna crossing roads etc.
- Animals could gain access to waste receptacles.
- Roadkill, electrocutions of fauna during construction and post-construction.
- Disturbance can favour the recruitment of pioneer species and alien invasive plants, threatening habitats and alter the composition, structure and functioning of ecosystems.
- Cumulative habitat loss, the ability to meet conservation targets and impact on broad-scale ecological processes.
- Direct loss of terrestrial plants from the development footprint.
- Construction activities could result in increased soil erosion due to vegetation clearing.
- Revegetation may not be sufficient to bind and protect the topsoil from erosion.

Grazing Potential

- Reduced grazing carrying capacity and loss in agricultural potential or production
- Landscape degradation from under grazing
- Landscape degradation from overgrazing
- Erosion and desertification

Soil

- Potential enhanced soil erosion
- The clayey soils and most noticeably the Swartland and Valsrivier soils may restrict vehicle movement during the wet season
- Sedimentation of a watercourse
- Overgrazing negatively impacts on veld condition
- The shallow soils may present a challenge for some construction items like poles that need to be planted. The Swartland and Valsrivier soils may also have an influence on any foundations

Geotechnical

- The usage of poor-quality aggregate is unsafe and will increase the costs of maintenance.
- Poor foundation conditions or ineffective support will cause the solar panel structures to overturn.
- Access roads crossing a drainage channel will be subject to submerged conditions from time to time.
- Fly rock from blasting.

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- Noise and dust generation.

Cultural Heritage

- Disturbance to or destruction of Stone Age open-air surface scatters
- Disturbance to or destruction of Stone Cairns indicating an old Wagon Road
- Damage to previously unknown or invisible sites, features or material heritage artifacts/gravesites

Hydrology

- Potential run-off and stormwater discharge from the site into the surrounding causing soil erosion and sedimentation
- Disturbance, including pollution, of vadose zone during excavations activities, contractor laydown areas.
- Hydrocarbon (fuel or oil) spills will contaminate the soil, surface water run-off and possibly seepage.
- Alteration of natural drainage lines may lead to ponding or increased runoff.

Geo-Hydrology

- Leakages from construction and contractor vehicles accessing the site may cause soil pollution.
- Dewatering of the aquifer via groundwater boreholes (only if overproduced).
- Sedimentation runoff from areas where no stormwater management measures are implemented; or where vegetation is not maintained.
- Scaling in piping or on solar panels if borehole water is applied and left to evaporate (high salt content).

Palaeontology

- Earthmoving activities could damage or destroy artefacts.
- The loss of a heritage resources undermines the understanding of previous generations that is vital to creating a sense of unity, belonging, and even pride among South Africans.

Visual

- Loss of landscape character.
- Degraded local landscape resources.
- Cumulative impacts are caused mainly by multiple power lines being routed adjacent to each other, or converging on a specific area, resulting in a massing effect and subsequent landscape degradation.
- Light pollution and glare.

Bats

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- If bat roosting sites were not considered in the assessments of the nearby solar PV facilities, bats could be displaced and may impact on occupied roosting sites and or encourage bats to use anthropogenic structures as alternative roosting sites which could lead to human-wildlife conflict.
- Ephemeral water resources are critical for bats in arid and semi-arid environments for foraging and drinking (Salinas-Ramos et al. 2019). If the main seasonal water resources/drainage lines were not protected in the other facilities, inter- and intra-specific competition could occur at neighbouring existing ephemeral water resources.
- Navigation and/or commuting routes could be negatively impacted or altered if landscape features such as ridges are developed or removed for the solar PV facilities.
- Decrease in species composition, activity and abundance.
- Light pollution could alter species composition, foraging patterns and predation rate of bats.
- Possible bat fatalities incurred from collisions with infrastructure associated with the solar PV facility including solar arrays, security fencing, transmission lines, and buildings.

Avifauna

- Habitat loss and fragmentation due to displacement as a result of infrastructure installation (panels, powerlines, roads, fences and sub surface cables).
- Habitat loss and fragmentation due to displacement as a result of dust effects.
- The destruction or disturbance of bird roosts during the construction phase.
- Disturbance (including of nesting SCC) due to noise such as, machinery movements and maintenance operations during the construction phase the proposed PV solar farm.
- Bird mortalities during the operational phase due to vehicle collisions, collisions with infrastructure and/or combustion.
- Loss of Bird Foraging Habitat.
- Bird mortalities during the operational phase due to the addition of grazing sheep to the footprint which may attract raptor SCC who may scavenge on dead lambs/ adult sheep or prey upon livestock.
- Disruption of bird migratory pathways during the operational phase.
- The attraction of some novel bird species due to the development of a solar farm with associated infrastructure such as lake effect perches, nest and shade opportunities.
- Chemicals being used to keep the PV panels clean from dust (suppressants) etc. could contaminate the ecosystem.
- Cumulative impact of the project and other projects in the area concerning collision risk, habitat loss and fragmentation and loss of suitable habitat for threatened species.

Social Economic

- Cumulative social impacts as it relates to social ills such as increases in crimes, theft, HIV rates, unemployment levels etc.
- Decrease in the “sense of place” as it relates to noise, visual and light pollution.

- Indirect economic opportunities for local entrepreneurs, opportunities include transport, fencing, road maintenance, accommodation, meals, and laundry services. These economic benefits may not be achieved by local residents/service providers.
- Workers on site may be at risk to stray bullets or hunting accidents from neighbouring game farms.
- Economic losses due to damage/loss of livestock/game/property.
- Change of land use and livelihoods.
- Decrease in property values.
- There is an expectation from the affected communities and municipalities that the project will result in similar benefits and opportunities as other existing renewable projects in the area.

Traffic

- Decrease in condition of gravel roads.
- Dust and noise generation.
- Potential congestion and delays on the surrounding road network.
- Potential impact on traffic safety and increase in accidents with other vehicles or animals.
- Delays if the required haulage permit/s are not obtained.

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SECTION J: ASSESSMENT OF IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK.

3(1) A EIA report… must include –

(j) an assessment of each identified potentially significant impact and risk; including-

(i) cumulative impacts;

(ii) the nature, significance and consequence of the impact and risk;

(iii) the extent and duration of the impact and risk;

(iv) the probability of the impact and risk occurring;

(v) the degree to which the impact and risk can be reversed;

(vi) the degree to which the impact and risk may cause irreplaceable loss of resources

(vii) the degree to which the impact and risk can be mitigated;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended.

Please refer to the Impact Assessment in **Appendix D.**

CUMULATIVE IMPACTS AND CLIMATE CHANGE

A guide prepared for the Canadian Environmental Assessment Agency (CEAA) (Hegmann et al. 1999) defined cumulative effects as: *"…changes to the environment that are caused by an action in combination with other past, present and future human actions."*

Cumulative effects are commonly understood as the impacts which combine from different projects and which result in significant change, which is larger than the sum of all the impacts. (DEAT (2004) Cumulative Effects Assessment, Integrated Environmental Management, Information Series 7, Department of Environmental Affairs and Tourism (DEAT), Pretoria)

Cumulative effects can then occur when impacts are:

1. additive (incremental);
2. interactive;
3. sequential; or
4. synergistic.

Eccles et al. (1994) summarises the essence of cumulative environmental change as follows:

"Where the intensity of development remains low, the impacts can be assimilated by the environment over time, and cumulative effects do not become a significant issue. However, when development reaches a high level of intensity, impacts cannot be assimilated rapidly enough by the environment to prevent an incremental build-up of these impacts over time. Changes over time and space accumulate and compound so that in aggregate the

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effect exceeds the simple sum of previous changes. This temporal and spatial accumulation gradually alters the structure and functioning of environmental systems, and subsequently affects human activities."

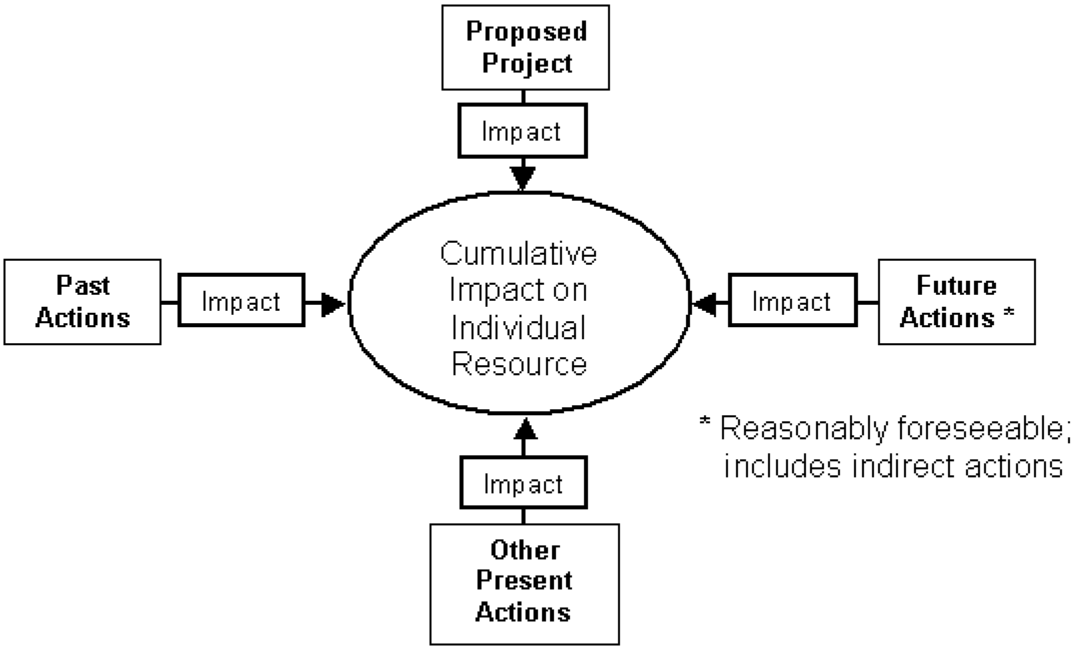

Figure 11. A flow diagram showing the compounding effects of cumulative impacts on a resource.

The EIA would need to identify and investigate the potential cumulative effects of the proposed development taking into consideration the types and characteristics of aggregate effects. These can be fragmentation, compounding effects, indirect effects, triggers and thresholds.

Planning to address cumulative effects involves delineating spatial and temporal boundaries, determining future development and determining the significance of cumulative impacts. The selected method to identify and assess cumulative effects for this EIA was primarily based on Geographic Information Systems (GIS). This computer tool uses powerful mapping and spatial information for capturing, displaying and analysing digital data. Map overlays have been used to identify areas where effects are likely to be greatest.

The following cumulative impact maps below (**Figure 12 and 13**) have been produced by overlying all specialists GIS shapefiles or Google Earth. kml files using the sensitive receptor information to form a consolidated "no-go" area map from a geographical, physical, biological, social, economic, heritage and cultural aspects.

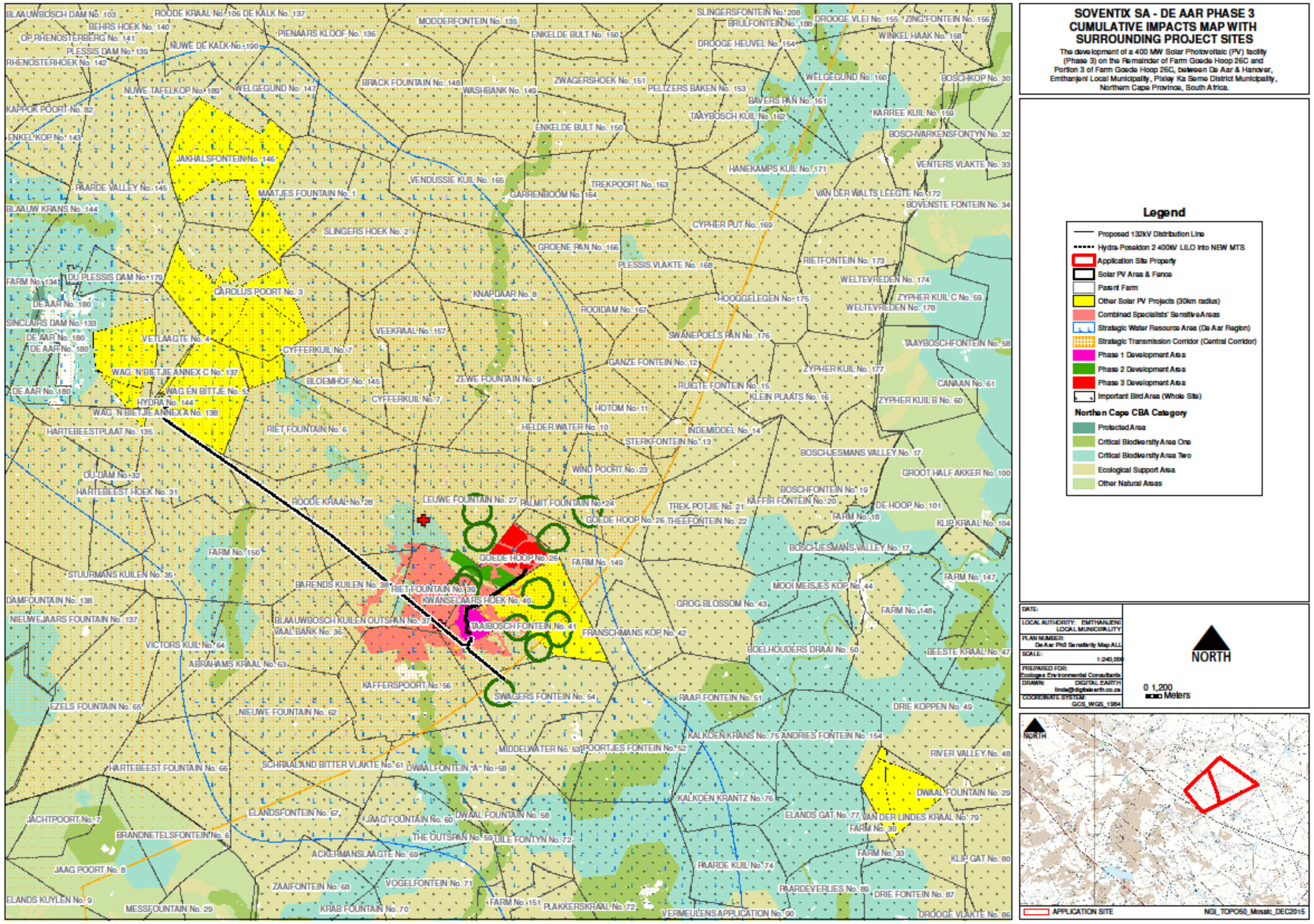

Figure 12. Cumulative Impact Map (refer to **Appendix A: Annexure I**).

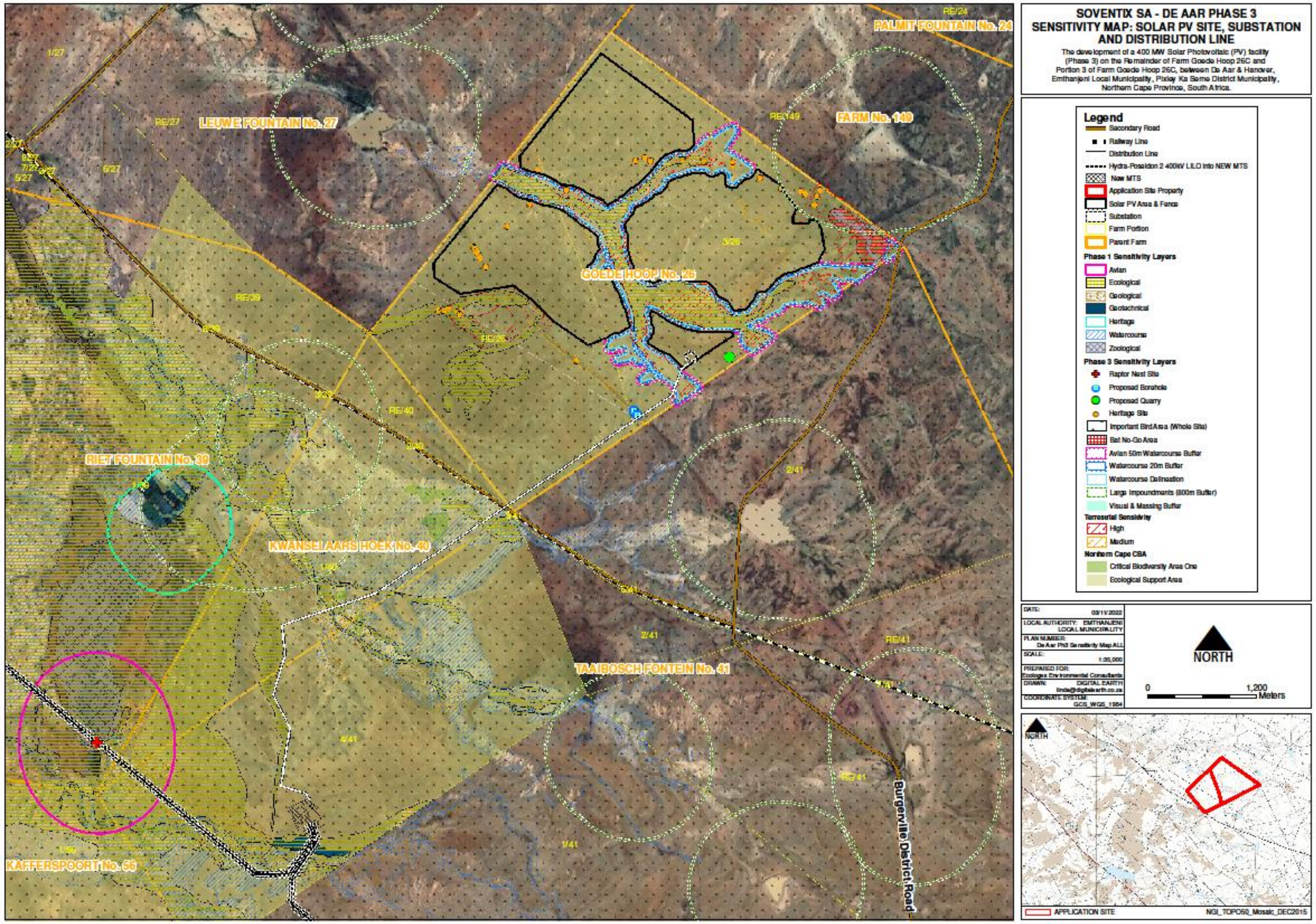

Figure 13. Combined sensitivity map (refer to **Appendix A: Annexure H**).

This exercise used the method of bio-geographical analysis, including landscape analysis looking at patterns, structure and ecological process within a spatial unit (i.e. the project development footprint). There was also the carrying capacity analysis which identifies thresholds as constraints to development, in the ecological context, carrying capacity is defined as the threshold below which ecosystem functions can be sustained.

The specialists were requested to assess cumulative impacts relating to their environmental themes. However, some specialist's studies such as Heritage and Paleontological themes are not affected by cumulative impacts from neighbouring facilities as their impacts are localized to the physical footprint. This was undertaken within the development footprint selection matrix and the completion of the impact assessment within **Appendix D.**

The other pathway within cumulative impacts of a proposed development could be the compounding effect from one or more processes. The method of interactive matrices involves analysis of the additive and interactive effects of various configurations of multiple similar projects in the same geographic area. This has been identified within **Figure 14** below, which highlights other similar renewable energy (solar) projects on the existing landscape character and on the identified sensitive receptors.

Table 25 and **Figure 14** below identifies the "approved" or "in progress" similar renewable energy (solar) developments within a 30km radius of the proposed Phase 3 site. This data is based on the DFFE Renewable Energy database which contains various sets of data. The following is an excerpt from the DFFE Renewable Energy Database webpage: "*The latest South African Renewable Energy EIA Application Data, is available for download, and contains spatial data for renewable energy applications for environmental authorisation. It includes spatial and attribute information for both active (in process and with valid authorisations) and non-active (lapsed or replaced by amendments) applications*. *Data is captured and managed on a parcels level as well as aggregated to the project level. Only outer boundaries are provided in this release. New sites will be systematically added to the database in subsequent releases. The data is released on a quarterly basis."*

However, the DEA map does not indicate the actual footprint of the facilities which are, in most cases, much smaller than the cadastral units indicated. Consequently, cumulative impacts are a concern in the area and their impact on fauna is highlighted as a greater concern than that on flora. The vegetation in the area, especially on the plains, is Northern Upper Karoo which is one of the most extensive vegetation types in the country and has a low overall abundance of species of conservation concern. In terms of fauna, smaller fauna such as rodents will experience some habitat loss due to transformation within the footprint of the current and other PV facilities. Medium and larger fauna are however likely to be more vulnerable to the cumulative impacts of development as they would be affected by habitat loss, difficulty in passing security fencing as well as noise and disturbance. In context of the current project, the plains around the site are still largely undeveloped and the three proposed development areas are separated by some distance, which would facilitate movement of fauna across the site as there will still be large intact corridors present. In addition, the Brak River is likely to be an important movement corridor in the region and, as this will not be directly affected by the development, the overall impact on landscape connectivity is likely to be low, especially given the largely intact nature of the surrounding landscape.

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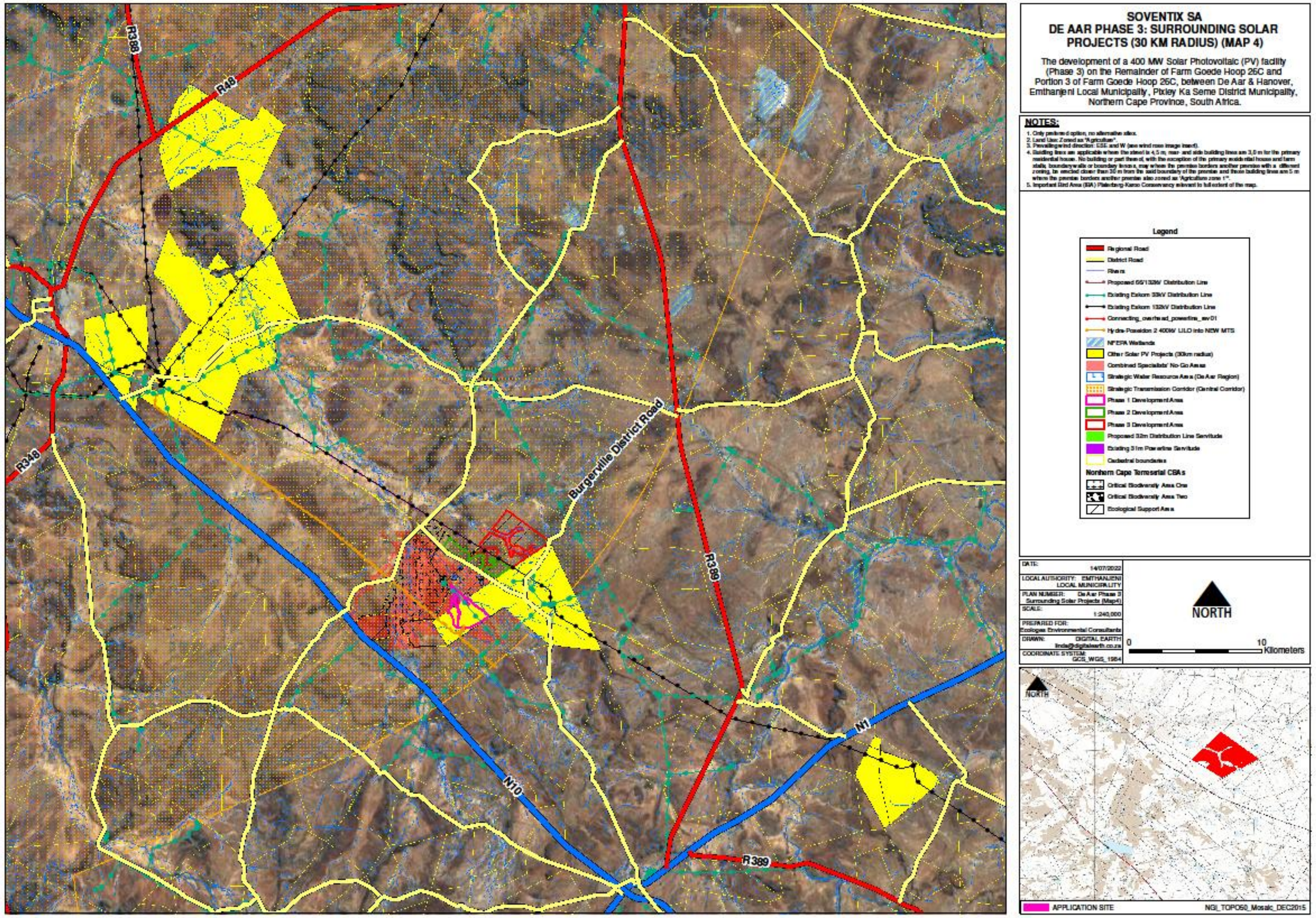

Figure 14: "Approved" or "in progress" solar developments within a 30km radius of the proposed Phase 3 site based on the DFFE Renewable Energy Database

Table 25: "Approved" or "in progress" solar developments within a 30km radius of the proposed Phase 3 site based on the DFFE Renewable Energy Database.

No.	Name of development	EA No. and date	Status	Description of facility and associated infrastructure, e.g., solar PV facility plus on-site substation plus distribution line.	Location (GPS)	Size of facility (MW)	Area of facility or property (ha)
1	The Proposed Construction Of A Solar Energy Facility in The Emthanjeni Local Municipality In The Northern Cape Province	DEA REF 12/12/20/2250 (multiple amendments)	Approved (not built)	Solar PV	30°42'13.39"S 24° 7'49.38"E	225 MW	7 000 (based on REEA_OR)
2	The Proposed Establishment Of Photovoltaic (Solar Power) Farms In The Northern Cape Province (3 sites)	12/12/20/2258/4	Approved (not built)	Solar PV	30°52'41.68"S 24°22'26.04"E		4 400 (based on REEA_OR)
		12/12/20/2258/3	Approved (not built)	Solar PV	31° 0'20.03"S 24°37'47.09"E		650 (based on REEA_OR)
		12/12/20/2258/2	Operational	Solar PV and substation	31° 0'53.23"S 24°39'4.32"E (Linde site)	36.8 MW	120

							
3	The Proposed Development Of A Photovoltaic Power Plant And Power Line Near De Aar, Northern Cape	12/12/20/2313 (various amendments)	In progress	Solar PV and powerline	30°43'30.81"S 24° 4'6.08"E	30 MW	108 (based on REEA_OR)
4	Expansion of the Photovoltaic Solar Facility in Emthanjemi Local Municipality, Northern Cape on the property, Northern Cape Province	14/12/16/3/3/1/1122	Approved (not built)	Solar PV	30°59'7.87"S 24°38'12.25"E		50 (based on REEA_OR)
5	Proposed PV facility on farm Caroluspoort near De Aar	14/12/16/3/3/2/741	In progress	Solar PV	30°39'10.02"S 24° 7'35.65"E	300 MW	2 340 (based on REEA_OR)
6	Proposed PV facility on farm Jakhalsfontein near De Aar	14/12/16/3/3/2/744	In progress	Solar PV	30°33'15.82"S 24° 9'46.11"E		5 220 (based on REEA_OR)
7	Proposed photovoltaic (solar) energy plant on Vetlaagte Farm near De Aar, Northern Cape	12/12/20/2499	In progress	Solar PV	30°41'36.26"S 24° 3'39.49"E	100 MW	2 100 (based on REEA_OR)

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Summary of cumulative Impacts as per the specialist studies

Terrestrial Biodiversity Report

In terms of cumulative impacts in and around the Soventix Phase 3 site, the closest and most relevant projects are the Soventix Phase 1 and Phase 2 projects which are adjacent to the current site. Soventix Phase 1 has been authorised, but is not a preferred bidder, while Phase 2 is still in-process. Further afield, there is a node of development around De Aar, with some built facilties as well as well as several approved and in-process projects.

The estimated footprint of the Soventix Phase 1 and Phase 2 projects would be approximately 650ha, while the built projects which are located largely around De Aar, but also include the Linde PV project near Hanover is approximately 640ha. The planned projects would amount to approximately 1500ha of additional habitat loss if all were to be built. However, the affected vegetation types, which is largely Northern Upper Karoo is a very extensive vegetation type and has not experienced a large amount of habitat loss to date. In addition, as there is some distance between the current facility and the developments at De Aar and Richmond, fragmentation and the potential for other forms of ecological disruption across the area is currently still low. The contribution of the Soventix Phase 3 development is listed at 650ha and is not considered highly significant, especially given the avoidance of the important ecological features of the site such as the drainage areas. The contribution of the Soventix Phase 3 development to cumulative impact is therefore considered acceptable.

Aquatic Report

Apart from farms practicing agriculture, there are no other PV developments present in the small catchment further upstream. The isolation of the Phase 3 Solar PV facility project catchment protects the project drainage lines from any significant development further upstream.

If any cumulative impacts on the receiving drainage systems have been identified from other PV developments within 30 km radius of the Phase 3 Solar PV development, this will not impact on the Phase 3 Solar PV facility and the proposed project is not expected to add to any cumulative impacts further downstream.

Soil Report

Runoff from all three phases was found to be only 10.24% of all the PV projects inside the catchment. This will be a 10% addition to the cumulative effect of the other PV developments. The overall runoff from all three projects is only 1.39% of the total runoff from the catchment and just 0.79% from Phase 3.
This implies that the cumulative effect (in terms of sediment load carried by the watercourses) of all three phases on developments downstream will be relatively small, even with some potential higher runoff during the construction of these phases.

Grazing Potential Report

The effects of enhanced soil erosion in the case of rangeland mismanagement and the effects of increased runoff and sediment load downstream, in relation with other PV developments within 30km downstream, are quantified in the soil report (Van den Berg and Botha, 2022).

Geo-Hydrological Report

As all activities will take place on the same property, and close to other solar developments there will be cumulative impacts (however limited due to the project type). The cumulative impacts from a groundwater perspective are limited in that only a few boreholes will be used to supplement the water use at the site (small-scale local use) and that no dedicated groundwater pollution sources will be created (e.g., landfills, oil or fuel storage areas). Moreover, the other proposed solar developments are situated in different drainage areas, rendering the likely impact associated with this project zero. Any geohydrological risk for this project will be confined to the delineated sub-catchments (worst case) and only local impacts around boreholes being used for the development.

Hydrology Report

The cumulative impacts from a surface water perspective are limited as:

- there will be no significant increase in surface water run-off (run-off volumes, peak rates or time to peak rates),
- small areas will be disturbed,
- disturbed areas will likely only show temporary impacts in terms of water quality (e.g., sedimentation if flooding takes place),
- the streams and rivers are ephemeral, and
- no dedicated surface water pollution sources will be created (e.g., landfills, oil or fuel storage areas, mining, etc.).

Moreover, the other proposed solar developments are situated in different drainage areas, rendering the likely cumulative impact associated with this project zero. Any hydrological risk for this project will be confined to the delineated sub-catchments.

Visual Report

Massing effects created by large scale coverage or expanses of solar PV panels, including from multiple projects, in a rural agricultural landscape setting with medium to high levels of Scenic Quality/A large-scale project creating long lines of PV that wrap over prominent landform would degrade local landscape resources in this rural landscape.

Cumulative impacts are caused mainly by multiple power lines being routed adjacent to each other, or converging on a specific area, resulting in a massing effect and subsequent landscape degradation.

The development without mitigation will set a negative precedent for development of PV projects in remote, rural areas, creating clear intervisibility with the proposed Phase 2 PV development area.

With mitigation and retaining the visual setback buffers, intervisibility is reduced with large block massing effects reduced. A large PV precedent will be set in place that could attract other RE projects, but a suitable setback and massing-reduction precedent would be set.

Avi Fauna

There are a number of existing renewable energy projects (both solar and WEFs) that already have quantified negative impacts on the avifauna community in the region. Therefore, any impacts anticipated from the proposed solar facility will add to these existing impacts and require assessment under a Cumulative Impacts assessment.

Results obtained during this preconstruction survey and from the subsequent impact analysis should be considered in conjunction with the impacts created by the proposed development. The current developments within the region raise the possibility of significant cumulative impacts, especially concerning collision risk, habitat loss and fragmentation and loss of suitable habitat for threatened species.

The following current impacts will be exacerbated through increased solar developments regionally;

- Habitat loss;
- Road-kills;
- Regional saturation of solar facilities. This has implications for several priority species, both in terms of lake effect, collision mortality from additional powerline infrastructure;
- Powerlines.

Bat Report

Fine scale and cumulative environmental impacts (regional and global) relating to the installation and operation of solar PV facilities have not been extensively addressed in scientific literature. The Linde Solar Farm (Simacel 155 Pty Ltd), Du Plessis Solar PV4, Mulilo Solar PV De Aar, South African Mainstream Renewable Power De Aar PV (De Aar Solar Power Pty Ltd) and Solar Capital De Aar (Solar Capital Pty Ltd) that lie 36km, 37km, 39km, 37km and 35km respectively from the proposed Soventix Solar Farm. The impacts of bats over these solar farms have not been assessed and addressed. Cumulatively, there may be a high potential for loss of species diversity, decrease in ecosystem functionality and service provision, and the cessation of processes within the landscape that can be permanent, lead to further land degradation and ultimately a collapse in the livelihood of natural fauna, flora and human inhabitants.
Considering that in general bats are sensitive to changes in habitat that drives species composition, activity and abundance (Fahr and Kalko, 2011; Montag et al. 2016; Olimpi and Philpott, 2018), the cumulative impact of the alteration of habitat over a greater area may cause a shift in the abundance of bat species to favour open-air forages such as T. aegyptiaca if the alteration in habitat is unfavourable for clutter-edge and clutter forager species such as L. capensis and Rhinolophus species.

Potential cumulative Impacts:

- If bat roosting sites were not considered in the assessments of the nearby solar PV facilities, bats could be displaced and may impact on occupied roosting sites and or encourage bats to use anthropogenic structures as alternative roosting sites which could lead to human-wildlife conflict.
- Ephemeral water resources are critical for bats in arid and semi-arid environments for foraging and drinking (Salinas-Ramos et al. 2019). If the main seasonal water resources/drainage lines were not protected in the other facilities, inter- and intra-specific competition could occur at neighbouring existing ephemeral water resources.
- Navigation and/or commuting routes could be negatively impacted or altered if landscape features such as ridges are developed or removed for the solar PV facilities.

The impact of Phase 3 can be kept minimal by implementing the mitigation strategies discussed below to ensure the protection of ephemeral water resources, roosting sites, navigational landscape features and maintaining natural vegetation to preserve the existing bat communities and populations.

Social Economic Report

The impacts created by the Soventix project will be cumulative to the existing positive economic impacts, and extent the live of some of the positive social impacts. It can change some of the residents lives permanently in a positive manner.

However, there are also negative cumulative impacts as a result of these projects and unless the social impact management plan is implemented as recommended, these negative cumulative social impacts could affect the communities of Hanover and De Aar. The communities are vulnerable considering the high number of children born with Foetal Alcohol Spectrum Disorders, the high unemployment levels, and absence of opportunities. The municipality indicated that people coming from outside the area to work in the existing solar projects had a definite impact on the community.

Although municipal services are not currently under pressure, the development of a few renewable facilities within a short period of each other may cause pressure on these services in future. The municipalities depend on borehole water, which may run out and is only available when there is electricity available to run the water pumps. There is a current shortage of housing which will get worse should the area be exposed to a boom cycle of development.

It must be acknowledged that it is almost impossible for the proponent to control the cumulative social impacts in the neighbouring towns. Therefore, it is important that the proponent have a good working relationship with the local authorities, and that they mitigate the impacts that they can control. Implementing the Corporate Social Responsibility strategy will also assist with mitigating and managing cumulative impacts in the broader community.

Paleontology Report

The cumulative impacts were not investigated as they are not particularly applicable to the paleontological aspects, given the fairly localized context.

Heritage Report

The cumulative impacts were not investigated as they are not particularly applicable to the Cultural Heritage sites, given the fairly localized context.

Geotechnical Report

The cumulative impacts were not investigated as they are not particularly applicable to the Geotechnical aspect, given the fairly localized context.

Traffic Report

The cumulative impacts of all the proposed renewable energy facilities that were included in the vicinity were considered and assessed. It is however very unlikely that all projects will occur at the same time, as all these projects will be subject to a highly competitive bidding process and only a few projects would be allowed to enter into a power purchase agreement with Eskom at a time. Construction will most likely be staggered based on project and site-specific issues.

The biggest traffic impact associated with renewable energy facilities is during the construction phase (and similarly during the decommissioning phase). During the operational phase, the trips added to the road network is expected to be insignificant.

Heat Island Effect

While photovoltaic (PV) renewable energy production has increased, concerns remain about whether or not PV power facilities induce a "heat island" (PVHI) effect, much like the increase in ambient temperatures relative to less developed rural areas generates an Urban Heat Island effect in cities.

Transitions to PV plants alter the way that incoming energy is reflected back to the atmosphere or absorbed, stored, and reradiated because PV plants change the measure of the diffuse reflection of solar radiation, vegetation, and structure of the terrain. Prior work on the PVHI has been mostly theoretical or based upon simulated models. A study by *Barron-Gafford G.A., et al (2016) entitled "The Photovoltaic Heat Island Effect: Larger solar power plants increase local temperatures"* found temperatures over a PV plant were regularly 3–4 °C warmer than more undeveloped rural areas at night.

Excess sun energy that isn't converted to electricity can leave the project area in two ways: either as latent heat or sensible heat. Sensible heat is the type that we can feel, and the type that is damaging to solar PV production. Latent heat is the energy that is absorbed by nearby water, evaporating into vapour. By maintaining the grazing component on the project area in the form of an Agrivoltaic system in a dry climate, results in more latent heat absorption, taking heat pressure off the panels.

Heat Island Effect Mitigations for inclusion in the EMPr:

Impact:

The PV "heat island" (PVHI) effect would be the result of a detectable increase in sensible heat flux (atmospheric warming).

Consequences:

Less available grazing would result in a loss of body condition if stocking densities are not adjusted accordingly.

Under grazing does have a deleterious effect on veld condition (indirect).

Mitigations:

1) A risk averse approach to the unknown lateral and vertical extent of the PVHI effect on wild game is to establish a 200 m corridor along the concerned neighbours' game farm boundary.

Limitations:

The lateral and vertical extent of the PHVI effect cannot be known.

Assumptions:

It is unlikely that Solar PV modules will have a direct negative impact on wild animals considering domestic animals such as sheep are successfully used in Agrivoltaic systems and actively seek shade beneath the modules.

Impact:

The PV "heat island" (PVHI) effect would be the result of a detectable increase in sensible heat flux (atmospheric warming). This may be compounded by the forecasted increase in temperatures linked to climate change.

Transitions to PV plants alters the energy flux dynamics of an area, specifically the way that incoming energy is reflected back to the atmosphere or absorbed, stored and reradiated because PV plants change the albedo, vegetation and structure of the terrain.

Consequences:

Warming surrounding areas could potentially influence wildlife habitat, ecosystem function and human health.(indirect)

Mitigations:

1) Minimise vegetation clearance.
2) Once construction has been completed in an area, immediately reinstate and maintain the vegetation underneath the solar PV modules to retain its cooling effect through transpiration.
3) Halt and reverse existing degradation primarily from extensive livestock production to counter increased climatic uncertainty - restore all bare patches of soil with vegetation using the Bare Patch Restoration Protocol (Appendix C).
4) Ensure responsible natural resource management that maintains the integrity of ecosystems and the continued provision of ecosystem services to current and future generations.
5) Maintain the vegetation underneath the solar PV modules to retain its cooling effect through transpiration.
6) Fragment the expansive covering of the solar PV development into two or more clusters segregated by ecological buffers.
7) Solar panel arrays shall be spaced approximately 9.5 m apart (from pile to pile). If each module is 2.2 m long, this will allow a 5 m gap between the modules of parallel arrays.

Limitations: The lateral and vertical extent of the PHVI effect cannot be known.

Assumptions:

1) Incoming solar energy is typically either reflected back to the atmosphere or absorbed, stored and later reradiated in the form of latent or sensible heat.
2) Within natural ecosystems, vegetation reduces heat gain (or capture) and storage in soils by creating surface shading. Energy absorbed by vegetation and surface soils can be released as latent heat in the transition of liquid water to water vapour to the atmosphere through evapotranspiration (the combined water loss from soils and vegetation).
3) In PV farms, the reduced albedo (reflectance) of the dark panels combined with the greater amount of exposed ground surfaces compared to natural systems absorbs a larger proportion of high energy, shortwave solar radiation during the day. Combined with minimal rates of heat-dissipating transpiration from vegetation, a proportionately higher amount of stored energy is reradiated as longwave radiation during the night in the form of sensible heat.
4) The PHVI effect occurs across all seasons with the greatest influence on ambient temperature at night (by as much as 3 to 4 degrees Celsius), possibly due to heat trapping of reradiated sensible heat flux under PV arrays at night and delayed cooling.
5) The maintenance of vegetation and ecosystem regulating services will reduce, but not avoid the potential PV "heat island" effect.

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6) A wind blows year-round and should alleviate heat trapping at night. Heat trapping can be further alleviated through adequate spacing between solar arrays.
7) The decreased albedo due to a PV power plant and their associated warming from the PVHI is at least offset by the carbon dioxide emission reductions associated with PV power plant and more so when ecosystem regulating services, such as carbon sequestration, are maintained through sound ecological management.
8) A risk averse approach to counter increased climatic uncertainty is through climate change mitigation, specifically the need to halt and reverse existing degradation primarily from extensive livestock production and adopt the most effective management practices.

Climate Change

The Climate Change Adaptation Response Strategy for the Northern Cape (2016), modelled climate variables in order to indicate future (2020-2050) climate change conditions under high and low climate change mitigation scenarios. Under a medium mitigation scenario model simulations indicated that: average temperatures in the province would increase by 1.6°C, while the number of heat waves experienced would increase by 11.83 events and the average rainfall would decline to 25.0 - 51.22mm per annum (Northern Cape: Department of Environment and Nature Conservation 2016a). Under a low climate change mitigation scenario, model simulations indicated: an average temperature increase by 2.3°C, an increase of 16.1 in the total number of heat waves experienced and a decrease in rainfall to 17mm - 74.3mm annually (Northern Cape: Department of Environment and Nature Conservation 2016a).

Agriculture

Climate change is predicted to negatively impact on the agricultural sector in Pixley ka Seme District Municipality. Increased temperatures, drought, and the increase in frequency and severity of storm events will impact on the crops that can be grown and potentially result in a loss of livestock.

Biodiversity and Environment

In the Pixley ka Seme District Municipality, it is projected that with the warmer temperatures that there will be a replacement of Nama Karoo biome with Savanna and Desert biomes. A large amount of Nama Karoo and Nama Karoo related species will be lost. Furthermore, development and changes in land use will impact negatively on the environment in the District.

Water

Pixley ka Seme District Municipality is currently experiencing issues of water scarcity and quality. Climate change is expected to exacerbate this problem. Drought, reduced runoff, increased evaporation, and an increase in flood events will impact on both water quality and quantity.

The projected rainfall decrease for the area as a result of climate change is estimated to decrease by as much as 150mm, reducing the total rainfall to about 170 mm/yr by 2050. It should be noted that the projected changes in the annual average number of extreme rainfall days throughout the district over the period 2021-2050 under the RCP 8.5 scenario (CSIR 2019) suggest either a decrease or increase in a rainfall event. It is anticipated that under the scenarios put forth, the groundwater resources in the project area may become completely replenished in the event of 1:50 and 1:100 year storm events that occur in the project area. As a climate change scenario, the 170mm annual rainfall for the area was used.

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Climate Change Mitigations for inclusion in the EMPr:

Impact:

1) Water scarcity is expected to be exacerbated by drought, reduced run-off and increased evaporation. According to the District Municipality's Climate Change Response Plan there are increased risks to inter alia water availability for irrigation and drinking in an arid District dependent on ground water (with a high salt content).
2) "He (Willem Retief, Landowner) also mentioned that the water table dropped by at least 3 metres over the last few years, due to the drought. So the question is how effective are the windmills, for if the water table drops below the intake pump the mill will spin, but no water will be abstracted?" (pers. comm. Henri Botha, Hydrologist)

Consequences:

A lack of sufficient locally available water for construction and operation could be a fatal flaw of the proposed development.

Assumptions:

A Geohydrological Assessment was commissioned to determine if there is enough groundwater to support demand during construction and operation under normal conditions and under drought years/climate change scenarios, as well as investigate the feasibility of drilling an additional borehole should it be required.

A geophysical investigation aimed to identify likely dolerite contact zones, as these are known preferential flow paths for groundwater movement, revealed two high-feasibility drilling positions which can be considered for future water supply : T1 and T2 located in the southwestern corner of Phase 3.

If the combined sustainable abstraction yield for both boreholes (336.67 m^3/day for 8 hours of pumping) is used as the Proposed Use in the water balance calculation for the HRU2 sub-catchment (Phase 3), there will be a surplus amount of 54 824.94 m3/yr (or 150.21 m3/day) available after the allocation of existing uses, basic human needs, base flow (to surface water streams) and PU (refer to Table 5-4 of the Geohydrological Assessment Report).

However, if the PU is substituted for the estimated demand during construction (including the period when construction and operation overlap), that is 216 m3/day, there will be a greater surplus of 98 869,79 m3/yr (or 270,87 m3/day)

It is therefore estimated that there is enough groundwater available on a sub-catchment level to sustain the proposed 8-hour abstraction from the designated boreholes and the sub-catchments they fall in. Provided the surplus estimates are not exceeded, the impact on the groundwater reserve will likely be minimum.

The base case water balance will be different under the forecasted climate change scenario for 2050. If the combined sustainable abstraction yield for both boreholes (336.67 m^3/day for 8 hours of pumping) is used as the Proposed Use (PU) in the water balance calculation under the climate change scenario (lower rainfall and effective recharge to the aquifer), there will be a deficit amount of -29 954.96 m3/yr (or -82.07 m3/day) available after the allocation of existing uses, basic human needs, base flow (to surface water streams) and PU (refer to Table 5-4 of the Geohydrological Assessment Report). Based on the climate change predictions, HRU2 will therefore not be able to meet the demand for water uses by 2050. Water abstraction rates, or specifically the PU, would need to be considerably decreased nearing the 2050 mark. The potential deficit must be avoided by reducing water usage during operation and substituting the

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PU with the estimated demand during operation, that is 150 m3/day, in which case there will be a surplus of 38 180 m3/yr (or 140,60 m3/day).

Although forecasted production rates (to support the development and operation of the Solar PV facility) under current and future climate change scenarios, are/can be sustainable, groundwater is a very important resource for locals in the area, so care should be taken not to overproduce from boreholes chosen for this project, and to ensure that there is a limited impact on existing livestock/domestic watering already implemented.

Mitigations:

1) Do not overproduce from boreholes used as part of the project. 8 hours of pumping per day is recommended.
2) The abstraction of groundwater from both properties combined (but limited to sub-catchment HRU2 of Quaternary Catchment D62D), including all boreholes contained thereon, shall not exceed 216 m3/ day (or 78 840,43 m3/ yr) during the construction period (including when it overlaps with operation), and 150 m3/day (or 54 750,3 m3/ yr) during operation.
3) Abstraction may not exceed the sustainable abstraction yield at the recommended pumping rate of 8 hrs per day for each borehole, that is 6,58 l/s @ 8hrs (or 189,5 m3/8hr day) for BH4 and 5,11 l/s @ 8 hrs (or 147,17 m3/8hr day) for BH5.
4) Undertake water level monitoring of boreholes within a 1.5 km radius of the pumping borehole. If a decline in water levels is noted in all boreholes, because of pumping, the abstraction rate should be lowered to prevent aquifer depletion.
5) All new boreholes drilled in the project area (such as T1 or T2) must be pump tested, and interference (if any) with other existing boreholes (closer than 500 m) be evaluated by long-duration pump tests.
6) Conduct multi borehole water level logging, to ensure that no cumulative dewatering impacts are taking place for boreholes which may be in the same contact zones.
7) Implement the Surface and Groundwater Monitoring Protocol during construction and operation (Appendix D).
8) Continually investigate (or research) and implement (or adopt) water-saving strategies and technologies or alternatives, including designs throughout construction and operation, particularly relating to, but not limited to, washing solar panels.

Impacts:

1) According to the District Municipality's Climate Change Response Plan there are increased risks to inter alia Biodiversity and environment, including increased impacts due to land-use change associated with continuing development of the renewable energy corridor. (negative)
2) Diversification by changing the current land-use (Agriculture) to an Agrivoltaic system is potentially a powerful climate resilient land-use, involving both climate change mitigation and adaption measures, that simultaneously supports the agricultural and energy industries.

The additional income stream from leasing the land to Soventix SA (Pty) Ltd will help offset productivity and sales losses from reduced stocking densities when drought periods dictate lower carrying capacities (CC adaption), ensuring good ecological management and maintenance of ecosystem integrity (CC mitigation). (positive)

Consequences:

Lost biodiversity reduces resilience to climate change.

Assumptions:

An Agricultural Agro-ecosystem Specialist Assessment was commissioned to undertake detailed soil mapping and veld condition assessments to determine the grazing capacity of the project area so that the landowner does not exceed recommended stocking densities and ensure adequate vegetation cover necessary for the maintenance of ecosystem services.

Mitigation:

1) The solar PV facility shall adopt a symbiotic Agrivoltaic system that combines agriculture, specifically good ecological management (grazing) practices, with green energy generation.
2) Develop a long-term grazing strategy using the findings (land capability classes/grazing units and carrying capacities) as well as Grazing Management Principles (Appendix F) identified in the Soil Mapping and Grazing Potential Assessments.
3) Implement good rangeland management practices defined by an adopted long-term grazing strategy with small stock for the areas underneath the solar panels to maintain optimal vegetation cover and to reduce soil erosion and runoff.
4) Halt and reverse existing degradation primarily from extensive livestock production to counter increased climatic uncertainty - restore all bare patches of soil by implementing the Bare Patch Restoration Protocol (Appendix C).
5) Ensure responsible natural resource management that maintains the integrity of ecosystems and the continued provision of ecosystem services to current and future generations.

Impacts:

According to the District Municipality's Climate Change Response Plan there are increased risks to inter alia Biodiversity and environment, including increased impacts due to loss of priority wetlands and river ecosystems.

Consequences:

Lost wetlands would remove ecosystem regulating services and increase the risk of flood events and ecosystem degradation (erosion) further downstream.

Assumptions:

An Aquatic Biodiversity Impact Assessment was commissioned to inter alia Identify, describe, delineate, and demarcate ecological buffers around watercourses, including wetlands.

The drainage systems are predominantly classified as ephemeral, which means that the stream flows briefly in direct response to precipitation in the immediate vicinity, and the channel is at all times above the ground-water reservoir. These ephemeral tributaries of the Brak River and considered to be in a largely natural ecological state. These systems have a far less predictable flow regime compared to perennial or seasonal rivers, and are frequently dry for long periods in arid regions. The ephemeral drainage system consists of one major ephemeral drainage channel which are fed by upstream catchment areas beyond the project area fence line. Three smaller tributaries are feeding into the main drainage line in the project area. The ecological importance and sensitivity category (EISC) of the ephemeral drainage system and associated alluvial floodplains is classified as “High” and therefore considered as a "no-go area" for all infrastructure apart from access roads, pipelines, cables and pylons. The no-go area includes the ecological buffer.

The delineated ephemeral drainage system is of conservation importance as it is considered a Freshwater Ecosystem Protected Area (FEPA) category. The entire sub-quaternary catchment indicates that the surrounding land and smaller stream network need to be managed in a way that maintains the good condition (A or B ecological category) of the river reach.

A buffer of 33 m wide on both sides of the drainage line delineation is required during the construction and operational phases to protect the Phase 3 PV facility in its current condition from any degradation. This buffer width is obtained whenever the following mitigation measures are applied to the model: (a) the management of surface water runoff, (b) erosion monitoring, and (c) constraints regarding the clearing of vegetation within these areas.

Assumption:

The clayey soils and most noticeably the Swartland and Valsrivier soils may restrict vehicle movement during the wet season. During the rainy season terrain mobility on high clay soils in low lying areas with drainage lines will be difficult and might increase soil erosion when drainage lines are disturbed.

Mitigations

1) Transformation and fragmentation of the aquatic ecosystem will be avoided by excluding development (with the exception of linear infrastructure crossings) from the ecologically sensitive ephemeral drainage system (an unnamed tributary to the D62D – 05610 tributary with its confluence just downstream of the Project Area) and its ecological buffer.
2) Road crossings should be 'engineered' (not two-track), including box culvert structures, to ensure year-round access to all parts of the veld (for livestock management) and facility (for operational management) and avoid vehicles getting stuck and damaging the watercourse.
3) Access roads to the project area, especially those crossing large flood plains, should be well planned.
4) The design of access roads must include the adequate management of surface water run-off.
5) Avoid discharges of untreated wastewater into natural wetlands.
6) Avoid or restrict point source discharges of storm water into natural wetlands by relying on free drainage.

Impact:

1) According to the District Municipality's Climate Change Response Plan there are increased risks to inter alia Agriculture, including livestock and game, relating to drought, less grazing and increased livestock mortality, affecting commercial exports.
2) The additional income stream from leasing the land to Soventix SA (Pty) Ltd will help offset productivity and sales losses from reduced stocking densities when drought periods dictate lower carrying capacities (CC adaption), ensuring good ecological management and maintenance of ecosystem integrity (CC mitigation) (positive).

Consequences:

Livestock mortality will reduce commercial exports and revenue for the farmer.

Assumptions:

An Agricultural Agro-ecosystem Specialist Assessment was commissioned to undertake detailed soil mapping and veld condition assessments to determine the grazing capacity of the project area so that the landowner does not exceed recommended stocking densities and ensure adequate vegetation cover necessary for the maintenance of ecosystem services.

Mitigation:

1) The solar PV facility shall adopt a symbiotic Agrivoltaic system that combines agriculture, specifically good ecological management (grazing) practices, with green energy generation.
2) Develop a long-term grazing strategy using the findings (land capability classes/grazing units and carrying capacities) as well as Grazing Management Principles (Appendix F) identified in the Soil Mapping and Grazing Potential Assessments.
3) Implement good rangeland management practices defined by an adopted long-term grazing strategy with small stock for the areas underneath the solar panels to maintain optimal vegetation cover and to reduce soil erosion and runoff.
4) Halt and reverse existing degradation primarily from extensive livestock production to counter increased climatic uncertainty - restore all bare patches of soil by implementing the Bare Patch Restoration Protocol (Appendix C).
5) Ensure responsible natural resource management that maintains the integrity of ecosystems and the continued provision of ecosystem services to current and future generations.

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(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;

Social Impact Assessment Report

The following is taken out of the *Social Impact Assessment Report prepared by Ilse Aucamp of Equispectives Research & Consulting Services dated August 2022* attached as **Appendix E: Annexure N**

Impacts And Mitigations

Social impacts during different phases of the project

The planning and design phase of the project occurs before any physical activities commence on site. The EIA process forms part of this phase, and the EIA is usually the means of introducing the affected communities to the proposed project. Unlike environmental impacts, social impacts can occur before any physical work on site is done, and rumours of development is enough to set off some social change processes and social impacts. In the case of the development of Phase 2 and 3 of the Soventix De Aar solar plant, the first phase has been approved. However, no construction activities have commenced. The previous EIA process was conducted in 2016, and in the time between 2016 and 2022 numerous other renewable energy development occurred in the area. The communities and affected parties are therefore more aware of the impacts that the proposed development may generate.

The three phases will be constructed sequentially, and there may be some overlap. The most severe social impacts usually occur during this phase of the project since it is the phase when the most activities on site take place and where the most people are involved. Some of the construction phase social impacts will take place on site or in close vicinity of the site, whilst others will occur in the communities around the site.

The operational phase of the project is estimated to be approximately 20 years. During this phase there will be less activities on site, and the focus would be on maintaining the grounds, cleaning the modules, cleaning the offices, keeping the site secure and ensuring that the technology runs smoothly. Impacts in this phase will mostly be associated with these activities.

Impacts identified, mitigation and management plan

All the identified impacts for Phase 1 are applicable to phase 3 **Table 26**.

Table 26. Impacts identified in Phase 1 and relevant to Phases 2 and 3

Impacts identified in Phase 1	Relative to Phase 3
Expectations about community benefits	Yes
Uncertainty amongst land owners	Yes
Change of land use/livelihoods	Yes
Traffic and roads	Yes

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Damage to farm infrastructure	Yes
Safety and security concerns due to more people in the area	Yes
Social disturbance and community safety	Yes
Economic opportunities	Yes
Sense of place	Yes
Generation of renewable energy	Yes

Mitigation measures for inclusion in EMPr:

Management Category: Pre-construction Phase – a stakeholder engagement and communication strategy

Impact: There is an expectation from the affected communities and municipalities that the Soventix project will result in similar benefits and opportunities as other existing renewable projects in the area.

Consequence: If Soventix does not manage stakeholder expectations from the beginning of the project, it can result in reputational damage for the company, bad stakeholder relationships and in the worst-case scenario violent protests

Assumption:

Community relations go hand in hand with expectations. Community relations will remain important throughout the project, but the basis for future relations is established in the beginning phases of a project.

Mitigation

(1) Develop a Stakeholder Engagement Plan during the pre-construction phase of the project using the Stakeholder Engagement Plan Protocol (**Appendix H**).

(2) The Stakeholder Engagement Plan must be implemented for the life of the project and adapted as required.

(3) A protocol on communication must be agreed upon and be in place before construction commences.

(4) The plan (or strategy) must communicate in an open and honest way what kind of jobs will be created, who will qualify and how the recruitment process will work.

(5) The plan (or strategy) should employ different media, including social media, printed media, meetings, and a community liaison officer.

(6) The plan (or strategy) must include liaison with the local municipality about project opportunities, as the municipality is often the first port of call for the community - the municipality can be an important ally for Soventix if the relationship is based on mutual trust and respect.

<u>Management outcome:</u> Build and maintain trusting relationships with affected stakeholders.

Management Category: Pre-construction Phase – a stakeholder engagement and communication strategy

Impact: There is a level of uncertainty amongst the directly affected landowners with regards to timelines for the project.

Assumption:

There is still a level of uncertainty amongst the directly affected landowners. The timelines for the project are not clear to them, they would like greater clarity about when the construction will start, how long it would be and what the layout and design of the solar panels will be. Other landowners have technical questions about practicalities and the implementation of the project. The farming community is close-knit, and people discuss the project amongst themselves. Soventix may harm their social license to operate if they do not clarify these aspects, since the uncertainty can change into mistrust, which is difficult to undo.

Mitigations:

(1) Hold a direct meeting between the affected landowners (directly affected landowner and owners of neighbouring properties) and Soventix during the planning and design and/or pre-construction phases. The meeting should provide greater clarity about when the construction will start, how long it will be, what the layout and design of the solar facility will be, as well as answer any technical questions about practicalities and the implementation of the project.

(2) A community liaison officer that is trusted by the community and has the necessary skills must be appointed before construction commences to interface and build trust between Soventix and the landowners.

(3) The community liaison officer must be bilingual with a solid knowledge of Afrikaans, as it is the language that most stakeholders are comfortable with (excluding the local government, where English would be sufficient).

Management outcome:

Clarity on project outcomes.

Build and maintain trusting relationships with affected landowners.

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Management Category: Pre-construction Phase - Change in land use – livelihoods

Impact: The construction of a solar electricity generating facility and its associated infrastructure will lead to a change of land use and livelihoods.

Consequence: Change of land use can potentially impact negatively on the livelihood of the affected farmer, which is sheep farming.

Assumptions:

During the construction phase all livestock would need to be moved to different parts of the farm as the construction activities may be distressing for the animals.

Mitigation:

(1) The farmers must be given a construction programme with sufficient leeway to ensure that they can move their livestock before construction activities commence.

Management Category: Pre-construction Phase - Change in land use – livelihoods

Impact: The construction of a solar electricity generating facility and its associated infrastructure will lead to a change of land use and livelihoods.

Consequence: Change of land use can potentially impact negatively on the livelihood of the affected farmer, which is sheep farming.

Assumptions:

In some cases, the neighbouring farmers will benefit from the construction of the facility since they can offer accommodation or other related services that can supplement their income.

Mitigation:

(1) The principle of “locals first” must be used to ensure that neighbouring landowners benefit from requirements for accommodation or any other services that they can deliver.

Management Category: Planning & Design Phase - Change in land use – property values

Impact: Decrease in property values

Consequence:

Assumptions:

Neighbouring farmers expressed their concerns about the potential impact of living adjacent to a solar facility on the value of their properties. A number of aspects such as interest rates, economic conditions, climate, terrain, carrying capacity and the availability of water, amongst others, can influence the property price of farms. Impacts on property values cannot be predicted with a high level of confidence, and as such should be treated with caution. Due to the recent droughts in the Karoo, even after receiving some rain, prices remain depressed as it will take some time for the natural grazing to recover and farmers to build their herds (Kriel, 2021). A search of estate agent’s databases indicated only one or two farms for sale in the Hanover/De Aar area (Compare Private Property; AgriSell; Property24; SA Farm Traders; ReMax South Africa). No local studies could be found regarding the impact of solar farms on property prices of neighbouring properties. Local studies on the impact of wind farms on property prices indicates that there is no measurable or statistically significant effect on sales prices (Van Zyl & Kinghorn, 2022). American studies found that properties

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immediately adjacent to a solar farm may see a negative impact, but tactics to hide the solar farm from view could help offset those effects (ASFMRA press, 2021). Rich Kirkland, who has conducted more than 100 property valuation studies across 19 states concluded that: *"In rural and suburban areas, I'm not finding any consistent negative impact from solar farms as long as there's at least 100 feet between the [solar] farm and the property, and enough landscaping to hide the panels."* (ASFMRA press, 2021). In the Netherlands evidence was found that house prices within 1km of a solar farm decrease by 2-3%, but the researchers did not have a high level of confidence in their findings as there are relatively few solar farms in the Netherlands (Koster & Droes, 2020). It is therefore estimated that the proposed development will not have a significant impact on the property values, although there are many external factors that may influence this potential impact.

Impacts on property values are dependent on how the site is developed and managed to minimise negative biophysical and social impacts. The measures recommended in other specialist reports to these impacts (primarily the minimisation of visual, heritage, traffic and ecological impacts) and in this study would thus also minimise property value impacts.

Mitigations:

(1) Screening the solar facility from the neighbouring properties in a way acceptable to the landowners must be investigated and agreed to.

(2) Where the proposed solar field is directly adjacent to a neighbour's fence line there should be a buffer zone between the panels and the fence as agreed in writing between Soventix and the directly affected neighbours during the EIA process, to ensure that it is included in the EIA authorisation. Recommendations made in the Visual Impact Assessment should be considered in the discussion about and development of the buffer zone.

Management Category: Damage to Farm Infrastructure

Impact: Damage to farm infrastructure

Consequence: Economic costs in replacing damaged infrastructure.

Assumptions:

A concern is the waterflow around the wetland and the potential impact on the road.

The movement of workers and vehicles on the site could cause damage to farm infrastructure (e.g., fencing, water troughs and gates), during construction and operation.

Farm owners are concerned about the impact of fences on water flow during heavy rain. If fences are not kept clear of debris, there is a risk that it can affect the waterflow into dams in the area, which is critical in a dry area like the Karoo.

Impact mitigation

Pre-construction Phase

(1) Develop a grievance mechanism using the Grievance Mechanism Protocol (**Appendix I**).

(2) The grievance mechanism must be in place and shared with all the stakeholders before the construction commences.

(2) The grievance mechanism must include a complaints procedure that allows the landowners to log their grievance and submit a claim for damages.

(3) A protocol on compensation must be agreed upon and be in place before construction commences.

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(4) A claims procedure must be in place and shared with all the stakeholders before the construction commences.

(5) The construction teams must be educated about the impact of damages to fences, water troughs and farm gates, through toolbox talks.

Construction Phase

(6) Affected landowners must be compensated for losses resulting from any damage to farm infrastructure.

(7) Inspections of boundary fences should be done on a daily basis in areas where there are activities.

(8) All fences should be inspected and be kept clear of debris, especially in the rainy season.

Management Category: Crime and Security

Impact: Increases in stock theft and other crimes.

Consequence: Economic losses due to loss of livestock/game/property

Assumptions:

Farm safety is a concern in the rural areas of South Africa. Although there is a low incidence of farm attacks in the Karoo, farmers and farm workers are soft targets due to the isolation on farms and distance from emergency services. More people moving around in the area will make it easier for opportunistic criminals to enter the area without being noticed. Stock theft is a problem in the area, and one farmer reported that during the times that Transnet contractors work in the area they lose up to ten sheep a week. Farmers are concerned that the presence of the construction workers in the area will cause an increase in stock theft, due to people becoming aware of where the stock are kept. There is also a possibility that petty theft or opportunistic crimes can take place. The municipality indicated that general crime levels increased during the construction phases of the renewable developments around the town. The municipality reported that once the construction teams left, they perceive that there is an increase in local petty crimes such as housebreaking which they attribute to loss of income amongst some community members. There will be less people in the area during the operational phase and fewer permanent workers onsite. Theft or vandalism of the PV panels or associated infrastructure may be of some concern during the operation phase.

Mitigations:

Pre-construction Phase

(1) Soventix should become a member of existing farmers' security groups and farmers' associations.

(2) Soventix should work with landowners, existing farmers' security groups and farmers' associations to create (a) a farm access protocol for everybody that need to access the properties, and (b) a security/safety plan.

(3) The protocol on farm access must be agreed upon and be in place before construction commences.

(3) Soventix should use existing security systems, which include the use of cameras, to avoid any duplication.

(4) Soventix must meet with the landowners before the construction phase commences to formalise security arrangements.

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(5) Soventix and its contractors must develop an induction programme that includes a Code of Conduct for all workers (including sub-contractors).

(6) Any person that does any work on site must sign the Code of Conduct and presented with a copy.

(7) The Code of Conduct must include the following aspects:

- Respect for local residents, their customs and property.
- Respect for farm infrastructure and agricultural activities.
- No hunting or un-authorised taking of products or livestock.
- Zero tolerance of illegal activities by construction personnel including: prostitution; illegal sale or purchase of alcohol; sale, purchase or consumption of drugs; illegal gambling or fighting.
- Compliance with the Traffic Management Plan and all road regulations; and
- Description of disciplinary measures for violation of the Code of Conduct and company rules.

(8) If workers are found to be in contravention of the Code of Conduct, which they will be required to sign at the beginning of their contract, they will face disciplinary procedures that could result in dismissal. Stock theft should be noted as a dismissible offence.

Construction Phase

(9) A roster stating dates and approximate times that contractors will be on the farms must be given directly to affected landowners. All access arrangements should be made at least 24 hours before farm access is required.

(10) All contractors and employees need to wear photo identification cards.

(11) Vehicles should be marked as construction vehicles and should have Soventix, or the contractor's logo clearly exhibited.

(12) Entry and exit points of the site should be controlled.

(13) Areas where materials are stockpiled must be fenced.

(14) If a security company is used, their schedules should be communicated to the landowners.

Management Category: Poaching

Impact: Poaching

Consequence: Economic losses due to loss of livestock/game/property

Assumptions:

There are concerns that poaching incidents may increase, especially when the fencing is erected and when a number of construction teams are active in the area.

Mitigations:

Pre-construction and Construction Phases

(1) Soventix must have a zero-tolerance policy regarding poaching, and make it clear what the punishment and consequences would be.

(2) All poaching incidences must be reported to the local police.

Management Category: Layout and Design - Installing Perimeter Fence and Access Control

Impact: Large antelope can get trapped inside the fenced area and smaller animals such as tortoises could get trapped along the fence line.

Consequence: Loss of wildlife, damage to property.

Assumptions:

There are game on the directly affected and neighbouring properties. The noise of construction activities may keep the animals away from the construction site, but during operation when the site is quieter it may become a risk if a large antelope is trapped inside the fenced area.

Mitigations:

Construction Phase

(1) Ensure large animals are not trapped inside the fenced PV blocks.

(2) Inspections of boundary fences should be done on a daily basis.

Management Category: Safety

Impact: Workers on site may be at risk to stray bullets or hunting accidents.

Consequences: Loss/injury to personnel.

Assumptions:

Another safety concern is the hunting activities that take place on the adjacent farms. Although hunting is allowed throughout the year, hunting activities peak in the winter. With people permanently stationed on the Solar PV plant, there is a risk that they may be in danger from stray bullets or hunting accidents. High calibre guns are used for hunting, especially for bigger game.

Mitigations:

Pre-construction Phase

(1) Soventix must develop a protocol regarding hunting activities on neighbouring properties together with the owners.

(2) Soventix must be informed about any planned hunting activities at least 48 hours before it commences.

Communication strategy

(3) Soventix should check in with the direct neighbours once a month to ensure all grievances are dealt with and that the different parties remain informed about any planned activities.

Management Category: Loss of livestock

Impact: Farm gates being left open, or not being closed properly by construction teams.

Consequence: Loss of livestock

Assumptions:

There is a risk of stock loss due to farm gates being left open, or not being closed properly by construction teams.

Mitigations

Pre-construction Phase

(1) The construction teams must be educated about the closing/locking farm gates, through toolbox talks.

Construction Phase

(2) Inspections of boundary gates should be done on a daily basis in areas where there are activities.

(3) Affected landowners must be compensated for their losses if any livestock losses occur.

(4) Develop a grievance mechanism and a complaints procedure that allows the landowners to log their grievance and submit a claim for damages.

Management Category: Safety

Impact: During the clearing of the site this may pose a risk to the workers and during the operation there may also be snake encounters.

Consequence: Loss/injury to personnel.

Assumptions:

There are venomous snakes, and during the clearing of the site this may pose a risk to the workers. There is always a risk of snakes in the area and during the operation there may also be snake encounters.

Mitigations:

Pre-construction Phase

(1) Workers and contractors must be educated about safety aspects in areas where there are wild animals. This could be done through toolbox talks.

(2) At least one person on site needs to be trained to relocate venomous snakes.

(3) The person responsible for first aid must be trained in dealing with snake bites.

Management Category: Concerns about social disturbance and community safety

Impact: Vulnerable group's susceptible to negative influences in society such as prostitution, relationships with minors, alcohol and drug abuse, gambling and fighting due to the presence of people from outside the area.

Consequence: Higher rates of crimes, HIV rates.

Assumptions:

In a 2004 study it was found that in De Aar, 120 out of every 1 000 (12%) children starting school showed some sign of being touched by Foetal Alcohol Syndrome Disorder (FASD). This is the highest rate in South Africa (Urban et al, 2008). South Africa has the highest FASD in the world. Many of the children also showed signs of malnutrition (Olivier et al, 2016). FASD may lead to primary disabilities such as intellectual disability, learning difficulties, poor impulse control, problems with attention, memory loss, social perception, reasoning and using judgement, cognitive processing, mathematics and language deficits, and developmental lags. Some secondary disabilities also associated with FASD include mental health problems, disrupted school experience, trouble with the law, custody, inappropriate sexual behaviour, and alcohol/drug problems (Streissguth et al, 2004). This means that a significant part of the population of De Aar can be seen as a vulnerable group susceptible to negative influences in society.

Safety concerns mentioned by people from Hanover and De Aar include social ills such as prostitution, relationships with minors, alcohol and drug abuse, gambling and fighting due to the presence of people from outside the area.

The municipality indicated that people coming from outside the area to work in the existing solar projects had a definite impact on the community. Different value systems lead to changes in behaviour, such as taverns being open on Sundays, sexual assaults, and an increase in the HIV rates. This may be a perception, as these aspects has been present in the community for a long time, but it must be acknowledged that these social ills are typically associated with an influx of people because of development. A massive influx of people is not expected, since there should be some skilled labour in the area as a result of the other solar projects that have been established in the last few years. However, if the number of solar developments in a 30 km radius of the proposed development are all constructed at the same time, there may be cumulative impacts.

A significant impact on basic services such as schools, health care, sanitation, and other municipal services are not expected due to the fact that a small number of temporary workers will enter the area for a limited period. The municipality indicated that there is a shortage of housing at the moment.

The grievance mechanism must be communicated to the affected communities. It is imperative for Soventix and the municipality to have a good relationship, since the parties will need each other to ensure that societal impacts can be mitigated.

Mitigation:

Pre-construction Phase

(1) Develop an induction programme that includes a Code of Conduct for all workers (including sub-contractors). The induction programme must include HIV/AIDS awareness, substance abuse programmes and education about alcohol abuse and gender-based violence.

(2) Any person that does any work on site must sign the Code of Conduct and presented with a copy.

(3) The Code of Conduct must include the following aspects:

- Respect for local residents, their customs and property.
- Respect for farm infrastructure and agricultural activities.
- No hunting or un-authorised taking of products or livestock.
- Zero tolerance of illegal activities by construction personnel including: prostitution; illegal sale or purchase of alcohol; sale, purchase or consumption of drugs; illegal gambling or fighting.
- Compliance with the Traffic Management Plan and all road regulations; and
- Description of disciplinary measures for violation of the Code of Conduct and company rules.

(4) If workers are found to be in contravention of the Code of Conduct, which they will be required to sign at the beginning of their contract, they will face disciplinary procedures that could result in dismissal. Stock theft should be noted as a dismissible offence.

(5) Establish a grievance mechanism. The grievance mechanism must be communicated to the affected communities.

(6) Appoint a community liaison officer that the community can access easily.

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Management Category: Economic opportunities - Employment of labour

Impact: The proposed project will create positive economic impacts in the area. The most direct impact on a community level is job creation.

Consequence The increase in disposable income (via the project workers) will result in increased demand for goods and services, and greater spending within the local community.

Assumptions:

Soventix assume that there will be 650 construction staff during peak construction and 55 staff during operation.

Although the construction phase jobs are temporary and will not contribute to the unemployment levels in the long term, it would have a significant positive impact on the short term. The increase in disposable income (via the project workers) will result in increased demand for goods and services, and greater spending within the local community. Local businesses confirmed that during the construction of previous renewable energy facilities there was a definite positive economic impact in the town. Some of the positive impacts remained present, as a business owner reported a 40% increase of business, despite the recession.

However, with an increase in economic activity from a boom-bust cycle created by construction events there are inherent risks. A local businessman explained that during the construction phase for another renewable energy facility there was an increase in eateries opening in De Aar. Lots of people applied for restaurant licences, but most places have subsequently closed. The sustainability of businesses created during boom periods must be ensured and prospective first-time business owners must be educated about the potential risks with opening a business.

It can be anticipated that there are semi-skilled and unskilled labour present in the area that has experience of construction work during the establishment of the existing solar farms in the area. The municipality noted that they feel that the skills transfer from renewable energy companies up to now has been limited, and they would like to see more skills transfer programmes on a local level.

Apart from the direct employment opportunities, there will also be significant indirect economic opportunities for local entrepreneurs. Opportunities include transport, fencing, road maintenance, accommodation, meals, and laundry services.

Mitigations

Pre-construction Phase

(1) As far as possible local labour must be used for the project. Local labour must be prioritised. The definition of “local” must be clarified with the affected stakeholders.

(2) Soventix must develop a recruitment policy and liaise with the Local Economic Development section of the municipality, local leaders, and NGOs during its development to ensure it is in line with the local practices and taps into existing knowledge.

(3) The recruitment policy must set reasonable targets for the employment of local people and women. Soventix and the municipality should identify these targets before recruitment commences.

(4) If there is a need for transferable skills, Soventix must ensure that people get on the job training as far as possible.

(5) A skills development project where skills required for renewable energy and the Fourth Industrial Revolution are taught locally must be considered.

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(5) Soventix must provide the local municipality with a list of skills required before the construction period commences, and the municipality must distribute the list to all stakeholders to allow them to prepare for the opportunities.

(6) All labour opportunities must be accessed through a labour desk in town, and no recruitment must be allowed on site.

Management Category: Indirect economic opportunities – procurement policy

Impact: Economic benefits may not be achieved by local residents/service providers.

Consequence: Limited real benefits to local communities.

Assumptions:

Apart from the direct employment opportunities, there will also be significant indirect economic opportunities for local entrepreneurs. Opportunities include transport, fencing, road maintenance, accommodation, meals, and laundry services. Several people reported that they established businesses that provide services to the renewable sector and has benefitted from the presence of these facilities in the area. The highly skilled technical people will need accommodation and other hospitality services while they reside in the area during the construction period. Some of the adjacent farms offer accommodation, which may be a viable option for some of the workers. Whilst some of the technical jobs need highly skilled people that are not available locally, service providers must make use of the secondary opportunities that are available locally.

Mitigations:

Pre-construction Phase

(1) Soventix must develop a local procurement policy.

(2) The specialised equipment needed for the project will not be available locally, but as far as possible everything else must be procured locally. Local procurement must be prioritised.

(3) Workers from outside the area must be provided with a list of local service providers for their accommodation and other social needs.

(4) People that provided services to other solar farms in the area should be offered an opportunity to put their names on a list at the municipality to ensure that Soventix is aware of the available resources.

Management Category: Enterprise development – community trust and CSR

Impact: Economic benefits may not be achieved by local residents/service providers.

Consequence: Limited real benefits to local communities.

Assumptions:

The Department of Energy (DoE), through the RFP document, requires that all renewable energy bidders must illustrate how the Project will benefit the local community. At present, the DoE is stipulating that one percent of revenue generated by the project must be contributed towards socio-economic development. In accordance with the relevant BBBEE legislation and guidelines, up to four percent of profit after tax could be used for community development over and above that associated with expenditure in the area. The BBBEE Scorecard specifies the following contributions (totalling four percent):

- Enterprise development – maximum of 15 points awarded for the contribution of three percent of profit after tax, or more; and
- Socio-economic development – maximum of five points awarded for the contribution of one percent of profit after tax, or more.

If these contributions are realised, the project has the opportunity to make a real difference in the local community. Between NGOs that serve the interest of the community as a whole and the municipality Soventix can be assisted with identifying worthwhile projects that will be sustainable and lead to direct local benefits in the communities that will be affected by the project.

Mitigations:

Pre-construction Phase

(1) It is recommended that Soventix establish a community trust.

(2) The final percentage contribution to the trust could only be calculated upon finalisation of the feed-in tariff as part of the Power Purchase Agreement, which is assumed not to be calculated at the time of writing of this report.

(3) The trust should be administered by a board comprising a range of representatives including representatives from the local community.

(4) The structure and operational objectives of the Community Trust should be determined at the time. It is envisaged that the development objectives/ projects identified and supported by the trust will be identified in collaboration with the local municipality, community representatives and NPOs in the area.

(5) Projects should be aligned with key needs as identified in the municipal Integrated Development Plan (IDP) and with input from local NPOs to ensure benefits are locally relevant.

(6) The renewable facilities in the area should combine their efforts and contributions to socio-economic and enterprise development to make a bigger positive impact instead of diluting the impact with small, unrelated projects.

(7) Soventix must consider the recommendations regarding Corporate Social Responsibility (CSR) projects (**Appendix G**)

Management Category: Visual – Sense of place

Impact: Decrease in the “sense of place” as it relates to noise, visual and light pollution.

Consequence: Lower aesthetic values enjoyed by the community.

Assumptions:

There is a strong sense and spirit of place associated with the Karoo landscape. The surrounding farms are used for sheep farming, game farming and hunting. The current residents and farm owners have a strong sense of place associated with the farms. Many things can impact on a person’s perception of sense of place. Farms are generally noisy places if one considers animal-sounds and farming activities. From the receptors’ perspective, this kind of **noise** is acceptable and even attractive, because this is what living on a farm is all about. Noises such as alarms and reverse hooters are not “normal” and disturb the sense of place and the value that people place on the auditory environment. Although lights are used as a security measure on farms, one of the things people values is the absence of **bright lights** and that they can see the stars. Lights for any other use than lightening up their direct environment is seen as invasive and disturbs the sense of place.

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Visual aspects are an important consideration in the experience of sense of place. If people are used to unspoiled vistas, or seeing open fields, the establishment of any buildings or infrastructure that they feel do not belong there can alter their sense of place. Sense of place refers to an individual's personal relationship with his/her local environment, both social and natural, which the individual experiences in his/her everyday daily life (Vanclay et al, 2015). It is highly personal, and once it is affected, it cannot be restored. It is also difficult to quantify. Part of the sense of place is the emotional attachment that the farmers have to their properties, and the hopes that they have for it to serve future generations (their children).

The spirit of place associated with an area is an important factor in tourism and hunting and the marketing of these activities. Spirit of place refers to the unique, distinctive, and cherished aspects of a place. Aspects that will impact on the sense and spirit of place include an increase in noise and activity levels from construction activities, but this will be a temporary impact during the construction phase. The construction phase will see a total transformation from the current setting and landscape of the proposed site. It is inevitable that the visual impact during the construction phase will be affected by dust, increase in vehicle traffic and other construction activities. Potential visual impacts caused by construction activities will include the visual changes brought about by clearance of vegetation for the solar arrays, ancillary buildings, and laydown areas; visual disturbance caused by construction of roads, buildings, energy collectors, power lines, increased traffic (and number of large vehicles), worker presence and activity, and dust emissions. Other visual disturbances may include soil stockpiles (from excavation for building foundations and other structures), soil scars, as well as potential for invasive plant species to develop on disturbed soils and soil stockpiles, which may contrast with existing vegetation.

During the operational phase, visual impacts such as glare from the solar panels, buildings, power lines, lack of vegetation and light at night will also impact on the sense and spirit of place and will be an impact as long as the plant is operational. Modern solar modules are designed to absorb the solar radiation and hence are not susceptible to reflection or glinting. Nonetheless, the contrast between the solar arrays and surrounding vegetation will exist, in colour, form, line and texture. The impact of lights in a dark rural area known for its beautiful night sky is a special concern of landowners. Although the preferred site may not influence the sense of and spirit of place of the Karoo as such, it will have a significant impact on the sense and spirit of place of the direct neighbours.

Although there is visual and biodiversity impact assessment reports that suggest mitigation, it must be acknowledged that the sense of place will be altered permanently and given the personal experience of this impact from some stakeholders, successful mitigation is extremely hard to do. In the eye of the affected parties the only thing that will not alter the sense and spirit of the place in this instance is to avoid any further development.

Mitigations:

Planning & Design Phase

(1) Screening the solar facility from the neighbouring properties in a way acceptable to the landowners must be investigated and agreed to.

(2) Where the proposed solar field is directly adjacent to a neighbour's fence line there should be a buffer zone between the panels and the fence as agreed in writing between Soventix and the directly affected neighbours during the EIA process, to ensure that it is included in the EIA authorisation. Recommendations made in the Visual Impact Assessment should be considered in the discussion about and development of the buffer zone.

(3) Construction of new roads should be minimised, and existing roads should be used where possible.

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Pre-construction Phase

(4) Develop a grievance mechanism and appoint a contact person that can deal with enquiries from local residents.

Construction Phase

(5) Dust suppression measures must be implemented when required.

(6) Residents near the development site should be notified 24 hours prior to any planned activities that will be visible.

(7) Demarcate construction boundaries.

(8) Minimise areas of surface disturbance.

(9) Night lighting of the construction sites should be minimised within requirements of safety and efficiency.

Rehabilitation

(10) Sense of place is a personal experience, but successful rehabilitation will go a long way in recreating a rural sense of place.

Management Category:

Impact: The proposed project will generate renewable energy that will feed into the national electricity grid. This is in line with the National Development Plan and sustainable development. As such it is a positive impact.

Mitigation

This is a positive impact, and no mitigation is required. Local benefits will enhance the positive effects.

Management Category: Cumulative Impacts – Social Ills

Impact: Cumulative social impacts as it relates to social ills such as increases in crimes, theft, HIV rates, unemployment levels etc.

Consequences: Increases in HIV rates, crimes.

Assumptions:

The social impacts do not occur on the sites, but in the communities around the sites and in the towns closest to the sites.

Although municipal services are not currently under pressure, the development of a few renewable facilities within a short period of each other may cause pressure on these services in future. The municipalities depend on borehole water, which may run out and is only available when there is electricity available to run the water pumps. There is a current shortage of housing which will get worse should the area are exposed to a boom cycle of development. It must be acknowledged that it is almost impossible for the proponent to control the cumulative social impacts in the neighbouring towns. Therefore, it is important that the proponent have a good working relationship with the local authorities, and that they mitigate the impacts that they can control, as suggested in the Social Impact Management Plan (SIMP). Implementing the Corporate Social Responsibility (CSR) strategy will also assist with mitigating and managing cumulative impacts in the broader community.

Mitigations:

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(1) The management of cumulative impacts must be a joint effort between Soventix, other players in the renewable energy field and the local and district municipality.

(2) Implement the Social Impact Management Plan during all phases of the project (**Appendix J**).

(3) It is recommended to invest in the development of SMME's or create a business incubator.

(4) It is recommended to assist with the development of skills required in the construction and management of renewable energy facilities.

(5) It is recommended to provide in-service training for candidates with potential.

(6) It is recommended to invest in solar energy in the town, e.g., for water pumps and other municipal infrastructure.

(7) It is recommended to encourage local manufacturing and maintenance service providers.

(8) It is recommended to become part of the community police forum and invest in security measures such as cameras and lights.

(9) It is recommended to create a renewable energy forum that meets on a quarterly basis. Discuss potential projects and alignment between different parties in this forum.

(10) It is recommended to discuss and develop social plans in conjunction with the municipality.

(11) It is recommended to discuss siting of construction camps with the town planning teams of the municipality and pool resources to ensure sustainability.

Management Category: Pre-construction and Construction Phases - Change in land use – livelihoods

Impact: The construction of a solar electricity generating facility and its associated infrastructure will lead to a change of land use and livelihoods.

Consequence: Change of land use can potentially impact negatively on the livelihood of the affected farmer, which is sheep farming.

Assumptions:

Although it will be a hybrid agrivoltaic system, fewer grazing areas may require the farmer reduce his herd size (production rates), which would impact negatively on his livelihood. It is possible for sheep to graze in between the solar panels, but to achieve that the farmer would need more labour than he is currently using. The reason for this is that he would need to divide his flocks and have them graze in separate areas. This entails the movement of the flock between camps and managing of the flock in the solar area. While it is true that the landowner will lose productive grazing areas, it must be considered that he will be compensated for the use of the land through a commercial transaction with Soventix. This should allow him to find an alternative source of grazing, either by buying or renting additional land. In addition, the design of the solar farm is such that the land will still be used for grazing purposes.

Changing the land use means that the land in question must be rezoned from agricultural to renewable energy infrastructure (Draft ELM Land Use Scheme, 2021). This has tax implications for the farmer, as taxes on renewable energy infrastructure is higher than taxes on agricultural land. Neighbouring farmers are also concerned that their property tax may be increased due to the development. The increase in his taxes should also be considered in the renting transaction.

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Farmers are also concerned about the impact of the quality of the roads on their quality of life and ability to transport their goods.

During the construction phase all livestock would need to be moved to different parts of the farm as the construction activities may be distressing for the animals. This is also the case with game, but it is not that easy to move game around on the farms. Farmers indicated that they would not be able to introduce new game on their properties during the construction phase due to the sensitivity of game to environmental factors such as noise and constant movement. Construction traffic may impact on the movement of the livestock around the farm.

Mitigation:

(1) Livestock must have right of way.

(2) Construction vehicles must wait for the animals to cross before they continue with their journey.

(3) The contractor must compensate the farmer for any losses of livestock due to irresponsible behaviour by the construction teams.

(4) A protocol on compensation must be agreed upon and be in place before construction commences.

(5) A claims procedure must be in place and shared with all the stakeholders before the construction commences.

Management Category: Traffic and Road Management

Impact: Stakeholders are concerned about the quality of the roads, increases in traffic and traffic safety.

Consequence: Increase in accidents, longer time periods in transportation of goods.

Assumptions:

During the dry season the area is very dry and dusty. During the wet season, the roads can become muddy, and vehicles can get stuck easily. The access road is used by a number of farmers in the area to access their properties. It also traverses or is adjacent to some of the neighbouring properties. The construction phase will generate significant additional traffic on the roads – just the transport of the workers will mean two trips per day, and then the delivery of construction material and management activities must also be considered. At the moment the local farmers do a lot of the road maintenance. They are concerned about the condition that the road will be in after the construction period.

Another concern is the generation of dust. Although the proposed site is far from any communities, it is relatively close to some of the farmers, but the biggest concern is the impact that the dust will have on the quality of the grazing. Farmers acknowledge that the dust will be washed of by rain, but it is an arid area with relatively low rainfall in general. The municipality indicated that the road infrastructure in town started deteriorating when the first renewable projects started in the area.

It is acknowledged that Soventix will not be the only road user, but it must be considered that their presence will add significant wear and tear to the road.

Impact mitigation

Pre-construction Phase

(1) Soventix must contribute to the maintenance of the roads for the life of the project.

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(2) An agreement must be formalised between Soventix and the parties currently responsible for road maintenance.

(3) Soventix must have a Traffic Management Plan to address the flow of traffic, including such aspects as speeding, driving while tired, transport of passengers, driving on un-tarred roads and general road safety.

(4) A protocol on road maintenance must be agreed upon and be in place before construction commences.

(5) Aspects of the Traffic Management Plan must be included in the induction of workers.

(6) If possible, local service providers must be used for road maintenance and dust suppression activities.

Construction Phase

(7) Dust suppression measures must be implemented when required but taking cognisance of water scarcity.

(8) Vehicles must be clearly marked, and the necessary road signage must be erected on the affected roads to warn road users about the construction activities and traffic.

Conclusions and recommendations

None of the social impacts identified are so severe that the project should not continue. Based on the findings of this report, it is recommended that the project continues, on the conditions that the mitigation measures are implemented.

Based on the findings of this study, the following key recommendations are made:

- Mitigation about safety and security must be implemented as soon as construction commences. The process must involve local security groups and landowners.
- A community liaison officer that is trusted by the community and has the necessary skills must be appointed before construction commences.
- Protocols on farm access, compensation, communication, and road maintenance must be agreed upon and be in place before construction commences.
- The social plans for the facility must be generated with input from the local municipality and other key stakeholders.
- A grievance mechanism and claims procedure must be in place and shared with all the stakeholders before the construction commences; and
- Economic benefits must be enhanced, and local labour and procurement should be prioritised.

Visual Scoping Assessment Report

The following is taken out of the *Visual Scoping Assessment Report (Final v_2) dated 19th September 2022 prepared by Stephen Stead of Visual Resource Management Africa cc* attached as **Appendix E: Annexure A**

Identified impacts

Landscape features and receptors flagged by the visual specialist during the Scoping Phase:

1. Proximity to ridgeline features and areas of prominence that add to the medium to high levels of local Scenic Quality.
    a. Avoidance (No-go): setback that excludes the eastern area adjacent to the locally prominent ridgeline feature.
    b. Reduction: Powerline pylons should not as far as is practicable be located on top of a ridgeline.
2. Neighbours who are sensitive to landscape change; receptor sensitivity to the landscape changes to the existing rural agricultural landscape character, particularly by neighbouring landowners located to the north- and south-east of the development site.
3. Massing effects created by large scale coverage or expanses of solar PV panels in a rural agricultural landscape setting with medium to high levels of Scenic Quality/A large-scale project creating long lines of PV that wrap over prominent landform would degrade local landscape resources in this rural landscape.
4. Light trespass or spillage from poor outdoor lighting shines onto neighbours' properties giving the area an unattractive, trashy look.
5. Light directed uselessly above the horizon creates murky skyglow - the "light pollution" that washes out our view of the stars.
6. Distracting glare (light that beams directly from a bulb into your eye) hampers the vision of pedestrians, cyclists, and drivers.
7. Lights at night have the potential to significantly increase the visual exposure of the proposed project.
8. Energy Waste

Other Renewable Energy Projects

Numerous other renewable energy projects are in the region around the town of De Aar (**Figure 15**). The only project listed on the DFFE database is 12/12/20/2258/4, referring to the Soventix PV Phase 1 that has status Authorised but remains unbuilt. This project is located 3km to the southwest of the Phase 3 study area, and with a low ridgeline separating the two projects, therefore massing effects from multiple PV project visible from a single location is reduced. Located directly to the southwest of the study area, the Soventix Phase 2 assessment is also being undertaken. Due to the close proximity of the two projects, a wrap over visual effect could transpire if located in close proximity, increasing potential for visual intrusion as the two projects will be viewed as a single element in the landscape. The ridgeline location between the two projects does create the opportunity to allow for visual buffering, and this would need to be addressed in the VIA phase. The cluster of PV projects around the town of De Aar to the northwest of the project are located further than 12km were the intervisibility would not take place. Also located in the landscape and visible from the property, are the wind farm lights at night. Set in the background, this effect is limited and as PV does not require Aircraft Warning Lights at Night (ALW), intervisibility of lights at night is likely to be a limited effect. To reduce localised massing effects from the authorised Soventix PV Phase1 and Phase 2 (in assessment), buffers between the different projects should be maintained, especially on more prominent areas.

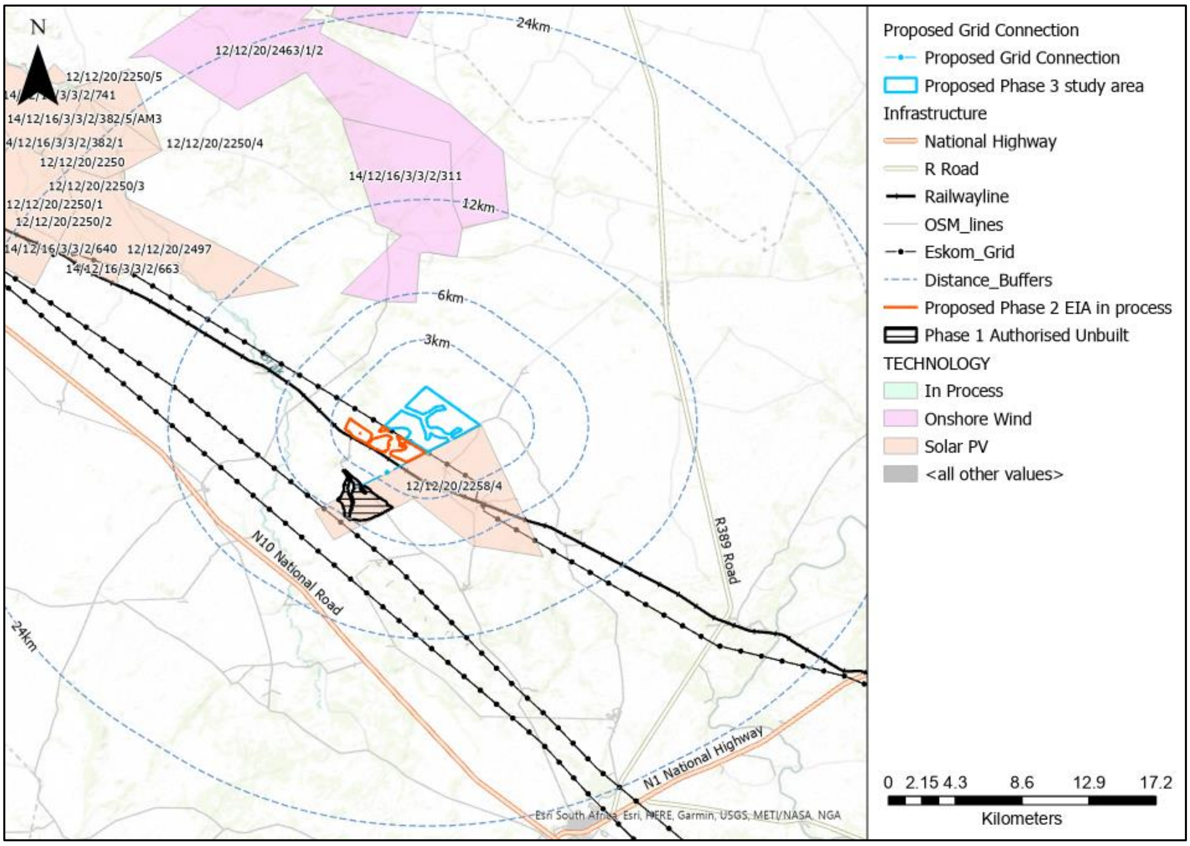


Figure 15. Map depicting DEA Renewable Energy project status.

Mitigation Measures to be included in EMPr:

It is the recommendation that the proposed development should commence WITH MITIGATION for the following key reasons:

- Moderate Zone of Visual Influence with no tourism activities or tourist view-corridors.
- The area is remote, with few receptors were identified, but two adjacent farms have indicated sensitivity to landscape change.
- Wide buffer areas and fragmented design elements have been utilised to reduce the massing effects of a single large area PV blocks. Four smaller PV Blocks with wide corridors between them reduce visual intensity to some degree.
- Intervisibility between the Phase 1(Authorised unbuilt) and Phase 2 (in assessment process) is limited by making use of topographic elements to reduce visual prominence. The low ridgeline between the proposed Phase 2 and Phase 3 would assist in reducing intervisibility between the two PV projects.
- Due to the remote locality, Medium to High Post Mitigation Impacts are likely where residual effects could degrade *local* landscape resources.

The visual recommendations from the scoping phase reporting were all incorporated into the layout design, accommodating a wide buffer on the adjacent properties, as well as accommodating wide ecological corridors between the four PV blocks. While the local sense of place will be modified, the impacted visual resources are localised to some degree and are not highly significant such that a No-go Option would be preferred. Goede Hoop Farmstead *could* experience partial views of the panels at 4.5 km (the dwelling is at the fringe of the viewshed analysis), with direct views from Skilpadskuil Farmstead screened by local vegetation. As such, the Preferred PV development option is recommended with mitigation.

It is important to note that should the project be authorised, the Relevant Authority would need to recognise that the existing Medium to High levels of Scenic Quality of the locality would be degraded in the Foreground distance area around the PV site, with potential for further degradation should PV development become more established in the area.

Policy Fit	**Medium**
In terms of regional and local planning, the **expected visual/ landscape policy fit of the landscape change is rated Medium**. Local and District Municipality guidelines are in favour of Renewable Energy (RE) for economic development opportunities. Planning also emphasises the value of eco-tourism, but no tourism activities were located within the project Zone of Visual Influence (ZVI). The limitation to planning is that the project does not fall with a REDZ, where RE development is encouraged. The area is rural and remote, where the large scale semi-industrial type development has the potential to degrade the existing Medium to High levels of scenic quality.	

Methodology	**Bureau of Land Management's Visual Resource Management (VRM) method**
The methodology for determining landscape significance is based on the United States Bureau of Land Management's Visual Resource Management (VRM) method (USDI., 2004). This GIS-based method allows for increased objectivity and consistency by using standard assessment criteria to classify the landscape type into four VRM Classes, with Class I being the most valued and Class IV, the least. The Classes are derived from Scenic Quality, Visual Sensitivity Levels, and Distance Zones. Specifically, the methodology involved: site survey; review of legal framework; determination of Zone of Visual Influence (ZVI); identification of Visual Issues and Visual Resources; assessment of Potential Visual Impacts; and formulation of Mitigation Measures.	

Zone of Visual Influence	**Local region**
The visible extent, or viewshed, is "the outer boundary defining a view catchment area, usually along crests and ridgelines" (Oberholzer, 2005). In order to define the extent of the possible influence of the proposed project, a viewshed analysis was undertaken from the proposed site at a specified height above ground level (**Figure 16**). The viewshed is most pronounced towards the north, and within 6km of the site, beyond which topographical screening reduces the viewshed to isolated, high points. The viewshed extends up to 24km in westerly and south-westerly direction, albeit at a lower frequency. The site will not be visible from the N1 National Highway, nor the R389 regional road to the east. It will, however, be visible at a low frequency, from the N10 National Road for roughly 15km of its length. The corridor between the N10 and the site, however, is also occupied by three Eskom powerlines, which would further mitigate the visual influence of the facility.	

With the location of the PV panels in lower lying areas (not wrapping over prominent topography), and with a visual set back from the concerned receptor borders, the viewshed is reduced to some degree, especially at the local level where the viewshed is more fragmented, and less likely to have incidence with the concerned receptor's dwellings (**Figure 17**).

Without mitigation, both the concerned neighbour dwellings are likely to have Mid-ground views of the PV panels, but with mitigation, this effect is reduced and there would be more fragmented views around the dwellings and along the access roads. Goede Hoop Farmstead could have partial views of the panels at 4.5km, with direct views from Skilpadskuil Farmstead screened by local vegetation.

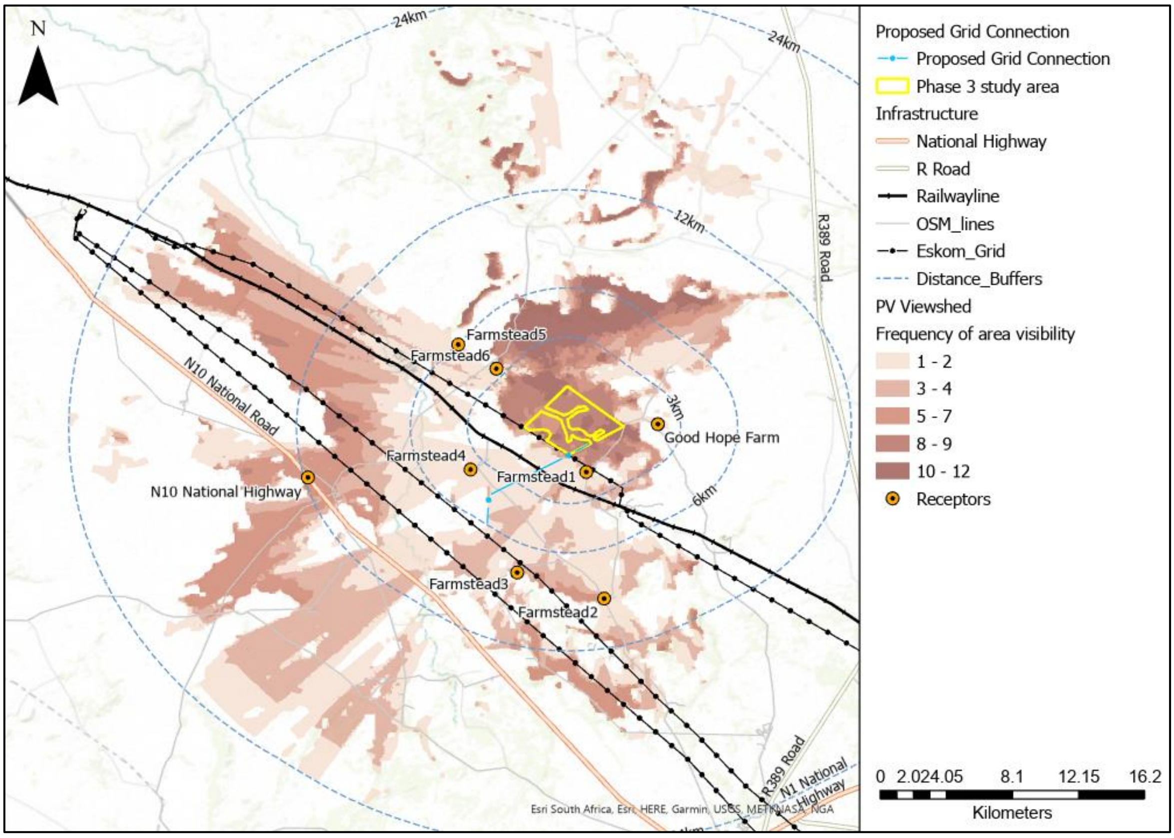


Figure 16. Viewshed analysis with receptor locations.

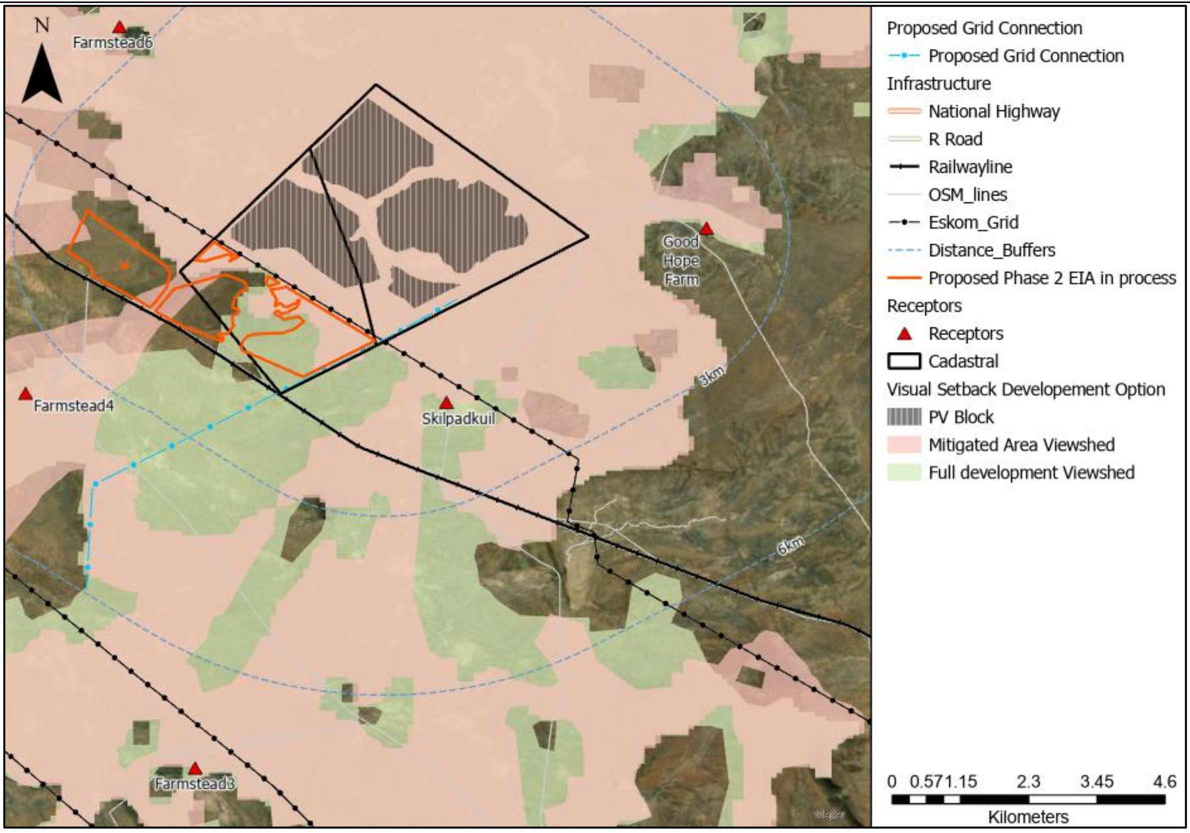


Figure 17. Un-mitigated compared to mitigation viewshed area.

Receptors and Key Observation Points	**8 Receptors and 3 Key Observations Points (no tourism of tourism road view corridors)**
Key Observation Points (KOPs) are the people (receptors) located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape modifications are proposed. The viewshed analysis found three KOPs (rural farmsteads) located within the project ZVI, namely "Good Hope Farm," "Farmstead 1," and "Farmstead 6." Preliminary discussions with some of the neighbouring property owners indicated High levels of sensitivity to landscape change and concerns regarding loss in property value with the potential development of three PV projects in the vicinity. While the N10 does fall within the viewshed, the Low level of exposure would reduce the visibility of the proposed landscape change as seen from this receptor. As such, it was not defined as a Key Observation Point.	

SCENIC QUALITY	**Medium to High**
Adjacent scenery is rated medium to high due to the undulating karoo landscape that includes low hills and wide valleys where a clear absence of manmade modifications enhances the visual quality of the locality. Landscape Scarcity is rated medium as the scenic quality of the landscape with its distinctive colour is similar to the surrounding landscape within the region. As there are no dominating manmade modifications in the landscape, the category for Cultural Modification is rated as a positive landscape element as the existing rural agricultural land uses favourably enhance visual harmony and add to the Medium to High levels of Scenic Quality.	

RECEPTOR SENSITIVITY TO LANDSCAPE CHANGE	**Medium to High**
Maintenance of visual quality to sustain adjacent land uses is rated Medium to High as eastern property owners have indicated concern regarding the semi-industrial type of development in a deep rural setting. The maintenance of visual quality to sustain special area management objectives is rated Medium as the area is zoned for agriculture and is not located within a REDZ area. The area also has Medium to Higher levels of scenic quality that add to the local landscape character, with the proposed development likely to result in a strong change to the sense of place. The letters from the I&APs indicating concern for their adjacent property values are listed in the Comment and Response Report.	

Visual Resource Management (VRM) Assessment

The BLM has defined four Classes that represent the relative value of the visual resources of an area and are defined making use of the VRM Matrix:

i. **Classes I and II** are the most valued

ii. **Class III** represent a moderate value

iii. **Class IV** is of least value

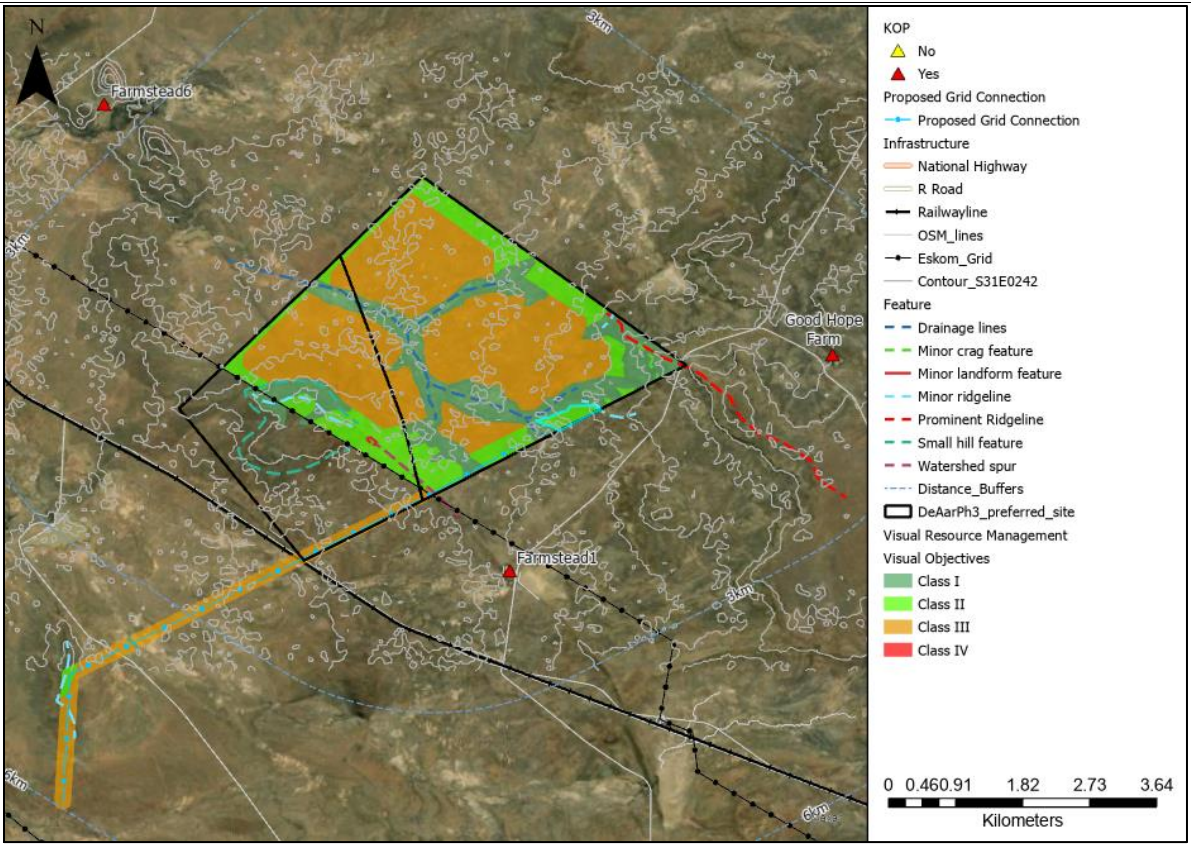
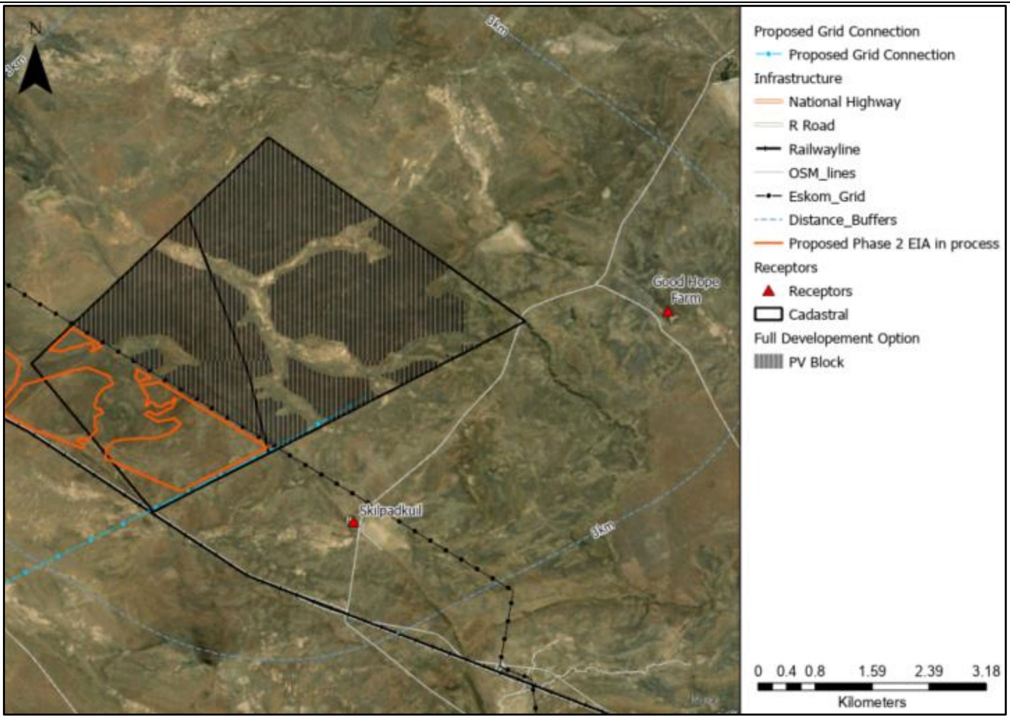


Figure 18. Detailed Visual Resource Management Classes map updated with ecological setback areas.

Class I	• Any river / streams and associated flood lines buffers identified as significant in terms of the WULA process.

These areas are not suitable for development (with the exception of roads, power lines, underground pipelines and underground cables)	• Any wetlands identified as significant in terms of the WULA process. • Any ecological areas (or plant species) identified as having a high significance. • Any heritage area identified as having a high significance.
Class II (Visual sensitivity and massing buffers, and SSV setbacks) **This area is not suitable for development (with the exception of roads, fences, underground pipelines and cables, the powerline and quarry).**	• Visual sensitivity and massing buffers, and SSV setbacks for ridgelines and steep slopes
Class III (low-lying grasslands) **This area is suitable for development with height mitigation.**	• Lower lying topographic areas defined as grasslands
Class IV (not applicable)	• As the area is zoned agricultural and located adjacent to an area that does have scenic value and could carry tourist receptors in the area region, no Class IV areas were defined.

EXPECTED Impact significance	
High (without mitigation)	Without mitigation the proposed development is likely to result in Strong levels of visual contrast and will exceed the carrying capacity of the rural landscape, degrading the Medium to High levels of Scenic Quality. As the area is not within a REDZ, massing effects resulting from multiple large scale semi-industrial projects could significantly degrade the current rural sense of place.

	 **Figure 19.** Full development option (without visual setbacks). Without visual mitigation and the development of all the areas, except those set aside for maintaining ecological integrity, the contrast generated from Form, Line, colour and Texture is rated Strong. As seen from the areas adjacent to the development at similar terrain elevation, the 4 m PV panels located 30 m from the boundary will create a wide rectangular form for almost 3 km along the north-eastern border, the vertical units of the panels creating Strong vertical line contrast as well as Strong contrast from texture and colour. The sections of the property within close proximity to the development will become degraded with a long-term, semi-industrial sense of place well established. Views from southern elevated viewpoints on the neighbouring properties will depict a large massing effect, with a visual link to the proposed Soventix PV Phase 2 site to the southwest of the development, increasing the visual massing effect from the wrap-over PV panels.
Medium to High (with mitigation)	With mitigation, the visual intrusion of the proposed semi-industrial landscape can be moderated to some degree, with the ZVI contained to lower lying, less prominent areas of the study area with suitable buffers on eastern property boundaries. The change to the current sense of place will be strongly experienced by the adjacent non-developing property owners, resulting in some local landscape degradation.

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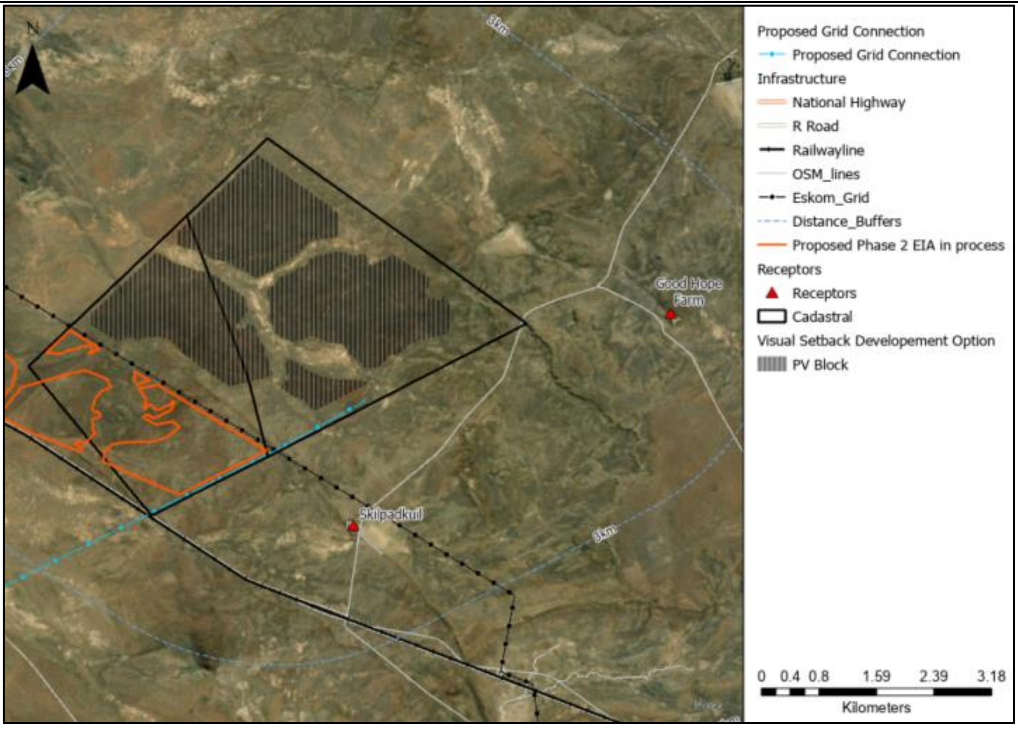

Figure 20. Visual setback development option.

With mitigation and the incorporation of a 250m buffer from the two southern neighbouring properties, the Form effect from the 4m PV panels will be reduced and take on less of a dominating 3D effect. While line contrast is still likely to be Strong and dominating, the Colour and Texture will also be slightly reduced. A key factor of the setback is that the massing effect of the PV development is broken up into four distinct blocks, with the interior lines following the organic pattern of the defined ecological corridors. The long 3 km wall of PV effect created by the full development option, as seen from the north-eastern receptors, is also broken by a 700 m ecological setback area and the eastern extent of the PV pushed back from the raised ridgeline located to the east of the property. A roughly 400 m buffer between Phase 3 and Phase 2 is created, with the low topographic ridgeline located between the two development areas used for topographic screening of Phase 2 development, thus further reducing the massing effect from intervisibility of the two PV projects.

While the change to the existing landscape will still be strongly experienced by the neighbouring receptors (Good Hope Farm and Skilpadskuil), both of the dwellings will not have views overlooking the PV development areas. As such, the Medium to Strong outcomes for the mitigation visual setback option, would be acceptable as the main domains and the key views are focussed away from the development, with some moderation of the views from the remainder of the property areas.

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Cumulative Effects

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Without mitigation, a negative precedent would be set for large PV area coverage in remote, rural areas that have Medium to High levels of Scenic Quality. With mitigation, the massing effect can be reduced to some degree, with no PV development on prominent ridgelines and a suitable buffer to reduce intervisibility between the adjacent Phase 2 PV development.

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Key Mitigation Measures:

Landscape Element	Mitigation	Motivation
Farm boundary setback	250m buffer	A 250m setback from the two sensitive receptors.
PV Intervisibility	470m buffer	A 470m buffer needs to be retained between the proposed Soventix Phase 2 & Phase 3 PV areas to allow the low rise between the two development parcels to assist in topographic screening.
Massing effects	Break up the PV parcels into four smaller area.	To reduce the massing effect created by a large area development, the PV development area needs to be broken up into smaller PV parcels. Each area should be fenced separately and the areas between operate as ecological corridors.
PV Height Restriction	4m	The PV panel height should not exceed 4m above ground level.

Management Category: Design phase mitigations

Impact:

Neighbours who are sensitive to landscape change; receptor sensitivity to the landscape changes to the existing rural agricultural landscape character, particularly by neighbouring landowners located to the north- and south-east of the development site.

Mitigation:

(1) Retain a 250 m 'visual sensitivity buffer' from sensitive receptor boundaries, specifically Good Hope Farm and Skilpadskuil Farm boundaries.

(2) Location of the buildings / substation should be away from prominent landscape features and outside of eastern receptor view area. However, the alignment of the 132 kV distribution line and the upgrading or construction of road crossings across the watercourse are permissible within this buffer.

<u>Management Outcome:</u> Maintain visual quality by visually buffering adjacent land uses/farms along north- and south-eastern property boundary (as these owners have indicated concern regarding the semi-industrial type of development in a deep rural setting).

Management Category: Design phase mitigations

Impact:

Proximity to ridgeline features and areas of prominence that add to the medium to high levels of local Scenic Quality.

Mitigation:

(1) Setback that excludes the eastern area adjacent to the locally prominent ridgeline feature.

(2) The grid connect corridor between Phase 2 and Phase 1 includes a low ridgeline (see Figures 16 and 17 of Visual Impact Assessment Report). Routing of the power line should not result in the location of power lines on top of the ridgeline.

Management Outcome: A less dominant landscape change.

Management Category: Design phase mitigations

Impact (and cumulative impact):

(1) Massing effects created by large scale coverage or expanses of solar PV panels, including from multiple projects, in a rural agricultural landscape setting with medium to high levels of Scenic Quality/A large-scale project creating long lines of PV that wrap over prominent landform would degrade local landscape resources in this rural landscape.

(2) Cumulative impacts are caused mainly by multiple power lines being routed adjacent to each other, or converging on a specific area, resulting in a massing effect and subsequent landscape degradation.

Assumptions:

(1) The development without mitigation will set a negative precedent for development of PV projects in remote, rural areas, creating clear intervisibility with the proposed Phase 2 PV development area. With mitigation and retaining the visual setback buffers, intervisibility is reduced with large block massing effects reduced. A large PV precedent will be set in place that could attract other RE projects, but a suitable setback and massing-reduction precedent would be set.

(2) The existing Eskom power line corridors already define the landscape along of the routing. This will be moderately enhanced with the addition of the new power line. Intervisibility is likely but will be locally contained by the undulating topography.

Mitigations:

(1) The PV facility must be developed in lower lying valley areas or grasslands that reflect pockets of development that are better aligned with the lay of the land and the hydrology drainage of the site - the massing effect of the PV development shall be broken up into four distinct PV Blocks, with the interior lines following the organic pattern of the defined ecological corridors.

(2) Reduce the massing effects by establishing a ‘massing buffer’ at the head of the ephemeral tributary north of the main watercourse, effectively segregating the northern-most PV development into two separate clusters.

(3) Reduce the massing effects created by the location of the adjacent Phase 2 development by establishing a roughly 470 m ‘massing buffer’ along the low ridgeline between Phases 3 and 2 thereby reducing the massing effect from intervisibility of the two developments through topographic screening.

Management Outcome: Breaking of massing effects created by large scale coverage or expanses of solar PV panels such that the development parcels are more reflective of the landscape carrying capacity and less dominating to sensitive receptors located in the northern areas.

Management Category: Design phase mitigations

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Impact:

Light directed uselessly above the horizon creates murky skyglow - the “light pollution” that washes out our view of the stars.

Light trespass or spillage from poor outdoor lighting shines onto neighbours’ properties giving the area an unattractive, trashy look.

Distracting glare (light that beams directly from a bulb into your eye) hampers the vision of pedestrians, cyclists, and drivers.

Mitigation:

(1) Effective light management needs to be incorporated into the design of the lighting to ensure that the visual influence is limited to the solar PV facility, without jeopardising project operational safety and security (See Annexure D of the Visual Impact Assessment Report, as well as lighting mitigations by The New England Light Pollution Advisory Group (NELPAG) and Sky Publishing Corp in 14.2).

(2) Provide only enough light for the task at hand; don’t over-light, and don’t spill light off your property.

(3) Choose “full-cut-off shielded” fixtures that keep light from going uselessly up or sideways. Full-cut-off fixtures produce minimum glare

(4) No overhead security lighting. Rather locate the light source closer to the operation, use directed technology, and aim fixtures either down or to maximise their impact on the targeted area whilst minimizing their impact elsewhere.

(5) No security lighting should be placed on the perimeter fencing.

<u>Management Outcome:</u> Retain the existing rural dark sky night landscape.

Management Category: Design phase mitigations

Impact: Energy wastage.

Mitigation: If colour discrimination is not important, choose energy- efficient fixtures utilising yellowish high-pressure sodium (HPS) bulbs. If “white” light is needed, fixtures using compact fluorescent or metal-halide (MH) bulbs are more energy-efficient than those using incandescent, halogen, or mercury-vapour bulbs.

Management Category: Design phase mitigations

Impact: Loss of landscape character from the current rural agricultural sense of place to the semi-industrial RE landscape - due to the removal of vegetation and the construction of the PV structures and associated infrastructure, including power lines and associated cabling in the landscape, as well as the substation.

Mitigation:

(1) Limit the height of the PV panels to a maximum of 4 m above ground level.

(2) All internal power line cables need to be buried to reduce visual intrusion to the local landscape.

(3) Structures, including the substation buildings should be painted a grey-brown colour.

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(4) To allow ecological and associated landscape integrity, the PV Blocks should each be fenced separately. Fencing must not go around the total property or project area, with the exception of existing farm fences being retained along the outside farm boundaries.

Management Category: Construction phase mitigations

Impact:

(1) Short-term landscape change from the current rural agricultural sense of place to the semi-industrial RE landscape - Wind-blown dust due to the removal of large areas of vegetation and large earth moving equipment.

Due to the small footprint of the substation, monopole site and access small track, windblown dust is likely to be limited, but a nuisance value could occur from the movement of vehicles to the substation or occasional maintenance vehicles travelling down the access track to check on possible soil erosion and the power lines.

Mitigation:

(1) Following the removal of the vegetation, wind-blown dust during construction should be monitored by the ECO to ensure that it does not become a nuisance factor to the local receptors.

(2) Should excessive dust be generated from the movement of vehicles on the roads such that the dust becomes visible to the immediate surrounds, dust-retardant measures should be implemented under direction of the ECO.

Management Category: Construction phase mitigations

Impact: Short-term landscape change from the current rural agricultural sense of place to the semi-industrial RE landscape - Loss of site landscape character due to the removal of vegetation and the construction of the PV structures and associated infrastructure.

Mitigation:

(1) Structures need to be painted a mid-grey or grey-brown colour.

(2) The laydown and building structures should be located away from neighbouring property farmsteads and banked into the ground to the eastern areas as much as possible

(3) Fencing around the construction camp should be simple, diamond shaped (to catch wind-blown litter) and appear transparent from a distance. The fences should be checked monthly for the collection of litter caught on the fence.

(4) Signage on the main access and local farm roads should be moderated.

Management Category: Construction phase mitigations

Impact: Short-term landscape change from the current rural agricultural sense of place to the semi-industrial RE landscape - Possible soil erosion from temporary roads.

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The use of large vehicles and a crane to raise the power line monopoles - small maintenance access routes would be created along the proposed power line route which could result in soil erosion if not adequately managed.

Mitigation:

(1) Topsoil from the footprints of the road and structures should be dealt with in accordance with EMPr.

(2) Soil erosion measures along the construction roads need to be adequately implemented and routinely monitored by the ECO (monthly).

(3) Soil erosion along the power line maintenance road needs to be adequately monitored on a Bi-Annual basis.

Management Category: Construction phase mitigations

Impact: Short-term landscape change from the current rural agricultural sense of place to the semi-industrial RE landscape - Wind-blown litter from the laydown and construction sites.

Mitigation:

(1) Littering should be a finable offence.

(2) Fencing around the laydown areas should be simple, diamond shaped (to catch wind-blown litter) and appear transparent from a distance The fences should be checked monthly for the collection of litter caught on the fence.

Management Category: Construction phase mitigations

Impact: Short-term landscape change from the current rural agricultural sense of place to the semi-industrial RE landscape - Loss of site landscape character due to the operation of the PV structures and associated infrastructure - Lights at night have the potential to significantly increase the visual exposure of the proposed project.

Mitigation:

(1) Implement measures to reduce light spillage (e.g., choose “full-cut-off shielded” fixtures that keep light from going up or sideways, locate the light source closer to the operation, use directed LED technology, and aim fixtures either down or to maximise their impact on the targeted area whilst minimizing their impact elsewhere).

(2) No overhead lighting to be used for security purposes.

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Bat Specialist Report

The following is taken out of the *Chiropteran Specialist Report for Phase 3 of the Proposed Soventix-Solar Africa Solar PV Facility, Hanover, Northern Cape Prepared by: Dawn Cory Toussaint dated July 2022* attached as **Appendix E: Annexure K.**

Results

Desktop Study

Areas of potential importance to bats: Water Resources and Roosting Sites

A watercourse was observed via Google Earth Pro to be present centrally in the proposed Phase 3 footprint and indicated on maps provided by the EAP. The watercourse and the extent of any wetland associated with the watercourse, could be an important resource for bats for both drinking and foraging particularly in dry landscapes (Blakey *et al.* 2018).

The potential roosting site identified during the desktop study were investigated on foot on 03 April 2022 for signs of bat occupancy. No roosts were located, however, the ridge should be preserved and buffered with a zone of at least 100m from the parameter of the solar array.

Probability of species occurrence

A list of eight bat species that may occur on the proposed Soventix solar PV facility was composed, namely:

- Tadarida aegyptiaca (Egyptian Free-tail Bat)
- Laephotis capensis (Cape Serotine)
- Eptesicus hottentotus (Long-tailed Serotine)
- Miniopterus natalensis (Natal Long-fingered Bat)
- Rhinolophus clivosus (Geoffroy's Horseshoe Bat)
- Rhinolophus darling (Darling's Horseshoe Bat)
- Rhinolophus denti (Near Threatened) (Dent's Horseshoe Bat)
- Nycteris thebaica (Egyptian Slit-faced Bat)

All the above species are considered "Least Concern" on the IUCN Red data list (IUCN 2021-3) and 2016 Red List of Mammals of Southern Africa, Lesotho and Swaziland, with the exception of *Rhinolophus denti* that is classified as Near Threatened on the 2016 Red List of Mammals of Southern Africa, Lesotho and Swaziland.

Species Richness

Three bat species out of a potential eight species were recorded over the proposed Phase 3 footprint namely:

- Tadarida aegyptiaca (Egyptian Free-tailed bat),
- Laephotis capensis (Cape Serotine), and
- Miniopterus natalensis (Natal Long-fingered bat)

All three species are widespread and abundant and are classified as "Least Concern" on the IUCN Red Data List (IUCN 2021) and the Red List of Mammals of Southern Africa, Lesotho and Swaziland.

Potential Impacts and Mitigation Measures

Cumulative Impacts

It is important that the project developers are cautious and sensitive to species occurring within a given development footprint in relation to potential cumulative impacts of anthropogenic activities and other solar PV facilities in the vicinity of the proposed Soventix solar PV facility and associated infrastructure. Fine scale and cumulative environmental impacts (regional and global) relating to the installation and operation of solar PV facilities have not been extensively addressed in scientific literature. The Linde Solar Farm (Simacel 155 Pty Ltd), Du Plessis Solar PV4, Mulilo Solar PV De Aar, South African Mainstream Renewable Power De Aar PV (De Aar Solar Power Pty Ltd) and Solar Capital De Aar (Solar Capital Pty Ltd) that lie 36km, 37km, 39km, 37km and 35km respectively from the proposed Soventix Solar Farm. The impacts of bats over these solar farms have not been assessed and addressed. Cumulatively, there may be a high potential for loss of species diversity, decrease in ecosystem functionality and service provision, and the cessation of processes within the landscape that can be permanent, lead to further land degradation and ultimately a collapse in the livelihood of natural fauna, flora and human inhabitants.

Considering that in general bats are sensitive to changes in habitat that drives species composition, activity and abundance (Fahr and Kalko, 2011; Montag et al. 2016; Olimpi and Philpott, 2018), the cumulative impact of the alteration of habitat over a greater area may cause a shift in the abundance of bat species to favour open-air forages such as T. aegyptiaca if the alteration in habitat is unfavourable for clutter-edge and clutter forager species such as L. capensis and Rhinolophus species.

Potential cumulative Impacts:

- If bat roosting sites were not considered in the assessments of the nearby solar PV facilities, bats could be displaced and may impact on occupied roosting sites and or encourage bats to use anthropogenic structures as alternative roosting sites which could lead to human-wildlife conflict.
- Ephemeral water resources are critical for bats in arid and semi-arid environments for foraging and drinking (Salinas-Ramos et al. 2019). If the main seasonal water resources/drainage lines were not protected in the other facilities, inter- and intra-specific competition could occur at neighbouring existing ephemeral water resources.
- Navigation and/or commuting routes could be negatively impacted or altered if landscape features such as ridges are developed or removed for the solar PV facilities.

The impact of Phase 3 can be kept minimal by implementing the mitigation strategies discussed below to ensure the protection of ephemeral water resources, roosting sites, navigational landscape features and maintaining natural vegetation to preserve the existing bat communities and populations.

Mitigations for inclusion in the EMPr:

Management Category: Planning and Design Phase: Layout & Design: Installing panel arrays and associated infrastructure (Interfering with ecological processes and biodiversity pattern)
Impact: Decrease in species composition, activity and abundance.
Consequence: Forced redistribution out of home ranges
Assumptions:
Changes in landscape and habitat conversion can affect bat populations and assemblages on a local and regional scale.
Mitigation:

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(1) Areas of significance for bats such as foraging and socialising areas, landscape features used for commuting/navigation and roosting sites must be considered during the planning, layout and design of the solar arrays.

Management Category: Planning and Design Phase: Layout & Design: Installing panel arrays and associated infrastructure (Interfering with ecological processes and biodiversity pattern)

Impact: Disturbance to roosting sites and commuting routes during construction activities

Consequence:

(1) Forced redistribution out of home ranges.

(2) Cumulative deterioration to the landscape and the loss of habitat due to vegetation clearing and roost disturbance/destruction may cause a shift in the species composition and abundance within the bat community to a bias towards more hardy species such as the Egyptian free-tailed bat, *T. aegyptiaca*.

Assumptions:

Bats are known to use a variety of roost types from rock cavities, exfoliating rock, tree foliage, under tree bark, tree cavities, aardvark burrows, natural and man-made caves and numerous man-made structures. However, during the active search for roosts in the rocky outcrop along the eastern boundary, no roosting sites were located.

Linear structures in the landscape such as vegetation edges and rocky outcrops/ridges, are known to be used by some bats as landmarks to navigate across the landscape.

Mitigations:

(1) Avoid development of the ridge near the eastern border of the farm and extend a 100m buffer zone from the crest of the rocky outcrop to limit any potential impact on possible roosting sites and commuting routes.

Management Category: Planning and Design Phase: Layout & Design: Installing panel arrays and associated infrastructure (Interfering with ecological processes and biodiversity pattern)

Impact: Removal of vegetation and disruption to the ephemeral watercourse

Consequence:

(1) Habitat degradation leads to disturbance/alteration of important areas of bat activity such as roosting sites, commuting, foraging and socialising areas.

(2) Habitat degradation leads to changes in bat community and abundance of bat species.

(3) Cumulative deterioration to the landscape and the loss of habitat due to vegetation clearing and roost disturbance/destruction may cause a shift in the species composition and abundance within the bat community to a bias towards more hardy species such as the Egyptian free-tailed bat, *T. aegyptiaca*.

Assumptions:

Seasonal water bodies (for example ephemeral pans) are important as surface water is a scarce resource in arid and semi-arid regions that is important for the survival of many animals. These pans are key drinking and foraging resources for bats and must be protected. 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.

Mitigation:

(1) The ephemeral drainage line running centrally through the proposed footprint must not be altered/developed as this feature would be an important seasonal resource for bats.

Management Category: Construction: Clearing/Grubbing and Grading, and Construction: Construction Plant Management: Transporting

Impact: Removal of vegetation and disruption to the watercourse

Consequence:

(1) Habitat degradation leads to disturbance/alteration of important areas of bat activity such as roosting sites, commuting, foraging and socialising areas.

(2) Habitat degradation leads to changes in bat community and abundance of bat species.

(3) Cumulative deterioration to the landscape and the loss of habitat due to vegetation clearing and roost disturbance/destruction may cause a shift in the species composition and abundance within the bat community to a bias towards more hardy species such as the Egyptian free-tailed bat, *T. aegyptiaca*.

Assumptions:

Large scale removal of natural vegetation for the installation and operation of solar PV facilities can alter preferred habitats, cause a change in prey availability and thus a change in bat activity in the landscape.

Mitigation:

(1) Conserve the natural vegetation around the physical footprints.
(2) Driving through natural vegetation must be discouraged where construction activities are not taking place.

Management Category: Post-construction: Grazing Management, and Post-construction: Maintenance and Monitoring

Impact: Removal of vegetation and disruption to the watercourse

Consequence:

(1) Habitat degradation leads to disturbance/alteration of important areas of bat activity such as roosting sites, commuting, foraging and socialising areas.

(2) Habitat degradation leads to changes in bat community and abundance of bat species.

Assumption:

Overgrazing will significantly alter plant canopies, potentially leading to a reduction in leaf litter from the plants which is important for seed retention and will expose the soil to erosion by both wind and water. With the loss of precious topsoil, the restoration of these areas will be difficult.

Mitigation:

(1) The use of domestic livestock (preferably sheep) should be used to control the height of vegetation instead of herbicides.

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(2) Ensure that the vegetation in the solar plant farm footprint is not overgrazed.

(3) Monitor the effects of the grazing management strategy on veld condition as (a) grazing during and shortly after a drought can cause palatable plant species to die off, (b) heavy grazing pressure in summer will favour the growth of karoid shrubs, and (c) high grazing pressure during winter will favour the growth of perennial grasses (Mucina and Rutherford, 2011) all of which can affect insect abundance which in turn may affect bats.

Management Category: Post-construction: Rehabilitation: Disturbed areas

Impact: Removal of vegetation and disruption to the ephemeral watercourse

Consequence:

(1) Habitat degradation leads to disturbance/alteration of important areas of bat activity such as roosting sites, commuting, foraging and socialising areas.

(2) Habitat degradation leads to changes in bat community and abundance of bat species.

Mitigation:

(1) Restore the natural vegetation on disturbed bare areas between and below the solar panels after construction to protect the topsoil and encourage invertebrate species richness, that is suitable prey availability for bats.

(2) Sow indigenous plant seed mixes into the tilled rows, using a combination of palatable locally indigenous Karoo dwarf shrubs (or ‘bossies’) and grasses at a seeding density or rate of 5 to 15 kg of seed mixture per hectare.

Management Category: Planning and Design: Layout and Design (Lighting), and Pre-construction: Site establishment (Lighting)

Impact: Light pollution

Consequence: alter species composition, foraging patterns and predation rate of bats.

Assumptions:

Although the facility will not be lit up during the nighttime period, selected infrastructure will have to be illuminated. These comparatively small, illuminated areas can still impact the surrounding ecological functioning (including biological systems) of the adjacent landscape through spill over lighting and sky glow.

Artificial lighting is well known to disrupt the flow of information to organisms, provides misleading clues and can cause interspecific competition for food resources by extending diurnal species foraging activity into the night-time period. As such, the spill-over of artificial lighting beyond the proposed solar PV facility into dark, natural spaces must be prevented.

Over fine and large scales, bats can be impacted by all types of conventional lighting.

Known impacts of artificial lighting on bats are; delayed emergence and reduced number of individuals from roosts, changes in navigation and commuting behaviour, foraging behaviour alterations, the creation of “barriers” limiting the connectivity of habitats in the landscape and the effective dispersal of species (isolating habitat patches and populations from immigration), and decreased growth rates of young bats if adult bats incur higher energetic losses and experience decreased foraging time if they have to forage further afield from maternity roosts.

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Artificial lighting appears to benefit some bat species (light-tolerant) through increasing their foraging efficiency by identifying and exploiting insects swarming around lights. Typical bat species that make use of the foraging opportunities under lights are often open-air and clutter-edge forager bat species with echolocation calls adapted for open and semi-open habitats created around artificial lighting, thus there is an expectation that *L. capensis* and *T. aegyptiaca* may benefit from artificial lighting. *Laephotis capensis* has been shown to forage around lights.

Light intolerant bat species are often slow flying and highly manoeuvrable, adapted for foraging in cluttered environments such as *Rhinolophids* and *Nycterids*. One reason for these species avoiding lit areas is that their echolocation call structure is not well suited for foraging in the open habitat associated with artificial lighting. A second reason for certain bat species to avoid artificially lit areas is the sensitivity of bat eyes to light. As light intensity increases, bat's visual sensitivity decreases.

Lighting, particularly in arid regions can have significant impacts on arid bat communities where bats may reduce drinking activity due to artificial lighting.

A combination of mitigation strategies could effectively reduce the impact of ecological light pollution.

Mitigations:

(1) The number and position of lights required must be limited and installed in areas where it is absolutely necessary.
(2) A light shield/lamp shade should be used to focus the beam downwards onto the ground to prevent sky glow as well as to prevent light from trespassing beyond the development area into the surrounding naturally dark areas.
(3) The intensity of the lighting is lowered (dim the lights). Alternatively, in conjunction with substantially dimming the lights, motion sensors could be installed.
(4) The spectrum of light chosen has longer wavelengths to reduce the attractiveness of light to insects.
(5) If possible, the duration of the lighting period should be limited, and lights switched on shortly after the peak night-time emergence of clutter-edge forager bats ~60min after sunset.

Management Category: Post-construction: Maintenance and Monitoring (NEW: Bat study monitoring)

Impact: Possible bat fatalities incurred from collisions with infrastructure associated with the solar PV facility including solar arrays, security fencing, transmission lines, and buildings.

Consequence: Decline in bat population due to injury/death

Assumptions:

Annual monitoring during preconstruction, construction and during the operational phase will provide much needed insight into the changes in bat activity, species composition and ecology over the affected property.

It is expected that any changes in bat activity and perceived impacts will be most evident during the first two years of operation.

By following monitoring guidelines, data sets can be gathered that are comparable with other large-scale renewable energy projects that impact bats and consolidated to understand the extent of the impacts of these projects and define effective mitigation strategies.

The risk of direct collisions of bats with solar PV panels is unknown and the perception of smooth surfaces by bats is not well studied. If bats perceive smooth surfaces as voids, solar PV panels left in a resting position perpendicular or more than 45 degrees in relation to the ground could pose a collision risk. However, this risk is negated for the proposed Phase 3 since single-axis tracker that allows the panels to be stowed horizontally at night to reduce wind-load and if bats are "confused" by the smooth surface or perceive it as a potential drinking source may approach the surface at a slower speed and not collide with it.

A 1.8 m high galvanised diamond razor mesh security fence will be installed around each of the four PV Blocks within the facility. The risk of the security fence in relation to bat collisions and bat injury/mortality is largely unknown.

Mitigation:

(1) Continuous monitoring for one year during pre-construction, one year during construction and two years during operation, should be undertaken using passive bioacoustic recording systems in line with the South African Good Practice Guidelines for Surveying Bats at WEF's (Sowler and Stoffberg, 2014) and SAGPG for Operational Monitoring (Aronson et al. 2014). If the timeline for construction does not allow one year of pre-con monitoring, the one-year period of passive monitoring will then begin before construction and continue for the remainder of the one-year period during construction. Should it be found that the construction phase extends beyond a year, the monitoring period can be reduced to the spring/summer months.

(2) A specialist should maintain these systems and determine the impacts of solar PV facility and associated infrastructure on bat populations in relation to landscape changes in both the physical changes with the installation of the solar PV panels, the resulting change in vegetation structure underneath the solar PV panels and the management strategy of the operational facility.

(3) Mortality searches near infrastructure and along the security fence line must be conducted to determine if the security fences pose a threat to bats. Post-construction monitoring can be altered accordingly based on the data collected during the construction phases.

Management Category: Rehabilitation (disturbed areas – terrestrial)

Impact: Habitat changes beneath the solar panels.

Consequence: Bat foraging patterns affected

Assumptions:

The change in the microclimate between and beneath the solar panels may provide different ecological conditions which may encourage or provide suitable conditions for botanical diversity. Botanical diversity influences invertebrate diversity as plants provide forage, suitable habitat and structure for reproduction, and thus in turn may positively influence and possibly increase bat foraging activity.

Mitigation:

(1) Restore the natural vegetation on disturbed bare areas between and below the solar panels after construction to protect the topsoil and encourage invertebrate species richness, that is suitable prey availability for bats.

(2) Sow indigenous plant seed mixes into the tilled rows, using a combination of palatable locally indigenous Karoo dwarf shrubs (or 'bossies') and grasses at a seeding density or rate of 5 to 15 kg of seed mixture per hectare.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
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Management Category: None

Impact: Cumulative impact of nearby solar PV facilities on regional bat populations.

Consequence:

Changes to the relative abundance of different bat species.

Human-wildlife conflict.

Increased inter- and intra-specific competition.

Assumptions:

Considering that bats are generally sensitive to changes in habitat that drives species composition, activity and abundance, the cumulative impact of the alteration of habitat over a greater area may cause a shift in the abundance of bat species to favour open-air forages such as *T. aegyptiaca* if the alteration in habitat is unfavourable for clutter-edge and clutter forager species such as *L. capensis* and *Rhinolophus* species.

If bat roosting sites were not considered in the assessments of the nearby solar PV facilities, bats could be displaced and may impact on occupied roosting sites and or encourage bats to use anthropogenic structures as alternative roosting sites which could lead to human-wildlife conflict.

Ephemeral water resources are critical for bats in arid and semi-arid environments for foraging and drinking. If the main seasonal water resources/drainage lines were not protected in the other facilities, inter- and intra-specific competition could occur at neighbouring existing ephemeral water resources.

Navigation and/or commuting routes could be negatively impacted or altered if landscape features such as ridges are developed or removed for the solar PV facilities.

Mitigation:

(1) The impact of Phase 3 can be kept minimal by implementing the mitigation strategies discussed above to ensure the protection of ephemeral water resources, roosting sites, navigational landscape features and maintaining natural vegetation to preserve the existing bat communities and populations.

Post-construction Monitoring

Annual monitoring during preconstruction, construction and the operational phases will provide much needed insight into the changes in bat activity, species composition and ecology over the affected property.

Continuous monitoring for one year during pre-construction, one year during construction and two years during operation, should be undertaken using passive bioacoustic recording systems in line with the South African Good Practice Guidelines for Surveying Bats at WEF's (Sowler and Stoffberg, 2014) and SAGPG for Operational Monitoring (Aronson et al. 2014). If the timeline for construction does not allow one year of pre-con monitoring, the one-year period of passive monitoring will then begin before construction and continue for the remainder of the one-year time period during construction. Should it be found that the construction phase extends beyond a year, the monitoring period can be reduced to the spring/summer months. During the first two years of operation, it is expected that any changes in bat activity and perceived impacts will be most evident.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Searches for bat fatalities at solar PV panels, near infrastructure and security fencing must be conducted. Post-construction monitoring can be altered accordingly based on the data collected during the construction phases.

General Conclusion

Based on the data collected during the bat baseline survey and available literature, there is little reason for the development of Phase 3 of the proposed Soventix solar PV facility not to be approved provided mitigation measures are put in place during the development, operation and decommissioning of the Soventix solar PV facility. The rehabilitation and management of the operational solar PV facility will be a critical activity as this will have a direct impact on biodiversity and ecosystem functioning further afield than within the boundary of the solar PV facility.

Although no specialist bat species were recorded during the study, additional species may be recorded during the proposed monitoring programme as it is assumed that bat activity will be significantly higher during the mid-summer months (compared with the reporting period in the current report).

Cumulative impacts of renewable energy facilities in the area may have detrimental impacts on the bat communities in the region, particularly if other developments have not taken any precautionary measures.

It is suggested that a passive recording monitoring system be put in place for one year pre-construction, one year during construction and thereafter bat activity can be monitored during the spring/summer seasons. Two years post construction bat monitoring is advised. A specialist should maintain these systems and determine the impacts of solar PV facility on bat populations in relation to landscape changes in both the physical changes with the installation of the solar PV panels, the resulting change in vegetation structure underneath the solar PV panels and the management strategy of the operational facility.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Geotechnical Assessment Study

The following was taken out of the *Geotechnical Assessment Study prepared by FDJ Stapelberg of the Council for Geoscience dated 11 May 2022 (CO2017-5806 (Phase 80))* and attached as **Appendix E: Annexure L.**

Perceived impacts

1. A new quarry will transform the local habitat.
2. The usage of mudstone from the Karoo Supergroup for use as concrete aggregate or road layers may reduce the quality of concrete and/or roads due to its instability.
3. Commercially available sources of concrete aggregate may prove to be too distant.
4. Poor foundation conditions or ineffective support will cause the solar panel structures to overturn.
5. Access roads crossing a drainage channel will be subject to submerged conditions from time to time.
6. Excessive dust from rock crushing plant causing air pollution and damage to equipment if not cleaned regularly.
7. Fly rock from blasting.
8. Loud noise generation.
9. Oil spills contaminate topsoil.

Possible mitigation measures

Quarry:

1. When sourcing material from a local quarry, preference should be given to the use of dolerite rock as construction material. Sedimentary rock may be used for the lower road layers but with caution — especially the sandstones and mudstone/shale which have been baked by dolerite intrusions (e.g., in close proximity to dolerite rock).
2. As far as is practical, feasible and permissible within the law, mine material for concrete aggregate and/or road layers from existing quarries before resorting to establishing a new quarry in the project area (on the Remainder or Portion 3 of Farm Goede Hoop 26C.
3. In the event that the engineers decide to create a new quarry on either the Remainder of or Portion 3 of the Farm Goede Hoop 26C (as opposed to lawfully mining from any of the other existing quarries in the area), then rock from the irregularly shaped dolerite sill traversing Phase 3 (see localities P20, P24, P26, P27, P28, P29, P35, P36, P38 in Figure 2 of the Geotechnical Assessment Report) as well as the adjacent baked sediments may be utilized as construction materials as long as it is outside any of the defined ecological, massing and/or visual sensitivity buffers.

Poor foundation conditions/ineffective support:

1. Excavation to a depth of 1, 0 m below natural ground level will probably be required to ensure overturning stability of solar panel structures.
2. Rammed piles are considered the most effective support option for solar panels but if driving to at least 1 m depth proves difficult over most of the site then ground beam concrete footings (which make use of concrete strip footings at very shallow depth below ground level to act as support and counterweight for solar panels) may be an alternative option.

Access roads and submerged conditions:

1. The three existing access road crossings require placement of compacted gravel layers to lift their elevation and increase traction.

Commercially available sources of aggregate:

1. Dolerite rock or baked sediments from the Phase 3 terrain can be considered for sources of concrete aggregate or road layers but materials will need to be tested for quality purposes (hardness, strength, durability, mineral composition, and degree of weathering).
2. Material intended for use in road surfacing needs to be tested for grading distribution, Atterberg limits, compaction-moisture density values and durability.

Dust:

1. Effective implementation of the National Dust Control Regulations.
2. Operating/offloading of the crusher plant shall be avoided during windy conditions, unless additional dust suppression methods will ensure that the dust fallout does not exceed the acceptable limits.
3. Dust suppressant must be prioritised for the operation of the crusher plant.
4. Regular plant washing and maintenance.
5. Combination of engineered dust control solutions such as dry fog, fine mist, dust collectors, improvements of feeding, discharge and transfer points and enclosures.

Loud noise:

1. Turn off all equipment when not in use.
2. Ensure that all equipment is kept in good working order.
3. Operate all equipment within specifications and capacity.
4. Adhere to any local bylaws and regulations regarding the generation of noise.

Oil Spills:

1. Rock crushing plant must have drip trays
2. Inspect crushing plant every morning for defects
3. In the event of a leak or spill onto the ground, 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.

Blasting (fly rock and dust):

1. Blasting shall be avoided during windy conditions, unless additional dust suppression methods will ensure that the dust fallout does not exceed the acceptable limits. We suggest that the contractor take into consideration predicted wind speeds from the local weather station when planning construction-related activities with a high risk of generating dust.
2. Any blasting activity must be conducted by a suitably licensed blasting contractor.
3. Notification of surrounding landowners, emergency services site personnel of blasting activity 24 hours prior to such activity taking place on Site.
4. Fly rock from blasting activity must be minimised and any pieces greater than 150 mm falling beyond the Working Area, must be collected and removed.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Mitigations for inclusion in the EMPr:

Management Category: Planning and Design, and Pre-construction - Quarry (new)

Impact: The dolerite dyke running sub-parallel to the southwestern boundary (represented by localities P11, P30, P31 and P34) has a width of between 20 and 50 m and a quarry for utilization of dolerite from this dyke can be located anywhere along the strike of the dyke.

Assumption:

Rock cairns (occurring at locality P31 and P34) may render that area historically sensitive, thus possibly preventing development in that vicinity (Geotechnical Assessment, 2022).

Although it is possible that these cairns are marking potential drill sites for groundwater, it is unlikely as the recorded cairns are located on top of the dyke, found in pairs opposite each other, with the pairs lining up with other pairs in nearly exact distances from each other. It is therefore seen as more likely being markers for an old road. Although the age, origin and function of this possible old road is not known, it could date to the late 19th/early 20th century, with some cultural material dating to this period found in association (Martini Henry cartridge). This was likely an old wagon road linking farmsteads with each other, as well as these with Hanover and other towns. From this point of view this road and related features (cairns) are relatively significant from a Cultural Heritage point of view and at least should in part be preserved. Stone cairns can be demolished in sections where they cannot be avoided by development actions. (Archaeological & Heritage Impact Assessment, 2022).

"P34 not recommended due to more prominence. P24 is my preferred location as it is more visually sheltered and will be cut into the northern facing slopes, screening the cutting from southern receptors" (pers. comm. Steve Stead, Visual Resource Management Africa cc).

Mitigation:

(1) Given the potential archaeological and visual sensitivity of the proposed quarry site represented by locality P34, use of this site is forbidden.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
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Management Category: Planning and Design, and Pre-construction - Quarry (new)

Impact: Rock from the irregularly shaped dolerite sill traversing Phase 3 (represented by localities P20, P24, P26, P27, P28, P29, P35, P36, P38) as well as the adjacent baked sediments may be utilized as construction materials.

Consequence: The usage of poor-quality aggregate is unsafe and will increase the costs of maintenance.

Assumption:

The main drawback of this source in comparison to P34 is that the dyke appears to be thin or even weathered away in parts leaving lesser quality baked sediments as construction material source (Geotechnical Assessment, 2022).

“P34 not recommended due to more prominence. P24 is my preferred location as it is more visually sheltered and will be cut into the northern facing slopes, screening the cutting from southern receptors” (pers. comm. Steve Stead, Visual Resource Management Africa cc).

Mitigation:

(1) In the event that the engineers decide to create a new quarry in the project area (as opposed to lawfully mining from any of the other existing quarries in the area), then rock from the locality P24 (in **Figure 2** of the Geotechnical Assessment Report) including the adjacent baked sediments may be utilized as construction materials as long as it remains further then 100 m from the ecological buffer.

(2) Given the location of the Quarry P24 in a “visual” sensitivity buffer its exact siting relative to/distance from the farm boundary must be agreed to with the south-eastern receptor (neighbouring farmer).

(3) The responsible engineer(s) should as far as is practical ensure that the quarry is visually sheltered by cutting into the northern facing slopes, screening the cutting from southern receptors.

Management Category: Piling

Impact:

Poor foundation conditions or ineffective support will cause the solar panel structures to overturn.

Consequence:

Overturning solar panel structures (or arrays) will have significant financial costs.

Mitigation:

(1) Excavation to a depth of 1,0 m below natural ground level will probably be required to ensure overturning stability of solar panel structures.

(2) Rammed piles are considered the most effective support option for solar panels but if driving to at least 1 m depth proves difficult over most of the site then ground beam concrete footings (which make use of concrete strip footings at very shallow depth below ground level to act as support and counterweight for solar panels) may be an alternative option.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Impact: Access roads crossing a drainage channel will be subject to submerged conditions from time to time.

Consequence: Vehicles may get stuck and damage the sensitive bed and banks of a watercourse.

Mitigations:

(1) The three existing access road crossings require placement of compacted gravel layers to lift their elevation and increase traction.

Management Category: Quarry (sourcing material)

Impact: Commercially available sources of concrete aggregate may prove to be too distant.

Consequence: Distant sources of material may be too expensive for utilization on site.

Mitigation:

(1) Dolerite rock or baked sediments from the Phase 3 terrain can be considered for sources of concrete aggregate or road layers but materials will need to be tested for quality purposes (hardness, strength, durability, mineral composition, and degree of weathering).

(2) Material intended for use in road surfacing needs to be tested for grading distribution, Atterberg limits, compaction-moisture density values and durability.

Management Category: Quarry (sourcing material)

Impact: Excessive dust

Consequence: disturbance

Mitigation:

(1) Effective implementation of the National Dust Control Regulations.

(2) operating/offloading of the crusher plant shall be avoided during windy conditions, unless additional dust suppression methods will ensure that the dust fallout does not exceed the acceptable limits. We suggest that the contractor take into consideration predicted wind speeds from the local weather station when planning construction-related activities with a high risk of generating dust.

(3) Dust suppressant must be prioritised for the operation of the crusher plant.

Management Category: Quarry (sourcing material)

Impact: Excessive dust

Consequence: damage the durability of the plant

Mitigation:

(1) regular plant washing and maintenance.

(2) combination of engineered dust control solutions such as dry fog, fine mist, dust collectors, improvements of feeding, discharge and transfer points and enclosures.

(3) Effective implementation of the National Dust Control Regulations.

(4) operating/offloading of the crusher plant shall be avoided during windy conditions, unless additional dust suppression methods will ensure that the dust fallout does not exceed the acceptable limits. We suggest that the contractor take into consideration predicted wind speeds from the local weather station when planning construction-related activities with a high risk of generating dust.

(5) Dust suppressant must be prioritised for the operation of the crusher plant.

Management Category: Quarry (sourcing material)

Impact: Loud noise

Consequence: disturbance

Mitigation:

(1) Turn off all equipment when not in use.

(2) Ensure that all equipment is kept in good working order.

(3) Operate all equipment within specifications and capacity.

(4) Adhere to any local bylaws and regulations regarding the generation of noise.

Management Category: Quarry (sourcing material)

Impact: Oil spills contaminate topsoil

Consequence: Contamination may sterilize the topsoil rendering it dysfunctional.

Mitigation:

(1) crushing plant must have drip trays

(2) Inspect crushing plant every morning for defects

(3) In the event of a leak or spill onto the ground, 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.

Management Category: Blasting

Impact: Excessive dust

Consequence: disturbance

Mitigation:

(1) Effective implementation of the National Dust Control Regulations.

(2) blasting shall be avoided during windy conditions, unless additional dust suppression methods will ensure that the dust fallout does not exceed the acceptable limits. We suggest that the contractor take into consideration predicted wind speeds from the local weather station when planning construction-related activities with a high risk of generating dust.

(3) Dust suppressant must be prioritised for the blasting periods.

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Management Category: Blasting

Impact: Fly rock from blasting

Consequence: damage to property and or injury/death to persons

Mitigation:

(1) Any blasting activity must be conducted by a suitably licensed blasting contractor.

(2) Notification of surrounding landowners, emergency services site personnel of blasting activity 24 hours prior to such activity taking place on Site.

(3) Fly rock from blasting activity must be minimised and any pieces greater than 150 mm falling beyond the Working Area, must be collected and removed.

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Geo-Hydrological Assessment

The following was taken from the *Geo-Hydrological Assessment Report Version – Final Rev 3 prepared by GCS Water and Environmental Consultants dated 10th August 2022 (GCS Project Number: 22-0401)* attached as **Appendix E: Annexure G:**

Geophysical assessment findings

The geophysical investigation aimed to identify likely dolerite contact zones that may intersect/underlie the study area. These are known preferential flow paths for groundwater movement. The findings are briefly summarised as follows:

Five (5) magnetic (Mag) profiles were completed. The Mag traverse varied from approximately 200 m in length. Mag readings were taken at 5 m intervals.

Based on the findings of the geophysical investigation and viewed in context to the local geology, several likely contact zones between the host sandstones/mudstone and intrusive rock bodies (dykes) are observed.

Table 27 and **Figure 21** shows two drilling positions which can be considered for future water supply – high feasibility, being T1 and T2 located in the southwestern corner of Phase 3. Table X below details the proposed drilling targets which have higher feasibility.

Table 27: Proposed drilling targets – higher feasibility (T1 and T2 on Phase 3).

Target ID	Latitude (WGS84)	Longitude (WGS84)	Elevation (mamsl)	Proposed Depth
T1	-30.851	24.35747	1382.89	60m-80m
T2	-30.8514	24.35786	1383.474	60m-80m
T3	-30.8858	24.31503	1370.921	60m-80m
T4	-30.8858	24.31503	1370.874	60m-80m

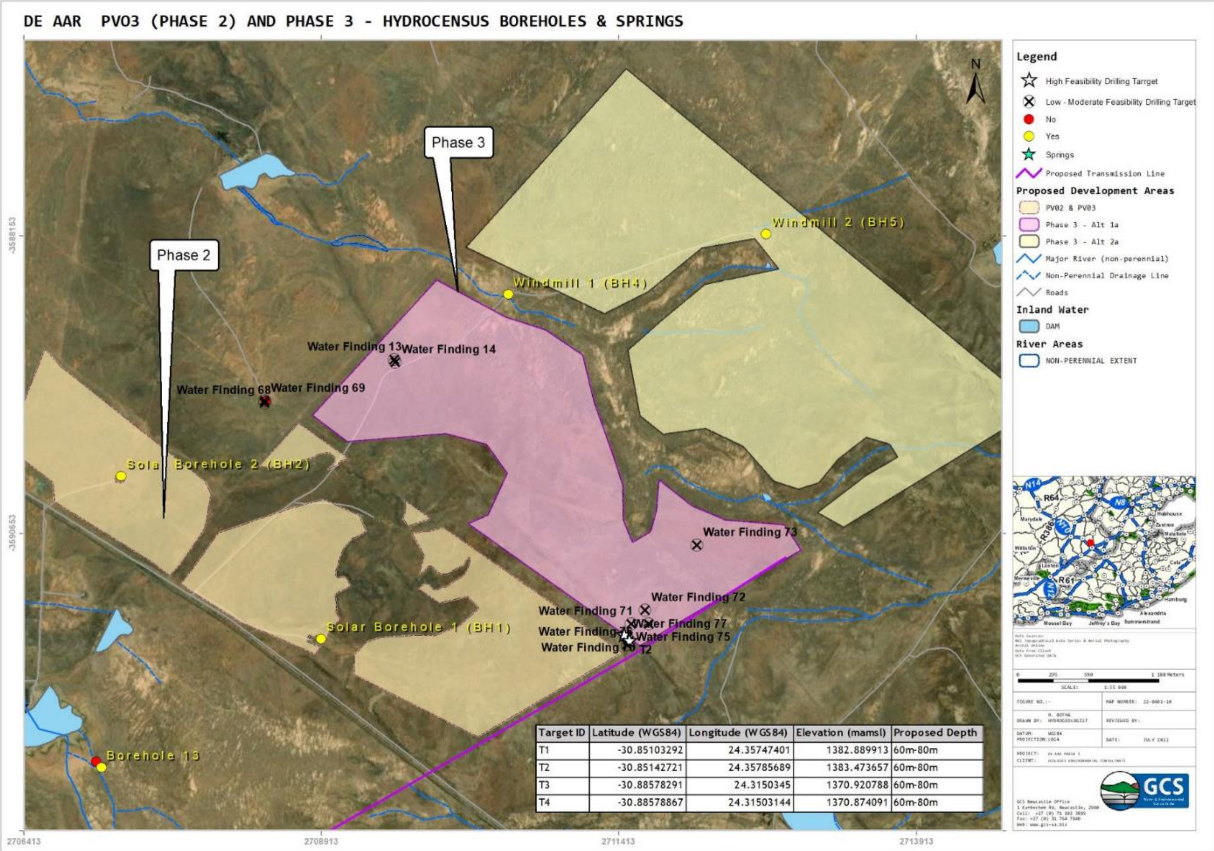

Figure 21: Geophysical investigation areas, existing boreholes and proposed drilling targets (Phase 2 and Phase 3)

Borehole Yield Testing

Constant discharge (CRD) and recovery tests were performed on the following boreholes 4 (BH4) and 5 (BH5) in area PV3 (Phase 3). The flow characterisation (FC) method developed by the Institute of Groundwater Studies (IGS) was applied to the pump test data to evaluate the sustainable yield.

Based on the pump test data generated, **<u>8-hour abstraction is recommended</u>**. However, smaller size pumps can be installed if 24hr pumping is required. This is however not advised, as the boreholes may be over pumped, decreasing the borehole life and increasing the probability of pump failure.

<u>Borehole 4:</u> The borehole is suitable for domestic water supply. A pump with a maximum yield of 6.58 l/sec can be installed, and the yield is estimated at 8 hours per day of pumping (**Table 28**).

<u>Borehole 5:</u> The borehole is suitable for domestic water supply. A pump with a maximum yield of 5.11 l/sec can be installed, and the yield is estimated at 8 hours per day of pumping (**Table 29**).

Table 28: Flow Characterisation FC Analyses BH 4.

Method	Sustainable yield (l/s)	Std. Dev	Early T (m^2/d)		Late T (m^2/d)		S	AD used
Basic FC	7.40	4.08	99		78.9		5.00E-03	6.7
FC inflection point	0.70	0.26						0.9
Cooper-Jacob	3.60	2.33			115.8		5.00E-03	6.7
Barker	3.47	2.46	Kf =	135		Ss =	7.90E-06	6.7
Average Q_sust (l/s)	**3.80**	**2.75**	b =	0.99	Fractal dimension n =		2.03	
Recommended abstraction rate (L/s)		**3.80**	for 24 hours per day					
Hours per day of pumping	8	6.58	L/s for	8	hours per day			

Amount of water allowed to be abstracted per month	9849.6
A borehole could satisfy the basic human need of	13133
Is the water suitable for domesticuse (Yes/No)	Yes

Comment
The borehole is suitable for domestic water supply. A pump with a maximum yield of 6.58 l/sec can be installed, and the yield is estimated at 8 hours per day of pumping.

Table 29: Flow Characterisation (FC) Analyses BH 5.

Method	Sustainable yield (l/s)	Std. Dev	Early T (m^2/d)	Late T (m^2/d)	S	AD used
Basic FC	1.90	1.28	88	11.5	5.00E-03	16.6
FC inflection point	1.48	0.06				4.3

Cooper-Jacob	6.70	4.33			105.4		5.00E-03	16.6
Barker	1.71	1.61	Kf =	11		Ss =	1.00E-07	16.6
Average Q_sust (l/s)	**2.95**	**2.51**	b =	3.70	Fractal dimension n =		2.03	
Recommended abstraction rate (L/s)		**2.95**	for 24 hours per day					
Hours per day of pumping	8	5.11	L/s for	8	hours per day			

Amount of water allowed to be abstracted per month	7646.4

A borehole could satisfy the basic human need of	10195

Is the water suitable for domesticuse (Yes/No)	Yes

Comment
The borehole is suitable for domestic water supply. A pump with a maximum yield of 5.11 l/sec can be installed, and the yield is estimated at 8 hours per day of pumping.

<u>*Impacts*</u>

Groundwater Recharge

Based on the nature of the project (raised PV solar arrays on pipe stand, and vegetation kept intact during the construction and operational phase of the project) a negative impact in terms of groundwater recharge to aquifer is expected to be marginal. Rainwater from the PV solar arrays will be allowed to percolate, and free drainage of runoff will take place, rather than stormwater conveyance.

Construction

As part of the construction activities associated with this project, there may be some disturbance of the vadose zone soils (i.e., road development, preparation of solar array fixtures to the ground). Poor quality seepage from machinery and services vehicles entering the project area or used to develop the solar arrays could lead to soil contamination of the vadose zone which could percolate to the shallow aquifer.

Drilling new borehole

Where a series of boreholes are drilled in the same contact, and close to each other (<500 m), borehole interference may likely occur as the fractures are simultaneously dewatered. Over-production may lead to fracture failures which will lead to borehole collapse. However, due to the degree of fracturing being unknown, the anticipated impact cannot be pre-determined.

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As a good practice, it is advised that all new boreholes drilled in the project area be pump tested, and interference (if any) be evaluated by long-duration pump tests. In terms of the development, limited impacts are anticipated due to the foreseeable low volumes required.

Estimated groundwater pollution migration velocities

The groundwater table in the study area is about 5 mbgl. The estimated seepage velocity within the shallow weathered aquifer zone (and deeper aquifer zones or host rock) is very slow (9×10^{-5} to 0,0096 m/day), but > 100 m/day in the fractured aquifer contacts. The ± 10 m-thick weathered aquifer zone of the Beaufort Group is likely to be the only zone that will be impacted due to the proposed activities.

Impacts on the groundwater reserve

The predicted pumping radius of influence for BH4 is 1 595,58 m and BH5 is 2 397,66 m. However, as no interference on surrounding boreholes was noted during pumping, it is anticipated that the boreholes are drawing from the fractured aquifer network or contact zones, which are not connected (they are confined).

Hydrogeological risk and impacts

The following potential geohydrological risks are identified during the construction phase:

- Leakages from construction and contractor vehicles accessing the site may cause soil pollution (e.g., un-inspected vehicles dripping oils/hydrocarbons onto soils may cause contamination of soil and surface water resources).
- Disturbing soils (land capability) due to some vegetation clearing may promote sedimented runoff during storm events.
- Excavation of borrow-pits for road building material may cause temporary sedimentation during storm events.
- Disturbing sediments associated with streams to install dedicated stream crossings and road culverts may promote sediment runoff.
- Dewatering of the aquifer via groundwater boreholes (only if overproduced).

The following potential geohydrological risks are identified during the operational phase:

- Oil spillage from parked vehicles (service vehicles), may seep into the aquifer via the vadose zone.
- Sedimentation runoff from areas where no stormwater management measures are implemented; or where vegetation is not maintained.
- Dewatering of the aquifer via groundwater boreholes (only if overproduced).

The risk assessment for both construction and post-construction phases of the project is considered marginal, with mostly reversible and manageable impacts. The largest risk of geohydrology is the proposed groundwater abstraction activities.

Cumulative impacts

As all activities will take place on the same property, and close to other solar developments there will be cumulative impacts (however limited due to the project type). The cumulative impacts from a groundwater

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perspective are limited in that only a few boreholes will be used to supplement the water use at the site (small-scale local use) and that no dedicated groundwater pollution sources will be created (e.g., landfills, oil or fuel storage areas). Moreover, the other proposed solar developments are situated in different drainage areas, rendering the likely impact associated with this project zero. Any geohydrological risk for this project will be confined to the delineated sub-catchments (worst case) and only local impacts around boreholes being used for the development.

Establishment of the monitoring network

Currently, no groundwater (GW) monitoring is taking place. It is proposed that a proper monitoring programme be implemented to monitor both the water quality and quantity at the site. The monitoring programme is divided into two phases:

- Phase 1: Monitoring during any expansion, construction or decommissioning activities (temporary monitoring)
    - During the construction phase, it is recommended that all vehicles are in good working order when entering the site (i.e., visual observations of any leakages that may emanate from the vehicle accessing the site) and parked in designated areas with drip trays.
    - Visual observations (i.e., monthly inspections and inspections shortly after rainfall events) of the banks associated with the non-perennial streams and rivers and the general conditions of the areas cleared, should be adequate to determine if there is any sediment runoff taking place or erosion.
- Phase 2: Monitoring after development expansion (long term or for a period after the activity).
    - From the risk assessment undertaken boreholes which fall within and downstream of the proposed development areas and the non-perennial streams (feeding into temporary livestock watering dams) are the receivers of any sediment runoff or poor-quality seepage/runoff from the site.
    - Monitoring the groundwater quality and quantity at the boreholes identified for future groundwater use (borehole 13, solar BH1 and solar BH2) should be sufficient to determine the impact on the local aquifer system. If any additional boreholes are drilled for this project these boreholes should be added to routine groundwater monitoring.
    - An annual hydrocensus of all known groundwater boreholes, springs, and new boreholes, is recommended. During the hydrocensus water levels and water quality should be evaluated, as well as complaints by landowners for declining yields which may relate to the project.

Monitoring duration, responsibility, and locality

Permanent monthly monitoring of abstraction rates and an annual hydrocensus is to be undertaken by either the applicant or an appointed service provider as per Table 7-1 of the Geohydrological Assessment Report.

Reasoned opinion on whether the activity should be authorized

The risk assessment for both construction and post-construction phases of the project is considered marginal, with mostly reversible and manageable impacts. This assessment cannot find any grounds or identify high hydrological risks to not proceed with the development. This is grounded on the assumption that the proposed mitigation measures, EMPr and EIA recommendations are implemented during the construction and operational phase of the development.

Mitigations

Impact: Disturbance, including pollution, of vadose zone during excavations activities, contractor laydown areas.

Consequence:

Interrupted pathway for groundwater recharge.

Pollution of groundwater.

Mitigation:

(1) Only clear or excavate areas applicable to the project area.

(2) Keep the site clean of all general and domestic wastes.

Impact: Natural Resource depletion (groundwater reserve) - Construction will require the abstraction of water from boreholes for dust suppression, mixing concrete and potable usage. Declining groundwater abstraction yields as a result of no water quality and quantity monitoring plan.

Consequence:

Depletion of groundwater reserve, particularly under future climate change scenarios. Less water in the underground aquifer means less water for other water users, including for reasonable domestic use and livestock watering (direct).

Assumption(s):

The largest risk of geohydrology is the proposed groundwater abstraction activities. As groundwater is a very important resource for locals in the area, care should be taken not to overproduce from boreholes chosen for this project, and there is a limited impact on existing livestock/domestic watering already implemented.

Furthermore, current sustainable production rates can be overproduction rates if the climate change forecasts are accurate and should therefore be adjusted accordingly nearing the 2050 mark.

Where a series of boreholes are drilled in the same contact, and close to each other (< 500 m), borehole interference may likely occur as the fractures are simultaneously dewatered. Over-production may lead to fracture failures which will lead to borehole collapse. However, due to the degree of fracturing being unknown, the anticipated impact cannot be pre-determined.

As a good practice, it is advised that all new boreholes drilled in the project area be pump tested, and interference (if any) be evaluated by long-duration pump tests. In terms of the development, limited impacts are anticipated due to the foreseeable low volumes required.

Currently, no groundwater (GW) monitoring is taking place. It is proposed that a proper monitoring programme be implemented to monitor both the water quality and quantity at the site.

Mitigation(s):

(1) Do not overproduce from boreholes used as part of the project. 8 hours of pumping per day is recommended.

(2) The abstraction of groundwater from both properties combined, (but limited to sub-catchment HRU2 of Quaternary Catchment D62D), including all boreholes contained thereon, shall not exceed 216 m3/ day (or 78 840,43 m3/ yr) during the construction period (including when it overlaps with operation), and 150 m3/day (or 54 750,3 m3/ yr) during operation.

(3) Abstraction may not exceed the sustainable abstraction yield at the recommended pumping rate of 8 hrs per day for each borehole, that is 6,58 l/s @ 8hrs (or 189,5 m3/8hr day) for BH4 and 5,11 l/s @ 8 hrs (or 147,17 m3/8hr day) for BH5.

(4) Undertake water level monitoring of boreholes within a 1.5 km radius of the pumping borehole. If a decline in water levels is noted in all boreholes, because of pumping, the abstraction rate should be lowered to prevent aquifer depletion.

(5) All new boreholes drilled in the project area (such as T1 or T2) must be pump tested, and interference (if any) with other existing boreholes (closer than 500 m) be evaluated by long-duration pump tests.

(6) Conduct multi borehole water level logging, to ensure that no cumulative dewatering impacts are taking place for boreholes which may be in the same contact zones.

(7) Implement the surface and groundwater monitoring protocol during construction and operation (Appendix D).

(8) Continually investigate and implement water-saving strategies and technologies or alternatives, including designs.

Management outcome: Minimise water usage during construction (and operation) to avoid depleting the underground aquifer.

Impact: High Electroconductivity levels of abstracted borehole water results in a high salt content.

Consequence: Scaling in piping or on solar panels if applied and left to evaporate.

Assumption:

(1) High EC (71,2 mS/m in BH4 and 59,7 mS/m in BH5) indicates a high salt load, which could result in scaling on solar panels if applied and left to evaporate. For cleaning purposes, the water would need to be wiped from the panels before it is allowed to evaporate. Otherwise, water softeners or deionisation plants will be required.

(2) The high dissolved salt content will likely cause scaling in piping exposed to heat, or in appliances used to boil water.

Mitigation:

(1) Groundwater should be treated with water softeners or deionization plant(s).

Impact: Impact on the aquifer reserve and borehole pump lifespan.

Consequence: Less water in an underground aquifer means less water for other water users, including for reasonable domestic use and livestock watering (direct).

Assumption:

It is advised that water be pumped to dedicated storage tanks from the boreholes to build up a reserve, whereafter the boreholes are only used to top up the storage tanks. Allowing boreholes to rest and recover between pumping cycles will help to decrease the impact on the aquifer reserve.

Mitigation:

(1) Groundwater should be pumped from the boreholes to dedicated water storage tanks to build up a reserve, whereafter the boreholes are only used to top up the storage tanks.

Management Outcome: Reduce impact on aquifer reserve.

Impact:

Hydrocarbon (fuel or oil) spills from construction vehicles or plant, and transformers will contaminate the soil, surface water run-off and possibly seepage.

Assumption:

Groundwater boreholes are generally situated within and downstream of the development areas, hence are potential receptors to pollution.

Consequence:

Poor quality seepage from oil/fuel spills during the construction phase, at any point in the project area, may impact the shallow groundwater table. Groundwater boreholes are generally situated within and downstream of the development areas, hence are potential receptors to pollution.

Sterile habitat for fauna and flora.

Mitigation:

(1) Have fuel/oil spill clean-up kits on site.

(2) Ensure all vehicles entering the site are parked in designated areas, with drip trays.

(3) Ensure that all vehicles entering the project area or facility are in good working order - vehicles or plant leaking fuel or oil are prohibited from entering site.

(4) Undertake regular inspections (monthly) and maintenance of transformers.

(5) Implement the surface and groundwater monitoring protocol during construction and operation (**Appendix D**).

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Management Category: Planning and Design

Impact:

Alteration of natural drainage lines may lead to ponding or increased runoff.

Installation of road culverts or pylons for transmission lines may cause temporary sedimentation after storm events.

Consequence: Ponding may cause stagnant water levels and increased run-off may cause erosion.

Mitigation:

(1) Ensure box culverts are used for any dedicated stream crossings. Box culverts should be sized to accommodate at least 1:100y flood events.

Management Category: Stormwater Management and Erosion Control

Impact:

There is a potential for erosion and sedimentation of the surroundings or non-perennial streams from, e.g., excavations associated with the borrow pits for road building material, if storm events take place and insufficient vegetation cover is present.

Consequence:

Loss of topsoil, disturbance to the vadose zone, and sedimentation of a watercourse.

Assumption:

Erosion and sedimentation are only likely to take place during severe storm events (e.g., 1:2 to 1:100y events). Incidental rainfall will likely not cause sedimentation.

Mitigation:

(1) It is recommended that the civil construction phase commence at the onset of winter as there is a decreased probability of storm events.

(2) All development footprint areas must remain as small as possible and vegetation clearing to be limited to what is essential.

(3) Retain as much indigenous vegetation as possible and re-vegetate cleared or eroded areas to reduce stormwater peak flows.

(4) It is recommended that sandbags and temporary berms be used, to manage stormwater runoff and control erosion.

(5) Exposed soils to be protected using a suitable covering, e.g., mulch.

(6) Where required, cover soil stockpiles with a temporary liner to prevent erosion and contamination.

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Management Category: Construction – dust suppression – water usage

Impact: The abstraction of water for dust suppression will likely be very high.

Consequences:

Less water in an underground aquifer means less water for other water users, including for reasonable domestic use and livestock watering (direct).

Assumption:

The water demand will depend on the frequency of spraying events for dust suppression. It is recommended that environmentally safe binding liquids be considered to decrease water use volumes. If dust suppression and operational water use volumes taken from groundwater resources in the sub-catchments are within the surplus estimates, the impact on the groundwater reserve will likely be minimum.

Mitigation:

(1) Environmentally safe binding liquids should be considered to decrease water use volumes.

<u>Management Outcome:</u> Minimize the impact of borehole abstraction on the groundwater reserve.

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Hydrology Assessment

The following was taken out of the Hydrology Assessment (*Hydrological Assessment (Version – Final 3) 01 September 2022 GCS Project Number: 22-0076 by Hendrik Botha*) attached as **Appendix E: Annexure F.**

Impacts

Based on the SPR model applied to the site, the following potential hydrological risks are identified:

- Construction phase risk (construction of standpipes and arrays for PV panels, construction of sub-stations, the establishment of stream crossings and culverts and erection of transmission lines):
    - Leakages from construction and contractor vehicles accessing the site may cause soil pollution (i.e., un-inspected vehicles dripping oils/hydrocarbons onto soils may cause contamination of soil and surface water resources).
    - Disturbing soils (land capability) due to some vegetation clearing may promote sedimented runoff during storm events.
    - Excavation of borrow-pits for road building material may cause temporary sedimentation during storm events.
    - Disturbing sediments associated with streams to install dedicated stream crossings and road culverts may promote sediment runoff.
- The operational phase of the PV farm:
    - Oil spillage from parked vehicles (service vehicles).
    - Sedimentation runoff from areas where no stormwater management measures are implemented; or where vegetation is not maintained.

The risk assessment for both construction and post-construction phases of the project is considered marginal, with mostly reversible and manageable impacts. Potential runoff and stormwater discharge from the site into the surrounding may cause erosion of the soils in areas where PV panels are erected and the surroundings. This is the largest risk and should be managed as per the conceptual stormwater management plan as proposed in this document (or detailed stormwater designs from the developer).

The risk of flooding, poor quality seepage via the vadose zone, and impacts on surface water quality is predicted to be marginal during the construction and operational phase of the project. This is largely due to the absence of any surface water streams in the project area and the nature of the development (i.e., assemblage of panels that are form factor).

Cumulative impacts

Limited cumulative impacts are anticipated due to the project type.

The cumulative impacts from a surface water perspective are limited as (1) there will be no significant increase in surface water run-off (run-off volumes, peak rates or time to peak rates), (2) small areas will be disturbed, (3) disturbed areas will likely only show temporary impacts in terms of water quality (e.g., sedimentation if flooding takes place), (4) the streams and rivers are ephemeral, and (5) no dedicated surface water pollution sources will be created (e.g., landfills, oil or fuel storage areas, mining, etc.).

Moreover, the other proposed solar developments are situated in different drainage areas, rendering the likely cumulative impact associated with this project zero. Any hydrological risk for this project will be confined to the delineated sub-catchments.

Considering the low risk of cumulative impacts associated with surface water hydrology, the proposed mitigations, and Conceptual Stormwater Management Plan (CSWMP) will be sufficient to avoid or reduce local impacts and therefore their potential contribution to cumulative impacts.

Reasoned opinion whether the activity should be authorized

The hydrological assessment cannot find any grounds or identify high hydrological risks to not proceed with the development. This is grounded on the assumption that the proposed mitigation measures, CSWMP, EMPr and EIA recommendations are implemented during the construction and operational phase of the development.

Mitigations

The following mitigation measures can be implemented as part of the EMPr to further reduce the risk of flooding on site and contribution to stormwater generation potential:

Proposed stormwater management measures:

1. Sandbags should be used to manage stormwater run-off (if storms do occur).
2. The (civil) construction phase should take place during the winter months (e.g., June to September) with a decreased probability of storm events.
3. Temporary stormwater systems should be sufficient to manage the stormwater at the site during the construction phase.
4. Ensure that all stormwater systems are kept clean of any debri to reduce flooding risk.
5. To circumvent potential erosion and sedimentation in open and unvegetated areas associated with the site native species of vegetation in the area should be planted and maintained.
6. Minimise vegetation disturbance.
7. Revegetate as soon as possible to maintain ground cover across the site.
8. Conduct regular inspections and maintenance of the site to ensure that vegetation cover is adequate, and no rivulets are generated.

The following stormwater systems are proposed if a storm event does occur and free drainage back to the environment shows evidence of erosion and sedimentation (refer to section 6.6.3 on report page 27 of the Hydrology Assessment Report 2022):

1. It is proposed that vegetated swales be installed downstream of the PV array areas to decrease peak run-off volumes from the panels and divert the water to the lower-lying swales for each area. The swales are to be sized according to the calculated storm peak flows (refer to sections 6.5 and 6.6 of the Hydrology Assessment Report 2022). Connecting vegetated swales as a type of herringbone system to the final discharge area (e.g., lowest point associated with the site) will help to slowly divert any run-off back to the environment which is generated by the solar panels.
2. At the lowest positions in each vegetated swale system, an outfall to the environment should be constructed. The outfall should simply comprise a vegetated discharge area (from the vegetated swales). Additional stormwater controls at the outfall can include rock riprap along with vegetation cover.

3. Native species should be planted in the swales and maintained to circumvent potential erosion and sedimentation in open and unvegetated areas.
4. Stormwater monitoring requirements of swales:
    a. Routine hydraulic monitoring, e.g., observations of any blockages in the swale systems, and clean out of the stormwater systems.
    b. Routine revegetation of the swales to ensure optimum operation.
    c. No quality monitoring is recommended.

Mitigations to be included in the EMPr:

Impact: Disturbance, including pollution, of vadose zone during excavations activities, contractor laydown areas.

Consequence:

Pollution of surface water.

Mitigation:

(1) Only clear or excavate areas applicable to the project area.

(2) Keep the site clean of all general and domestic wastes.

Management Category: Stormwater Management and Erosion Control

Impact:

There is a potential for erosion and sedimentation of the surroundings or non-perennial streams from, e.g., excavations associated with the borrow pits for road building material, if storm events take place and insufficient vegetation cover is present.

Consequence:

Loss of topsoil, disturbance to the vadose zone, and sedimentation of a watercourse.

Mitigation:

(1) It is recommended that the civil construction phase commence at the onset of winter as there is a decreased probability of storm events.

(2) All development footprint areas must remain as small as possible and vegetation clearing to be limited to what is essential.

(3) Retain as much indigenous vegetation as possible and re-vegetate cleared or eroded areas to reduce stormwater peak flows.

(4) It is recommended that sandbags and temporary berms be used, to manage stormwater runoff and control erosion.

(5) Exposed soils to be protected using a suitable covering, e.g., mulch.

(6) Where required, cover soil stockpiles with a temporary liner to prevent erosion and contamination.

(7) Re-vegetate areas where erosion is noted or where vegetation is required to reduce stormwater peak flows.

(8) Install swales as per the CSWMP (**Appendix E**) if free drainage back to the environment shows evidence of accelerated erosion and sedimentation.

Management Category: Planning and Design

Impact:

Alteration of natural drainage lines may lead to ponding or increased runoff.

Installation of road culverts or pylons for transmission lines may cause temporary sedimentation after storm events.

Consequence: Ponding may cause stagnant water levels and increased run-off may cause erosion.

Mitigation:

(1) Ensure box culverts are used for any dedicated stream crossings. Box culverts should be sized to accommodate at least 1:100y flood events.

Management Category: Construction / Machinery

Impact:

Hydrocarbon (fuel or oil) spills from construction vehicles or plant, and transformers will contaminate the soil, surface water run-off and possibly seepage.

Consequence:

Poor quality seepage from oil/fuel spills during the construction phase, at any point in the project area, may impact the shallow groundwater table. Groundwater boreholes are generally situated within and downstream of the development areas, hence are potential receptors to pollution.

Sterile habitat for fauna and flora.

Mitigation:

(1) Have fuel/oil spill clean-up kits on site.

(2) Ensure all vehicles entering the site are parked in designated areas, with drip trays.

(3) All vehicles must be in good working order when entering the site.

(4) Undertake visual inspections for any leakages that may emanate from any vehicle accessing the site - vehicles or plant leaking fuel or oil are prohibited from entering site.

(5) Undertake regular inspections (monthly) and maintenance of transformers.

(6) Implement the surface and groundwater monitoring protocol during construction and operation (**Appendix D**).

Monitoring Plan – during operation – (or post-construction)

Establish four (4) surface water monitoring sites (see Figure 8-1 on report page 40 of the Hydrology Assessment Report 2022) in the ephemeral drainage line and temporary dams constructed by the landowner.

Surface water should be monitored bi-annually for pH, Electrical Conductivity (EC) or Total Dissolved Solids (TDS) and Temperature.

Surface water monitoring should take place up to 2 years after the completion of development.

For groundwater monitoring aspects relating to the construction and operational phase of the project, the reader is referred to the GCS Groundwater Assessment Report (Project Number 22-0401 Date: 10 August 2022).

Other Mitigations

1. If PV panels and array assemblages are proposed in areas of high flood risk, the depth of flooding should be predicted for those areas, e.g., depth of surface water flooding predicted during the 1:100* year flood event (refer to Hydrology Impact Assessment). * *Clarified by Henri in an email dated 20th April 2022*.
2. All electrical connectors and other items vulnerable to flood water should be located at a minimal level of the maximum flood depth plus a 0,3 m free board above ground level to ensure that they are protected from the design flood event.

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Palaeontology Assessment

The following was taken out of the *Site Sensitivity Verification Report prepared by John E. Almond of Natura Viva cc dated May 2022* attached as **Appendix E: Annexure C.**

Fossil tetrapod remains appear to be generally very rare in this portion of the Permian Adelaide Subgroup outcrop area.

The only fossils previously recorded here comprise locally common, generally small blocks of reworked petrified wood within older alluvial deposits and surface gravels as well as possible low-diversity invertebrate trace fossil assemblages (Almond 2017, 2021).

No further High Palaeosensitivity fossil sites of scientific or conservation value have been identified within the wider Soventix solar project area during the recent palaeontological two-day site visit. The only new fossil material recorded from bedrock exposures here - all from *outside* the Phase 3 project areas (**Figure 22**) – comprises:

1. small, unidentifiable fragments of fossil bone
2. poorly-preserved moulds of woody plant axes within mudrock intraclast basal breccias
3. ill-defined horizontal invertebrate burrows on a crevasse splay sandstone bed top and
4. very occasional small reworked blocks of well-preserved silicified wood among surface gravels.

None of this fossil material is of significant scientific or conservation value. Of course, the potential occurrence of High Sensitivity fossil sites in the subsurface within the solar project areas cannot be entirely discounted.

Recently recorded fossil sites on the margins of the Soventix Phase 2 and Phase 3 solar project areas are illustrated below and mapped on the satellite image in **Figure 22.**

Site Sensitivity Verification

It is concluded that the entire solar facility and grid connection project areas are in fact of **Low palaeosensitivity overall**. This is based on:

1. The apparent rarity of scientifically important fossil material.
2. The pervasive thick cover of palaeontologically insensitive Late Caenozoic deposits (surface gravels, soils, colluvium) in low-lying areas which are the primary locus of solar plant development.
3. Compromising of fossil preservation due to intensive dolerite intrusion in the region.

Conclusions

With the exception of limited higher-lying, rocky areas on the periphery of or (mostly) outside the likely solar PV project footprint, the Permian bedrocks here are very poorly exposed due to pervasive, thick, unfossiliferous superficial sediments (surface gravels, soils).

Vertebrate fossil remains are very scarce within the available bedrock surface exposures while the only fossil sites recorded – *viz*. poorly-preserved bone and moulds of woody plant fragments, small reworked blocks of petrified wood, ill-defined invertebrate burrows – are of low scientific or conservation interest.

No High Sensitivity fossil sites are recorded within any of the Soventix Phase 1 to Phase 3 solar project areas (including all associated infrastructure such as grid connections, substations, access roads *etc*) and it is concluded that, in practice, all these sites – including the Soventix Phase 3 project area - are of LOW Palaeosensitivity.

Impacts

The potential for rare, largely unpredictable fossil sites of High Palaeosensitivity within the Permian bedrocks (*e.g.* tetrapod bones and teeth) or associated with older alluvial and pan deposits hidden in the subsurface (*e.g.* mammalian bones, teeth, horncores, non-marine molluscs, calcretised termitaria) cannot be entirely discounted.

Many or most of the younger fossil sites would probably be protected during construction by environmental buffer zones along drainage lines.

Mitigations

If any fossiliferous deposits are exposed by surface clearance or excavations during the construction phase of the development, the Chance Fossils Finds Protocol outlined in Appendix 1 of the Palaeontology report should be fully implemented. These recommendations should be included within the EMPrs.

Provided that the Chance Fossil Finds Protocol is incorporated into the EMPrs and fully implemented during the construction phase, there are no objections on palaeontological heritage grounds to authorisation of the proposed developments. Pending the discovery of significant new fossil finds before or during construction, no further specialist palaeontological studies, monitoring or mitigation are recommended for these renewable energy projects.

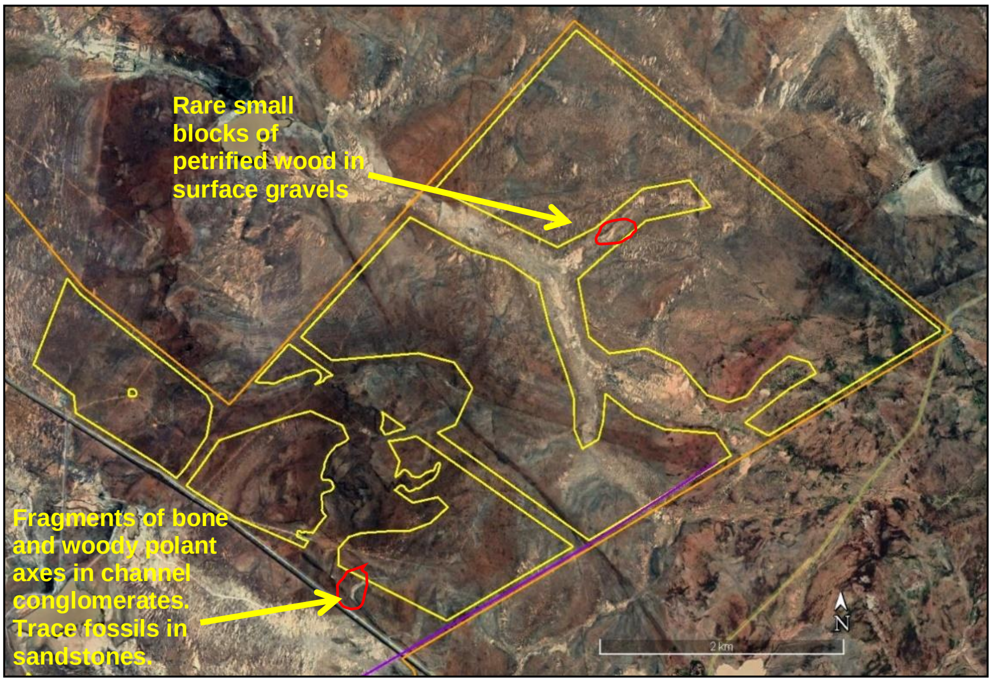

Figure 22: Palaeontology Sites **(**Reddish-brown areas are dolerite intrusions (unfossiliferous) while darker grey areas may reflect surface exposure of sedimentary bedrocks. However, field observations indicate that these areas often comprise weathered surface gravels of sandstone, palaeocalcrete and mudrock of low palaeosensitivity. Two areas where sparse fossil remains of low scientific and conservation value have been recorded are outlined in red. *N.B.* Both fossil sites lie *outside* the solar project areas).

Heritage Impact Assessment

The following was taken out of the *A Report on a Phase 1 Archaeological & Heritage Impact Assessment prepared by A.J. Pelser dated August 2022 (Report: APAC022/49)* attached as **Appendix E: Annexure B.**

Results of the June 2022 Field Assessment

A total of 31 sites were identified during the 2022 assessment in the study and development area (Sites 26-31 are located outside of the proposed development footprint). They included a fairly larger number of open-air Stone Age surface sites (with varying degrees of density), a recent stone kraal and some stone cairns that are most likely associated with an old road (**Figure 23**).

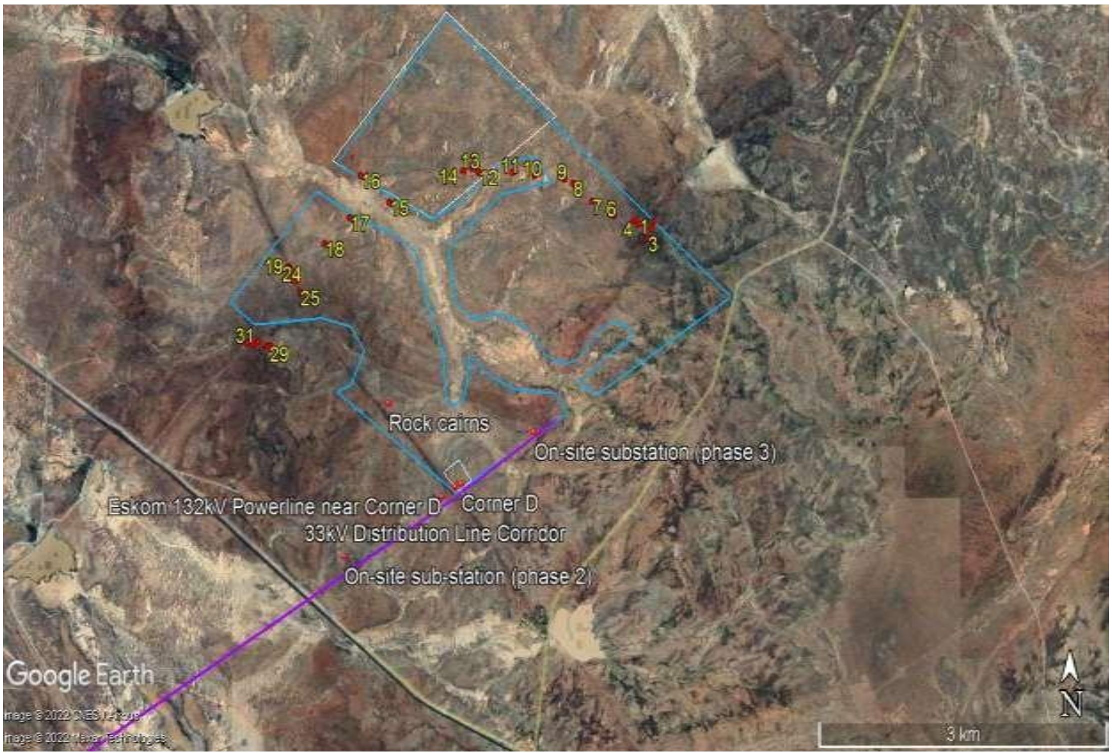

Figure 23: The distribution of 31 sites found during the June 2022 field assessment (Google Earth 2022).

Stone Age open-air surface scatters (Sites: 1; 3-15; 17-18; 26-28 & 30-31)

These sites were all open-air surface scatters with differing densities of material (cores, waste-flakes, more formal tools such as blades, scrapers and broken points). These artifact and sites most likely date to between the Middle and Late Stone Ages and is similar to those found in other areas during the 2017 & 2021 assessments and in other studies by archaeologists in the larger geographical area (**Figure 24**).

Although the sites and finds situated in the proposed development footprint are open-air surface locations and are therefore not located in a primary & stratified context such as those in rock shelters and caves, it is believed that they could contribute to our knowledge of the Stone Age of the specific and larger geographical area.

Sites 26-31 are located outside of the proposed development footprint.

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Figure 24: Some of the stone tools at Site 5. These artifacts were in an erosion gully.

Stone Kraal (Site 16)

This is a recent stone-built kraal used as livestock enclosure (sheep). Although the exact age is not known, it is likely less than 60 years of age. It is not deemed of any historical/cultural heritage significance and the documentation done during the Phase 1 assessment is seen as sufficient and no further mitigation is required.

Figure 25: A view of Site 16 stone kraal (livestock enclosure).

Stone Cairns (Sites: 2, 19-25 & Site 29)

Although it is possible that these cairns are marking potential drill sites for groundwater, it is unlikely as the recorded cairns are located on top of the dyke, found in pairs opposite each other, with the pairs lining up with other pairs in nearly exact distances from each other. It is therefore seen as more likely being markers for an old road. One of the stone cairns (Site 2) recorded is in another section of the study area and is possibly the remnant of an old farm boundary fence.

Although the age, origin and function of this possible old road is not known, it could date to the late 19th/early 20th century, with some cultural material dating to this period found in association (Martini Henry cartridge). This was likely an old wagon road linking farmsteads with each other, as well as these with Hanover and other towns. From this point of view this road and related features (cairns) are relatively significant from a Cultural Heritage point of view and at least should in part be preserved. Stone cairns can be demolished in sections where they cannot be avoided by development actions.

Figure 26: One of the stone cairns that formed part of the old wagon road/track (Sites 19- 25).

Figure 27: This image clearly shows the dolerite dyke (dark line) and possible old wagon road alignment with the stone cairns (Sites 19-25) on and next to it (Google Earth 2022).

Cumulative Impacts

The cumulative impacts were not investigated as they are not particularly applicable to the Cultural Heritage sites, given the fairly localized context.

Overall Ratings

Cultural Significance:

- Low to Medium (Stone Age Sites);
- Low (Site 2 Stone Cairn & Site 16 Stone Kraal);
- Medium to High (Stone Cairns/Old wagon road)

Heritage Significance:

- Grade III: Other heritage resources of local importance and therefore worthy of conservation (Stone Age sites and Old Wagon Road)

Field Ratings:

- General protection A (IV A): Sites should be mitigated before destruction (High/Medium significance)

Mitigation Measures or inclusion in EMPr:

Management Category: Pre-construction

Impact: Disturbance to or destruction of Stone Age open-air surface scatters (Sites: 1; 3-15; 17-18) by construction activities, e.g., clearing and grubbing activities.

Consequence: Loss/damage of heritage resources.

Assumption: These sites were all open-air surface scatters with differing densities of material (cores, waste-flakes, more formal tools such as blades, scrapers and broken points) on them.
Although the sites and finds situated in the proposed development footprint are open-air surface locations and are therefore not located in a primary & stratified context such as those in rock shelters and caves, it is believed that they could contribute to our knowledge of the Stone Age of the specific and larger geographical area. As is the case with the 2017 and 2021 Heritage Assessment, if the sites can't be avoided by the development activities that will be mostly drilling holes to insert the poles that support the solar modules, and two-track dirt roads and need to be destroyed as a result then mitigation is recommended prior to development commencing.

Mitigation:

(1) Prior to commencing development, appoint a heritage specialist/archaeologist registered with ASAPA to undertake detailed mapping and determine the extents of the Stone Age open-air surface scatters (sites: 1; 3-15; 17-18) if the sites can't be avoided by development activities.

(2) Landowner's permission to undertake the required mitigation work must be provided.

(3) Obtain a representative sample of Stone Age material and types to determine the age of the material and sites through the surface collection of material.

(4) For the surface sampling an Archaeological Mitigation Permit must be applied for and issued by SAHRA. A permit will only be issued by SAHRA once Environmental Authorization for the development have been given, Final Comments from SAHRA on the Phase 1 HIA has been provided and an accredited Archaeologist has been appointed to undertake the work.

Management Outcome: Preservation of heritage resources and contribute to our knowledge of the Stone Age of the specific and larger geographical area.

Management Category: Planning & Design

Impact: Disturbance to or destruction of Stone Cairns indicating an old Wagon Road (Sites: 19-25) by construction activities, e.g., clearing and grubbing activities.

Consequence: Loss/damage of heritage resource.

Assumption:

Although the age, origin and function of this possible old road is not known, it could date to the late 19th/early 20th century, with some cultural material dating to this period found in association (Martini Henry cartridge). This was likely an old wagon road linking farmsteads with each other, as well as these with Hanover and other towns. From this point of view this road and related features (cairns) are relatively significant from a Cultural Heritage point of view and at least should in part be preserved. Stone cairns can be demolished in sections where they cannot be avoided by development actions. The exact age and historical origin should also be researched.

Mitigation:

(1) Prior to commencing development, appoint a heritage specialist/archaeologist registered with ASAPA to undertake (a) desktop research on the age, origin and function, as well as (b) detailed mapping and photographic recording of the section of old Wagon Road in the development footprint and demarcated by stone cairns at sites 19 to 25 and 29.

(2) Landowner’s permission to undertake the required mitigation work must be provided.

(3) Preserve the section of road demarcated by the Heritage Specialist in a kmz file and including stone cairns at sites 19 to 22.

(4) The preserved section of old Wagon Road should be cordoned-off during construction.

(5) Erect information signage on the history of the old Wagon Road.

(6) As far as possible avoid destruction or demolition of other stone cairns, including but not limited to Sites 23 to 25. These cairns may only be destroyed if they can’t be avoided.

Management Outcome: Preservation of heritage resources and expansion of knowledge of the archeology of the area.

Management Category: Clearing and Grubbing - Destruction of artefacts

Impact: Damage to previously unknown or invisible sites, features or material heritage artifacts/gravesites during construction.

Consequence: Loss/damage of heritage resource.

Assumption:

Although all efforts are made to locate, identify and record all possible cultural heritage sites and features (including archaeological remains) there is always a possibility that some might have been missed as a result of grass cover and other factors. The subterranean nature of these resources (including low stone-packed or unmarked graves) should also be taken into consideration. Should any previously unknown or invisible sites, features or material be uncovered during any development actions then an expert should be contacted to investigate and provide recommendations on the way forward.

Mitigation:

(1) Implement Chance Find Protocol.

<u>Management Outcome:</u> Preservation of cultural heritage resources.

<u>Discussion</u>

From a Cultural Heritage point of view it can be said that the proposed development of a 400 MW Solar Photovoltaic (PV) facility and associated infrastructure (Phase 3) on the Remainder of Farm Goede Hoop 26C, Portion 3 of Farm Goede Hoop 26C and other properties, between De Aar & Hanover, Emthanjeni Local Municipality, Pixley Ka Seme District Municipality, Northern Cape Province, South Africa should be allowed to continue once the recommended mitigation measures related to the archaeological & historical sites and features have been implemented.

Soil Mapping Report

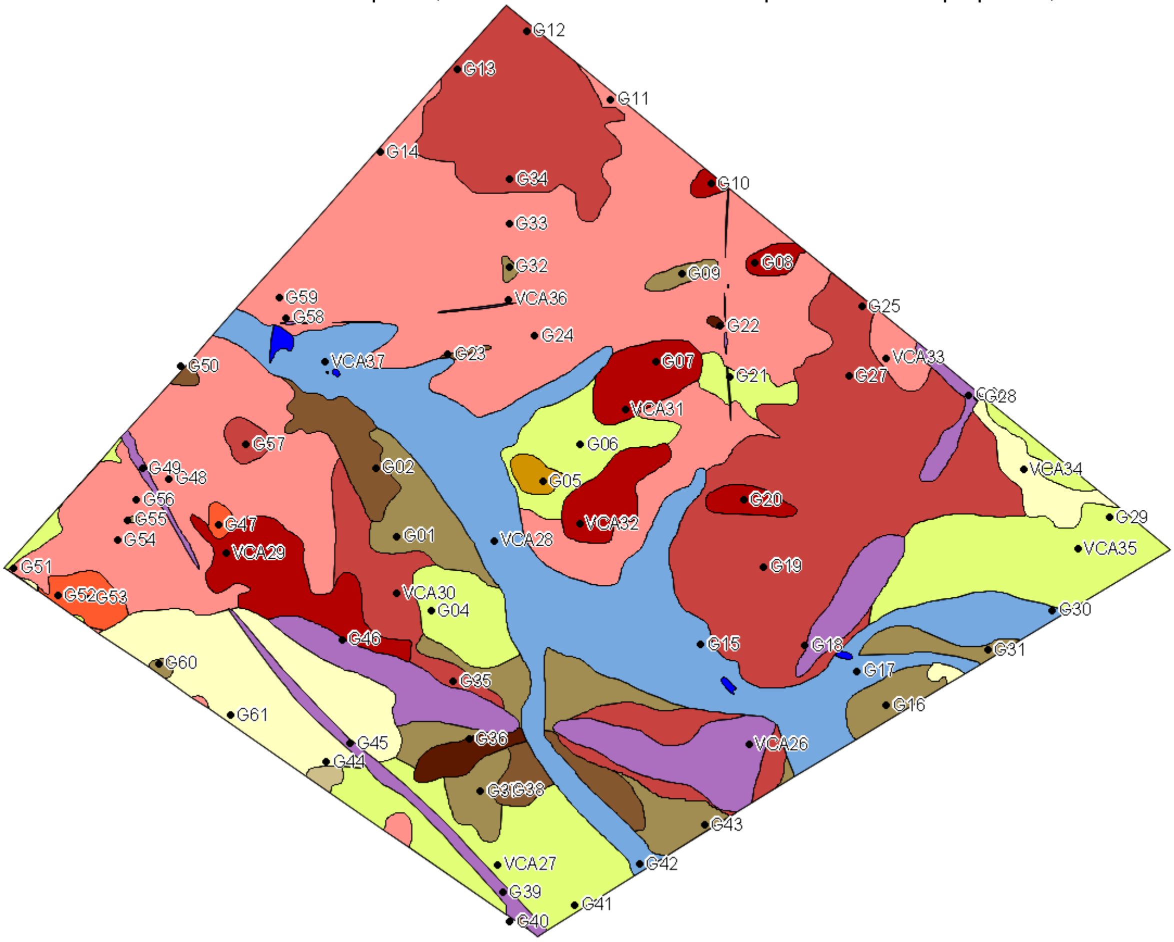
The following was taken out of the *Soil Mapping Report prepared by Hennie van den Burg of Iris International and Francois Botha of Eco Soil dated June 2022* attached as **Appendix E: Annexure E.**

Results

Ten soil forms were identified (**Figure 28** - soil map below) from 72 soil observation sites for Phase 3. The study area is part of the Beaufort Group of the Karoo Supergroup of geology in South Africa and consist mainly of sandstones and shales dominated by the Mispah soil form. Sub dominant soil forms are Swartland and Oakleaf forms. Dolerite koppies also form a small but conspicuous part of the landscape.

Most of the soils are very shallow with an average depth of less than 30cm. Clay content ranges from sandy loam to very clayey. Calcareous soils are covering relatively small areas. Soils are unsuitable for most types of agriculture.

No severe donga erosion has been observed in the study areas. Minor to moderate plate erosion is present. Severe donga and sheet erosion have been observed on flood plains outside the study areas.



Colour	No	Class	Dominant soils
	1	Sandstone outcrops	Outcrop/Ms complex
	2	Dolerite outcrops	Outcrop
	3	Very shallow yellow brown loamy soils	Ms
	4	Very shallow yellow brown clayey soils	Ms
	5	Very shallow red loamy soils	Ms, Gs
	6	Very shallow red clayey soils	Ms, Hu, (Gs)
	7	Shallow to medium deep yellow brown loamy soils	Gs, (Ms, Cv)
	8	Shallow to medium deep yellow brown clayey soils	Oa, Ad, Ag, (Gm)
	9	Shallow to medium deep red loamy soils	Hu, (Gs)
	10	Shallow to medium deep red clayey soils	Hu, Oa, Et, Ky,
	11	Structured shallow soils	Sw
	12	Structured medium deep soils	Va
	13	Permanent wetland - artificial	
	14	Bottomlands with ephemeral drainage lines	Va, Tu
	15	Water	

Figure 28. The soil map for the Phase 3 area. Soil survey sites are shown as black dots.

The 30km radius area is shown in **Figure 29.** Phases 1, 2 and 3 and the other proposed or existing PV developments are shown in relation to each other and stream flow (Strahler stream orders 3-6) derived from the ALOS DSM.

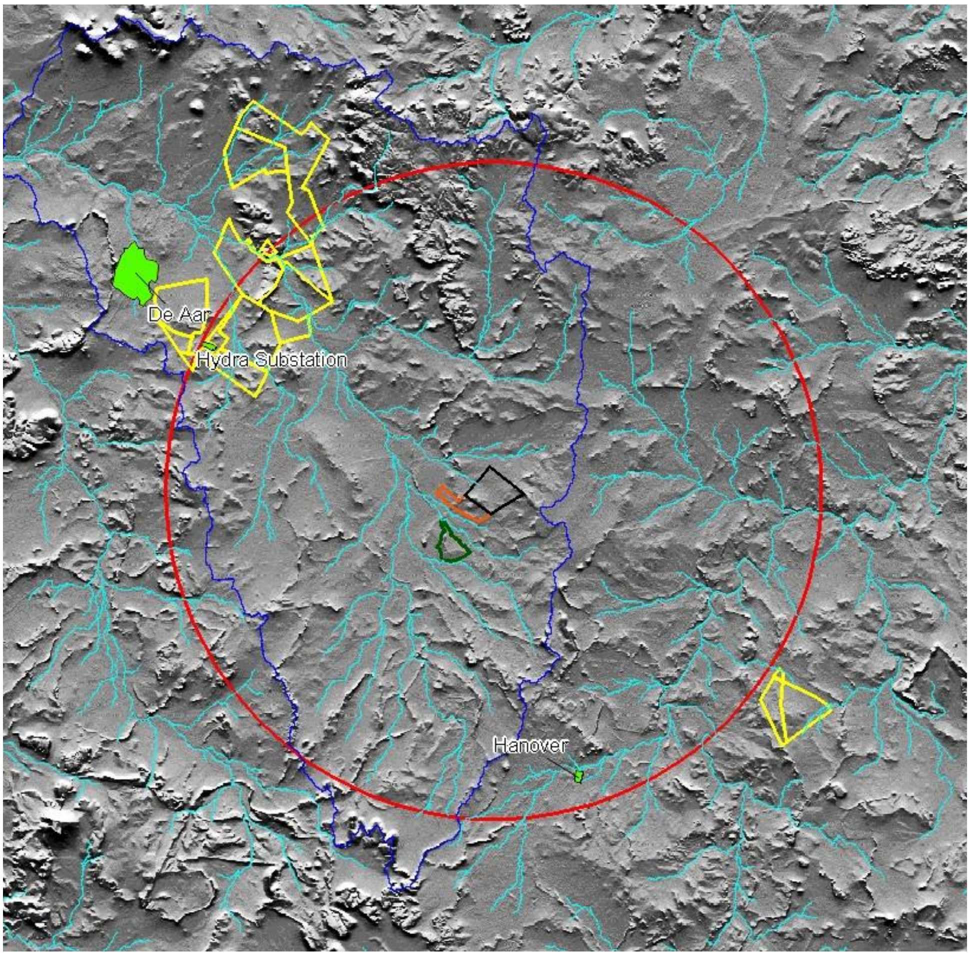


Figure 29. Potential cumulative runoff of from all proposed PV developments in a 30km radius (red circle) from Phase 3 - overlaid on an ALOS DSM hill-shading. Phases 1, 2 and 3 are shown respectively in green, orange and black delineations. The catchment (41 085 ha) containing all three Phases and the downstream PV developments is shown by a dark blue delineation. The potential PV developments other than the Phase 1, 2 and 3 areas are shown by yellow delineations. The Hydra substation and towns of De Aar and Hanover is also indicated in the figure. Strahler stream orders 3-6 are shown in cyan.

Table 30 shows the runoff from all three phases to be only 10.24% of all the PV projects inside the catchment. So this will be a 10% addition to the cumulative effect of the other PV developments. The overall runoff from all three projects is only 1.39% of the total runoff from the catchment and just 0.79% from Phase 3.

This implies that the cumulative effect (in terms of sediment load carried by the watercourses) of all three phases on developments downstream will be relatively small, even with some potential higher runoff during the construction of these phases.

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Table 30. Runoff from each Phase is expressed as total cells, % of all projects and % of the total catchment runoff.

Project	Runoff per project (cells*)	Runoff - whole catchment (cells)	% of all projects	% of catchment
Phase 1	9 389	2 935 952	2.35	0.32
Phase 2	8 232	2 935 952	2.06	0.28
Phase 3	23 222	2 935 952	5.82	0.79
Other PV projects down stream	358 046	2 935 952	89.76	12.20
Total	**398 889**	**2 935 952**		**13.59**
Total Phases 1, 2 & 3	**40 843**		**10.24**	**1.39**

*A cell is 30mx30m = 900m^2. The catchment is 41 085 ha.

Mitigation measures for inclusion in EMPr:

The only area of concern is potential enhanced soil erosion. Some infrastructure e.g., substations will have weatherproof surfaces and will cover in general relatively small areas with very little influence on soil erosion. Most of the areas will be covered by PV solar panels. It is possible that the shading effect of the proposed solar panels will increase soil moisture content and therefore improve the vegetation cover underneath the solar panels. Good grazing management as discussed in the grazing report (De Wet and Arnoldi, 2022) should keep the vegetation cover and condition intact. A grazing regime by small stock underneath the solar panels is also in our opinion the most environmentally friendly and cost-effective option to keep soil erosion to the bare minimum for the development areas. Roads should also be well planned and kept to a minimum to reduce soil erosion and excessive runoff.

The potential cumulative runoff from all proposed PV developments in a 30km radius analysis shows that the footprint of Phases 3 and 2 have very small sub catchments compared to the larger catchment area and the runoff contribution from both areas is around 1% of the main catchment.

Management Category: Planning and Design

Impact: The clayey soils and most noticeably the Swartland and Valsrivier soils may restrict vehicle movement during the wet season.

Consequence:

Economic, delays in construction.

Soil erosion cause by vehicles stuck in access roads

Assumption:

During the rainy season terrain mobility on high clay soils in low lying areas with drainage lines will be difficult and might increase soil erosion when drainage lines are disturbed.

Mitigation:

(1) Access roads to the project area, especially those crossing large flood plains, should be well planned.

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(2) The design of access roads must include the adequate management of surface water run-off.

Management Outcome: Reduce soil erosion

Management Category: Planning and Design

Impact: The shallow soils may present a challenge for some construction items like poles that need to be planted. The Swartland and Valsrivier soils may also have an influence on any foundations.

Consequence: economic feasibility

Mitigation:

(1) The engineers should be aware of and take into consideration the soil forms and properties as described in the Soil Mapping Report 2022 when planning the design and layout of the solar PV facility including associated infrastructure.

Management Outcome: Maintain project feasibility.

Management Category: Rehabilitation – Disturbed areas

Impact: Bare patches (or areas where the original vegetation was cleared or severely disturbed) are susceptible to erosion.

Consequence: Erosion leads to dysfunctional landscapes and reduced agricultural potential.

Assumption: Keeping as much of the original vegetation intact should be a high priority during all phases. The project area is situated on Karoo sediments that are known for high sodium and magnesium content in the soil. Sodic soils are highly dispersive, that is susceptible to soil capping and erosion.

Mitigation:

(1) A few topsoil samples should be taken and analysed for sodicity.

(2) Improve water infiltration by means of mechanical intervention and the application of gypsum or similar ameliorants.

(3) Sowing of grass seeds in combination with the chemical and mechanical water infiltration improvement measures should also be considered for highly degraded areas.

The following mitigation was included in the matrix instead of the above mitigations: Implement the Bare Patch Protocol (Appendix C) from the onset of construction.

Management Outcome: Improve surface water infiltration and minimise erosion.

Management Category: Grazing management

Impact: Overgrazing

Consequence: Overgrazing negatively impacts on veld condition, specifically reducing plant vigor, primary production and increasing soil erosion and sedimentation.

Assumption: Maintaining the natural vegetation in an optimal state is seen as the best and most cost-effective method to limit soil erosion to the minimum.

It is possible that the shading effect of the proposed solar panels will increase soil moisture content (through reduced evapotranspiration) and therefore improve the general grazing capacity of the study areas.

Mitigation:

(1) Implement good rangeland management practices defined by an adopted long-term grazing strategy with small stock for the areas underneath the solar panels to maintain optimal vegetation cover and to reduce soil erosion and runoff.

Management Outcome: Improve surface water infiltration and minimise erosion.

Management Category: Clearing/Grubbing and Grading

Impact:

Clearing of vegetation for the construction of access roads, solar panel installations, substations and other infrastructure can cause sediment load in the water courses before the cleared areas can be stabilized.

Consequence:

Erosion and sedimentation of a watercourse.

Mitigation:

(1) Clearing of vegetation, including for temporary access roads, should preferably be done outside the main rainfall periods.

(2) Keep as much of the original vegetation intact as possible.

(3) Rehabilitate areas where the original vegetation was cleared or severely disturbed (e.g., bare patches).

Management Outcome: Reduce sedimentation of watercourses

Discussion

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 if there is proper runoff management from roads and other bare areas. Good rangeland management for the areas underneath the solar panels will be essential to maintain a good vegetation cover and to reduce soil erosion and runoff. The shallow soils may present a challenge for some construction items like poles that need to be planted. The clayey soils and most noticeably the Swartland and Valsrivier soils may restrict vehicle movement during the wet season. The Swartland and Valsrivier soils may also have an influence on any foundations. It is possible that the shading effect of the proposed solar panels will increase soil moisture content and therefore improve the general grazing capacity of the study areas.

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Grazing Potential Assessment

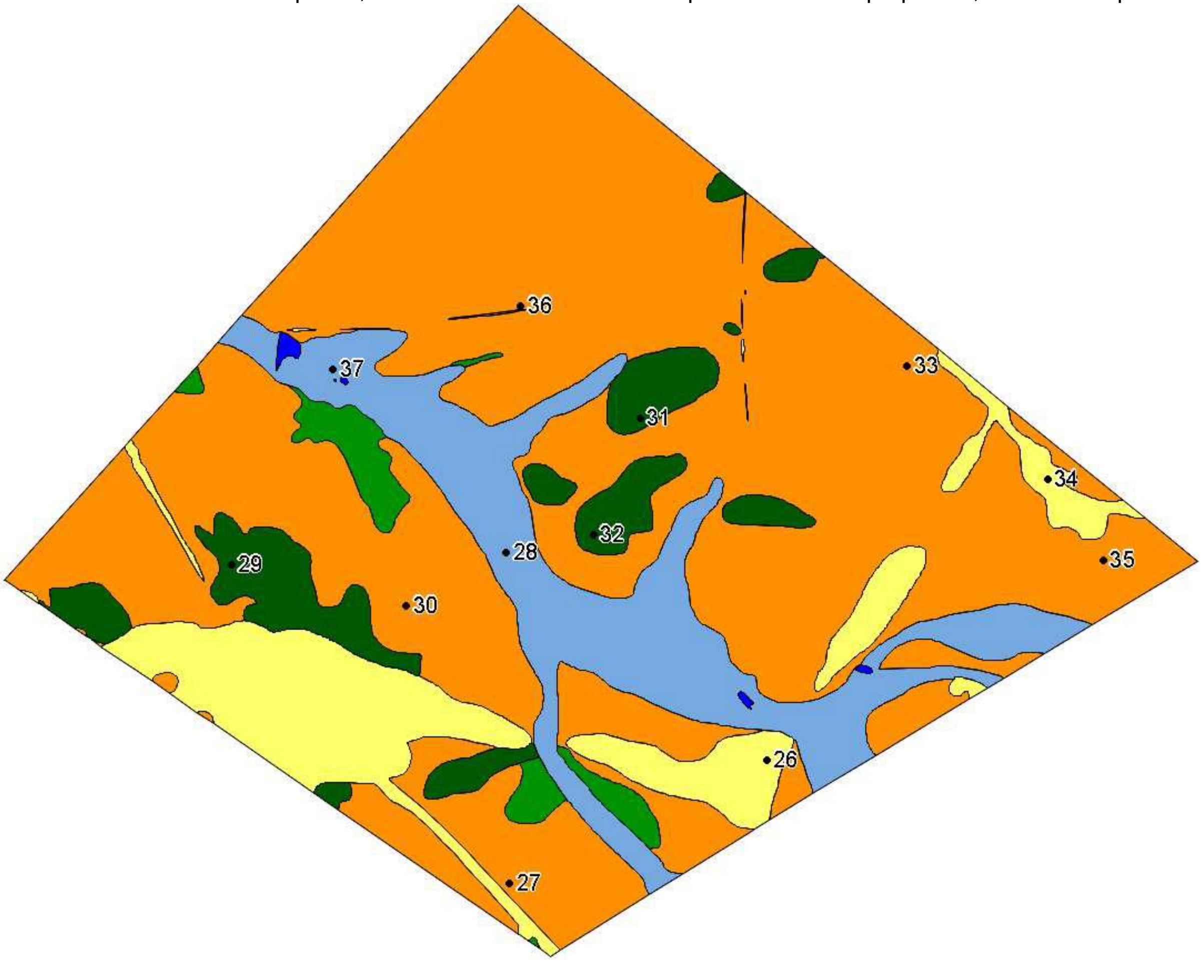
The following was taken out of the *Grazing Potential Assessment prepared by Francois de Wet of Enviro Pulse and Shobie Arnoldi of Topveld dated June 2022* attached as **Appendix E: Annexure D:**

Soils and Grazing Capacity

Thirteen (13) soil units were identified and mapped, using geology, soil texture and depth:

1. Class 1. Sandstone outcrops
2. Class 2. Dolerite outcrops
3. Class 3. Very shallow yellow brown loamy soils
4. Class 4. Very shallow yellow brown clayey soils
5. Class 5. Very shallow red loamy soils
6. Class 6. Very shallow red clayey soils
7. Class 7. Shallow to medium deep yellow brown loamy soils
8. Class 8. Shallow to medium deep yellow brown clayey soils
9. Class 9. Shallow to medium deep red loamy soils
10. Class 10. Shallow to medium deep red clayey soils
11. Class 11. Structured shallow soils
12. Class 12. Structured medium deep soils
13. Class 13. Bottomlands with ephemeral drainage lines

Geology and landscape/terrain position, together with soil depth and texture affect grazing potential. Consequently, the abovementioned soils units were combined to form five (5) larger grazing units (**Figure 30**).



Legend

COLOUR	NO	GRAZING UNITS
	1	G.U. I (Soils at lower part of catena)
	2	G.U. II (Structured / Swartland soils)
	3	GRAZING UNIT III (Shallow soils)
	4	GRAZING UNIT IV (Koppies)
	5	GRAZING UNIT V (Bottomlands with ephemeral drainage lines)
	6	Permanent wetland - artificial
	7	Water

Figure 30: Grazing units for Phase 3. Veld Condition Assessment (VCA) sites are indicated as black dots.

Cumulative Impacts

The effects of enhanced soil erosion in the case of rangeland mismanagement and the effects of increased runoff and sediment load downstream, in relation with other PV developments within 30km downstream, are quantified in the soil report (Van den Berg and Botha, 2022).

Mitigations to be included in EMPr:

Management Category: Grazing Management

Impact: Mismanagement (overgrazing or continuous grazing, selective grazing and undergrazing)

Consequence:

Landscape degradation from **undergrazing**, such as 'woody', unpalatable grasses in phase 3 growth stage, low organic material on soil surface, shading from moribund material, poor basal cover, soil capping, sheet erosion (onset of poor veld condition following longer fetch zones between perennial tufts), donga erosion and desertification.

Landscape degradation from **overgrazing**, such as grasses in phase 1 growth stage, very low grass cover and abundance of bossies, a dominance of annuals, decreased forage production (due to low abundance of perennials), minimal organic material on soil surface, poor basal cover and erosion.

Reduced grazing carrying capacity and loss in agricultural potential or production.

Assumption:

Regenerative grazing management improves the grass basal cover, water cycle, as well as the accumulation of organic matter on the soil surface, enhancing the mineral cycle and improving the water holding capacity of the soil, ensuring minimal soil temperature fluctuations, and improving the grass composition and forage production potential of the grass layer.

Ultra-high density grazing strategies results in the controlled impact of hooves, trampling grasses in moribund state ("taller unpalatable, woody grasses, with vertical growth form and unfavourable structure for grazers), covering bare ground and improving the carbon cycle.

Kraaling, that is short duration trampling & over-night occupancy of patches to allows for the deposition of manure and grass seed.

Resting camps will improve the recovery of forage reserves, allow grasses to seed and establish Decreaser species, thereby improving the grass production potential.

The total exclusion of grazers in such environments will be detrimental to maintaining important ecological processes such as the energy cycle, mineral cycle, and water cycle.

Mitigation:

Regenerative grazing management is strongly recommended, e.g., use regenerative grazing management plans – implement scheduled grazing days and strategic removal of grazers:

- Grazing management should include the strict use of holistic management grazing charts, where the number of animal days per camp are estimated, based on the grazing capacity at each camp.
- Grazing management should include the removal of sheep at the critical time, e.g., before the end of winter, to prevent deterioration in animal condition and allow time to reassess herd composition, based on the productivity from the past months.

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Determine the grazing capacity of each camp (or PV block and no-go corridor/ephemeral drainage line) either directly through veld condition assessments (VCAs) or by considering the grazing capacities of representative monitoring sites under different rainfall regimes (see De Wet, S.F., 2017 and 2021, and De Wet & Arnoldi, 2022) together with the Department of Agriculture's guidelines (Elser *et al.*, 2010).

It is recommended that the range and median carrying capacities of representative monitoring sites within the grazing units and/or camps (or PV block and no-go corridor/ephemeral drainage line) are used when determining stocking rates as the median focusses on the value in the middle of a range of numbers, thereby excluding potential outliers (or non-representative values), whereas the average, or mean, considers all values, including outliers (extreme values).

Stocking rates in the no-go corridor/ephemeral drainage line should consider the existing populations of wild game.

Grazing management should be adaptive as the stocking rates will be influenced by the grazing capacity under drier or wetter conditions as well as the adopted grazing strategy, which should include but not be limited to:

- Ultra-high density grazing and/or kraaling at selected areas, followed by controlled recovery periods, when there are signs or symptoms of landscape degradation because of **undergrazing**, e.g., 'woody', unpalatable grasses in phase 3 growth stage, low organic material on soil surface, shading from moribund material, poor basal cover, soil capping, sheet erosion (onset of poor veld condition following longer fetch zones between perennial tufts), donga erosion and desertification.
- Improve time control with grazing by shortening grazing period whilst allowing for relatively high stocking rates, followed by controlled recovering periods, when there are signs or symptoms of **overgrazing**, e.g., grasses in phase 1 growth stage, very low grass cover and abundance of bossies, a dominance of annuals, decreased forage production (due to low abundance of perennials), minimal organic material on soil surface, poor basal cover and erosion.

Grazing Management should include planned resting as time management per camp is essential. This includes removing grazers when available forage reserves become low, and resting camps for periods up to 12 months, at a frequency of once every four years.

No area should be excluded from grazing.

More information is available from grazing management courses at the Herding Academy, Graaf-Reinet (Roland Kroon: 082 883 2710 & Johan Bouwer: 082 776 0257).

Apply follow-up grazing assessments as well as annual monitoring of veld condition and veld condition trends, estimate current grazing capacity, and adapt grazing management accordingly.

Annual monitoring of veld condition should also investigate the influence of planned resting on veld condition as the exclusion of grazing can result in degradation of the veld and erosion.

<u>Management Outcome:</u>

Prevent undergrazing, overgrazing or continuous grazing.

Achieve good to excellent veld condition classes to maintain or improve agricultural potential. A record of veld condition and grazing capacity under different rainfall conditions.

Grazing Management Recommendations

Regenerative grazing management is strongly recommended. This will improve the grass basal cover, improve the water cycle, ensure organic accumulation on soil surface that will enhance the mineral cycle and improve the water holding capacity of the soil, ensure minimal temperature fluctuations in the soil and improve the grass composition and forage production potential of the grass layer. The controlled impact of hooves will ensure improvement of the Carbon cycle, also from trampling grasses in moribund state ("taller unpalatable, woody grasses, with vertical growth form and unfavourable structure for grazers) will become beneficial to cover bare ground through ultra-high density grazing strategies.

Grazing management should be including the strict use of holistic management grazing charts, where the number of animal days per camp are estimated, based on the grazing capacity at each camp.

Removal of sheep at the critical time, before end of winter should be included in the grazing management to prevent deterioration in animal condition and to allow time to reassess herd composition, based on the productivity from the past months.

Overgrazing or continuous grazing in areas should be prevented by planned resting. Time management per camp is essential. This includes removing grazers when available forage reserves become low, resting of camps for periods up to 12 months, at a frequency of once every four years. This will assist to improve recovery of forage reserves and allow for grass seeding and establishment of Decreaser grasses, which will result in an improvement in grass production potential. Sound management will improve the grass and bossie components with important forage species. This recommendation applies to all the camps. Planned resting should be carefully controlled while monitoring veld condition. It is especially important not to let any area be excluded from grazing as this will inevitably result in degradation in veld condition and in soil erosion.

Conclusion

From a grassland ecological perspective, the opinion is that the current planned development (and the cumulative effect of 30km from other PV-projects), will not have a significant impact on the determined potential grazing potential, reflected from the baseline study in 2017 and not from the current grazing capacity reflected from the 2022 study. This opinion comes with an important condition, that the above-mentioned guidelines are applied.

Furthermore, if the management guidelines are not followed in this report, it is envisaged that further deterioration in grass basal cover will occur, associated with increased bare ground and accelerated soil erosion, and it is envisaged that the potential impact from the planned development would then also need to be considered and be mitigated for.

No significantly negative impact on the grazing potential and production potential of forage is envisaged from the sun panels itself. This includes development at all the phases (i.e., Phase 2 and 3) if the presence of structures won't exclude grazing and active grazing management.

In the context of the development being in the Karoo, which is known to be in a brittle environment, the exclusion from grazing by grazers (i.e., unplanned resting or the removal of sheep and cattle) will result in desertification, for it will have a negative effect on grass basal cover, which would result in erosion, with a subsequent loss in grass production, grass species richness and plant diversity. It is known that the total exclusion of grazers in such

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environments will be detrimental to maintaining important ecological processes such as the energy cycle, mineral cycle, and water cycle.

Mismanagement through selective grazing and uncontrolled grazing and resting will affect Agricultural potential negative though. There are examples of veld improvement and the restoration of degraded veld under holistic or regenerative grazing under the following management, where high stocking densities are applied within short periods, followed by planned rest (under time control).

The grazing management should therefore be continued with the solar Photovoltaic facility construction at all the camps affected through this development.

Follow-up grazing assessments and annual monitoring of veld condition is recommended to record veld condition and grazing capacity under different rainfall conditions.

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Traffic Impact Assessment

The following was taken out of the *Traffic Impact Assessment prepared by Annebet Krige of Sturgeon Consulting (Pty) Ltd dated September 2022 (Project No.: STUR0352)* attached as **Appendix E: Annexure M**.

Road Condition

Existing road infrastructure is well developed in the area and thus well connected to surrounding major centres via regional routes. The combination of national roads and first and second order roads provides good inter- and intra-regional accessibility. The South African National Roads Agency (SANRAL) is responsible for the maintenance of the national roads which are in a good condition, while the gravel provincial roads in the vicinity of the site were in a fair to poor condition. Road freight, transport, specifically heavy vehicle transport, significantly contributed to the deterioration of the road surfaces and the maintenance of these roads are not always adequate.

Primary Access Location

The primary access to the proposed 400 MW solar PV facility will be taken along the N10, from the existing Burgerville Road. This access will be the only access used during the construction phase, operational phase and decommissioning phase.

Shoulder Sight Distance (SSD)

The shoulder sight distance (> 450 m) to the left of the primary site access location will be sufficient (at a design speed of 120 km/hr). Sight distance to the right, however, was measured as approximately 320 m, which is sufficient for Passenger vehicles (P), but not a Single-Unit Truck (SU). To ensure the safe exit of Single-Unit Trucks (SU) and especially Single-Unit Truck plus Trailers (SU+T), it therefore is proposed that appropriate traffic accommodation be placed on the eastern approach of the N10, indicating a construction access ahead with a possible flagman to alert drivers and slow them down.

Secondary Access Location

Direct access to the proposed 400 MW solar PV facility will be taken from the existing farm access along the Transnet servitude road, approximately 4.65 km southeast of where the Burgerville Road crosses the railway line. This access will be the only access to Phase 3 of the proposed project used during the construction phase, operational phase and decommissioning phase.

Shoulder Sight Distance (SSD)

The site visit and photos taken at the existing secondary access location off the Transnet Service Road indicated that shoulder sight distances (> 305 m) will be sufficient for a Passenger vehicle (P), a Single-Unit Truck (SU) and a Single-Unit Truck plus Trailer (at a design speed of 80 km/hr).

Existing Traffic Conditions

The annual growth rate in Average Daily Traffic (ADT) increased by approximately 6% between 2007 (435) and 2022 (1018). However, a significant increase in ADT and heavy vehicle traffic is evident from 2020 onwards, possibly be attributed to increased mining activities and renewable energy projects. It should however be noted that the capacity of a Class 1 road is in the order of 2000 vehicles per hour and therefore the traffic volumes recorded on this road is still significantly less than the capacity of the road.

Impacts

Trip Generation

From the trip generation information gathered, the following traffic impacts should be considered:

- Potential congestion and delays on the surrounding road network;
- Potential impact on traffic safety and increase in accidents with other vehicles or animals;
- Potential change in the quality of the surface condition of the roads; and
- Potential noise and dust pollution.

The number of additional daily trips per 400 MW solar PV plant and associated electrical grid infrastructure are summarised below. These trips can be expected for the duration of the construction period and decommissioning phase (48 months) and for the operational phase of the project (20 – 30 years).

Construction Phase – 78 Daily Trips (two-way):

- 6 daily truck trips
- 26 daily light load trips
- 44 daily staff transport trips
- 2 daily water truck trips

Operational Phase – 18 Daily Trips (two-way):

- 4 daily light load truck trips
- 12 daily staff transport trips
- 2 daily water truck trips

Decommissioning Phase – 78 Daily Trips (two-way):

- 6 daily truck trips
- 26 daily light load trips
- 44 daily staff transport trips
- 2 daily water truck trips

It is anticipated that the 400 MW PV facility will have a 48 to 60 month construction period. From the SANRAL Station 1300 historic traffic information, the AM and PM peak hour trips each constitute approximately 7% of the daily traffic. This relates to approximately an additional 6 trips on the road network during the peak hours for the construction and decommissioning phase and approximately an additional 2 trips on the road network during the peak hours for the operational phase. **The additional trips during the construction, operational and decommissioning phases will have an insignificant traffic impact on the surrounding road network.**

<u>Trip Generations for Multiple PV Facility Blocks</u>

Should construction of the facilities commence at the same time, the cumulative daily trips that can be anticipated are summarised below:

Construction Phase – 936 Daily Trips (two-way):

- 72 daily truck trips
- 312 daily light load trips
- 528 daily staff transport trips
- 24 daily water truck trips

Operational Phase – 216 Daily Trips (two-way):

- 48 daily light load truck trips
- 144 daily staff transport trips
- 24 daily water truck trips

Decommissioning Phase – 936 Daily Trips (two-way):

- 72 daily truck trips
- 312 daily light load trips
- 528 daily staff transport trips
- 24 daily water truck trips

Based on the above trip generation rates, an additional 66 trips could be expected on the road network during the peak hours for the construction and decommissioning phase. For the operational phase, an additional 16 trips could be expected on the road network during the peak hours. It is important to note that these trips can be expected on the main road network, e.g., along the National Routes (N10) and not on the access road (Burgerville Road) to the proposed 400 MW facility. The capacity of a Class 1 rural road is in the order of 2000 vehicles per hour (two-way) and the road has sufficient spare capacity to accommodate the additional trips.

<u>Cumulative Impacts</u>

The cumulative impacts of all the proposed renewable energy facilities that were included in the vicinity were considered and assessed. It is however very unlikely that all projects will occur at the same time, as all these projects will be subject to a highly competitive bidding process and only a few projects would be allowed to enter into a power purchase agreement with Eskom at a time. Construction will most likely be staggered based on project and site-specific issues.

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The biggest traffic impact associated with renewable energy facilities is during the construction phase (and similarly during the decommissioning phase). During the operational phase, the trips added to the road network is expected to be insignificant.

Mitigation measures for inclusion in the EMPr:

Management Category: Construction - Road Management – Dust generation

Impact: Dust pollution caused by increased traffic.

Consequence: Reduced photosynthetic functioning, nuisance.

Assumption:

Mitigation:

(1) Implement dust control measures on the gravel roads.

(2) Enforce speed control through speed limit road signage and fines.

Management Outcome: Minimise dust generation.

Management Category: Construction - Road Management - Development of corrugations, potholes, and puddles.

Impact: Increased traffic can result in corrugations and potholes on roads.

Consequence: Decrease in condition of gravel roads, increase in travel times.

Assumption: The main gravel road, Burgerville Road, in the vicinity of the proposed development is in a fair to poor condition. The main surfaced road, the N10, in the vicinity of the proposed development is in a good condition.

Mitigation:

(1) Undertake regular maintenance of the gravel access roads during all phases of the project, especially during the construction phase.

(2) Ensure access roads are restored to original pre-construction road condition.

(3) Upgrade the internal farm access road (e.g., internal private roads leading off the Burgerville Road) to suitable standards as specified by the civil engineer.

Management Outcome: Good road conditions.

Management Category: Pre-construction – Planning – Traffic Management Plan, and Construction – Transport

Impact: Noise pollution due to traffic.

Consequence: Decrease in sense of place due to noise generated by traffic.

Assumption:

Mitigation:

(1) Stagger delivery trips.

(2) Enforce speed control through speed limit road signage and fines.

Management Outcome: Minimal noise generated by traffic.

Management Category: Construction – Transport - Safety

Impact: Traffic accidents at primary access location off the N10.

Consequence: Injury or loss of life.

Assumption: The primary access to the proposed 400 MW solar PV facility will be at the junction of the N10 with the existing Burgerville (District) Road. The shoulder sight distance (> 450 m) to the left of the primary site access location will be sufficient (at a design speed of 120 km/hr). Sight distance to the right, however, was measured as approximately 320 m, which is sufficient for Passenger vehicles (P), but not a Single-Unit Truck (SU). It therefore is proposed that appropriate traffic accommodation be placed on the eastern approach of the N10, indicating a construction access ahead with a possible flagman to alert drivers and slow them down.

Mitigation:

(1) Place appropriate traffic accommodation on the eastern approach of the N10, indicating a construction access ahead with a possible flagman to alert drivers and slow them down.

Management Outcome: To ensure the safe exit of Single-Unit Trucks (SU) and especially Single-Unit Truck plus Trailers (SU+T) at the junction of the N10 with the existing Burgerville (District) Road.

Management Category: Planning and Design

Impact: Haulage of imported materials incur a cost relating to distance travelled and time.

Consequence: Financial feasibility of project.

Assumption: There are three alternative routes for the haulage of imported materials to the proposed PV facility, including from (a) the Cape Town harbour, (b) Port of Ngqura, and (c) Port of Saldanah. The preferred route is from the Port of Ngqura as it is the shortest (445 km) and fastest route to the site, following the N2 from the Port before turning north onto the N10 past Hanover and up to the access at Burgerville Road.

Mitigation:

(1) The engineers should consider the feasibility of the preferred alternative route for the haulage of imported materials from the Port of Ngqura to the proposed PV facility as recommended in the Traffic Impact Assessment Report.

Management Outcome: Maintain financial feasibility of the project.

Management Category:

Pre-construction: Planning, and Contractor readiness - Acquiring permits, licenses, Letters of consent and permissions – other approvals

Impact: Transport of abnormal roads could be delayed.

Consequence: Delays in construction

Assumption:

Mitigation:

(1) The appointed engineers should investigate the route to the site to ensure that the abnormal loads are not obstructed at any point by geometric, height and width limitations along the route.

(2) The applicable permits to transport the abnormal loads should be obtained.

Management Outcome: Safe (unobstructed) delivery of abnormal loads to site.

Management Category: Pre-construction – Planning -Traffic Management Plan, and Construction - Transport -

Impact: Potential congestion and delays on the surrounding road network.

Consequence: Disruptions and delays to local farmers in the area due to increase traffic volumes.

Assumption: Existing traffic information for 2022 indicates that the N10 carries an ADT of 1018 vehicles per day (two-way). The N10 operates well below the capacity of 2000 vehicles per hour for a Class 1 principal arterial with two lanes. Traffic generated during the Operational phase will have an insignificant traffic impact on the surrounding road network.

Mitigation:

(1) Stagger delivery trips and schedule deliveries outside of the peak traffic periods.

(2) Staff trips should also occur outside of the peak hours where possible.

Management Outcome: Minimise risk of congestion and delays to local farmers.

Management Category: Planning - Traffic Management Plan – Safety, and Construction - Transport

Impact: Potential impact on traffic safety and increase in accidents with other vehicles or animals.

Consequence: Death/injury to humans and loss/injury of livestock.

Mitigation:

(1) Consider speed control by means of stop and go systems.

(2) Enforce speed control through speed limit road signage and fines.

Management Outcome: No/minimal traffic safety incidents.

Conclusions

Provided that the above mitigations and recommendations are adhered to, the proposed development of the 400 MW Solar PV facility (Phase 3) can be supported from a traffic engineering perspective.

No other remedial or mitigation measures will be required to accommodate the additional traffic generated by the proposed Solar Photovoltaic Facility.

Aquatic Impact Assessment

The following was taken from the *Aquatic Biodiversity Impact Assessment, Section 21(c) & (i) Risk Assessment and Wetland Delineation Verification Report prepared by Dr Andrew Deacon dated August 2022* attached as **Appendix E: Annexure I.**

Results

The main water feature in the area is tributaries to the Brak River, a seasonal tributary within the Orange River System which flows in an arc from south-east to north-west, eventually feeding into the Orange River basin. The ephemeral drainage line running through the project area is an unnamed tributary to the D62D – 05610 tributary with its confluence just downstream of the Project Area.

The river flows to the north of the study area with a number of its tributaries crossing the area as it flows in a northerly direction.

The drainage systems are predominantly classified as ephemeral, which means that the stream flows briefly in direct response to precipitation in the immediate vicinity, and the channel is at all times above the ground-water reservoir. These ephemeral tributaries are tributaries of the Brak River and considered to be in a largely natural ecological state.

All the small tributaries in the area are ephemeral or intermittent and with no clear associated vegetation. These systems have a far less predictable flow regime compared to perennial or seasonal rivers and are frequently dry for long periods in arid regions.

The ephemeral drainage system of the De Aar Phase 3 Solar PV facility project area consists of one major ephemeral drainage channel which are fed by upstream catchment areas beyond the project area fence line. Three smaller tributaries are feeding into the main drainage line in the project area.

The vegetation integrity score is 93.9% which represents an Ecological Class A (90-100). This score reflects an “Unmodified, natural.” status. The overall Ecostatus of the Solar PV Facility (Phase 3) drainage line matches a Category B (Largely natural with few modifications). The table below provides the available parameters that were instrumental to establish the Ecostatus of the Solar PV Facility (Phase 3) drainage line.

Parameter	Score %	Category	Description
VEGRAI	93.9	A	Natural
SASS	3.2	C	Fair
Habitat	55.0	B	Poor
Ecostatus		B	Largely natural with few modifications

Ecological Category (EC)

EcoClassification - the term used for the Ecological Classification process - refers to the determination and categorisation of the Present Ecological State (PES; health or integrity) of various biophysical attributes of rivers relative to the natural or close to the natural reference condition.

The overall Ecostatus of the Solar PV Facility (Phase 3) drainage line matches a Category B (Largely natural with few modifications)

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According to the initial buffer requirement, it becomes apparent that, to protect the main drainage line of the Phase 3 project area in its current condition from any degradation, a buffer of 20 m wide on both sides of the drainage line delineation is required during the construction and operational phases. This buffer width is obtained whenever the following mitigation measures are applied to the model:

- the management of surface water runoff,
- erosion monitoring,

as well as constraints regarding the clearing of vegetation within these areas.

Freshwater Ecosystem Protected Areas (FEPA)

The delineated ephemeral drainage line in the project area has been identified as having the conservation importance relating to the Freshwater Ecosystem Protected Areas (FEPA) category. The entire sub-quaternary catchment indicates that the surrounding land and smaller stream network need to be managed in a way that maintains the good condition (A or B ecological category) of the river reach.

Due to the gentle slope of the terrain where headwater drainage systems originate, downpours will dissipate downhill without forming any discernible wetland habitats. Thus, the very short-lived nature of the headwater drainage systems, the Ecological Importance and Sensitivity Category (EISC) of this biotope is classified as “Low”.

Biotopes with “Moderate” and “Low” ecological and sensitivity classes were not considered as no-go areas. These biotopes included the headwater drainage systems which transport surface flows during high rainfall events and present short-lived aquatic systems.

Even that they are not considered as no-go areas, development within these areas, such as placement of solar panels, power line pylons and other linear infrastructure, shall be subjected to strict mitigation measures. This will include the management of surface water runoff, erosion monitoring, as well as constraints regarding the clearing of vegetation within these areas.

The ecological importance and sensitivity of the large ephemeral drainage systems and associated alluvial floodplains, are being classified as “High”. Water resource types with a “High” EISC will be considered as no go areas for development, except linear infrastructure crossings, specifically access roads, underground cables and pipelines, and overhead powerlines. The no-go areas will include the buffers of the drainage areas in the project footprint.

Conservation

This is a least threatened unit with a conservation target of 21%. None conserved in statutory conservation areas. About 4% has been cleared for cultivation (the highest proportion of any type in the Nama-Karoo) or irreversibly transformed by building of dams. Erosion is moderate (46.2%), very low (32%) and low (20%).

Aquatic invertebrate assessment

The fauna of the more seasonal and ephemeral ecosystems is not well known, but they have been found to provide aquatic habitat to a diverse array of faunal species that depend on brief periods of inundation for hatching, mating, feeding and refuge. For instance, many frogs of the Karoo region breed in temporary pools associated with watercourses and wetlands, this includes the Karoo Toad *Vandijkophrynus gariepensis* and Karoo Dainty Frog *Cacosternum Karooicum*.

A great number of other organisms are not confined to these temporary systems, but derive crucial benefits from them, like migratory birds and many invertebrates that migrate from permanent to temporary habitats on a regular basis.

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The shallow water level, brief presence of surface water and the lack of flows, reflected in the macro-invertebrate scores, resulting in "Fair" SASS scores and low number of families. Most of the taxa recorded had low sensitivity scores, with the highest scores of 5, indicating the low sensitivity of the assemblage, mostly air-breathers.

Impacts and Mitigations

During the risk assessment, 16 potential impacts were identified. For these potential impacts identified during the risk assessment, all were assigned mitigation measures that reversed potential impacts to "Low" risk rating posed to the resource quality of the watercourse. No impact was identified to cause loss of irreplaceable resources.

Cumulative Impacts

Apart from farms practicing agriculture, there are no other PV developments present in the small catchment further upstream. The isolation of the Phase 3 Solar PV facility project catchment protects the project drainage lines from any significant development further upstream.

If any cumulative impacts on the receiving drainage systems have been identified from other PV developments within 30 km radius of the Phase 3 Solar PV development, this will not impact on the Phase 3 Solar PV facility and the proposed project is not expected to add to any cumulative impacts further downstream.

Mitigations for inclusion in the EMPr:

Construction of linear structures: General

Management Category: Contractor readiness - Development of Method Statements

Impact:

Loss of riparian systems and disturbance of the alluvial water courses.

Mitigation:

(1) A construction method statement should be compiled and approved prior to the commencement of construction activities in the ephemeral drainage line and its buffer. The method statement should take cognisance of:
- The mitigation measures identified in the Aquatic Biodiversity Impact Assessment Report, as well as mitigation measures specified by each of the environmental specialists.
- The conditions of the Environmental Authorisation and Integrated Water Use License.
- The Environmental Management Program (EMPr) for the project submitted as part of the Environmental Impact Assessment Report.

(2) The Environmental Control Officer (ECO) must ensure that the contractor adheres to the method statement.

Management Outcome:

Riparian systems and alluvial water courses are maintained as far as possible.

Management Category: Layout and design - buffers

Impact:

Loss of riparian systems and disturbance of the alluvial water courses.

Mitigation:

(1) The highly sensitive major ephemeral washes and their associated buffer areas should be regarded as No-Go areas for development apart from construction activities relating to the road crossings (where the use of existing access roads is not an option), laying underground cables and pipelines and erecting the distribution line.
(2) The recommended buffer areas between the delineated freshwater resource features and proposed project should be maintained.

Management Outcome:

Riparian systems and alluvial water courses are maintained as far as possible.

Management Category: Layout and design

Impact:

Loss of riparian systems and disturbance of the alluvial water courses.

Mitigation:

(1) Linear infrastructure crossings (roads, pipes, cables and the powerline), should as far as is possible coincide to minimise the impact.
(2) Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.
(3) Vegetation clearing should occur in a phased manner to minimise erosion and/or run off.

Management Outcome:

Riparian systems and alluvial water courses are maintained as far as possible.

Management Category: Rehabilitation

Impact:

Loss of riparian systems and disturbance of the alluvial water courses.

Mitigation:

(1) A vegetation rehabilitation plan should be implemented. Vegetation cover can be removed as sods and stored within transformed vegetation. Alien invasive vegetation must be removed prior to storing the grassland sods.
(2) The sods must preferably be removed during the winter months and be replanted by latest springtime. The sods should not be stacked on top of each other.
(3) Once construction is completed, these sods should be used to rehabilitate the disturbed areas from where they have been removed. In the absence of timely rainfall, the sods should be watered well after planting and at least twice more over the next 2 weeks.

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(4) Any areas disturbed during the construction phase should be encouraged to rehabilitate as fast and effective as possible and where deemed necessary by the ECO.

Management Outcome:

Riparian systems and alluvial water courses are maintained as far as possible.

Management Category: Planning and design

Impact:

Areas cleared or disturbed around site might be affected by erosion of topsoil.

Consequence: Increased turbidity and siltation in watercourses.

Mitigation:

(1) Conduct pre-disturbance surveys as appropriate to assess the presence of sensitive areas, fauna, flora and sensitive habitats.
(2) Formal infrastructure, in the form of access roads, pipes, culverts, etc. should be kept to a minimum.
(3) Site projects to avoid construction too near pristine natural areas and communities.
(4) Vegetation and soil should be retained in position for as long as possible, and should only be removed immediately ahead of construction / earthworks in any specific area.
(5) In areas where construction activities have been completed and no further disturbance is anticipated, rehabilitation and re-vegetation should commence as soon as possible.
(6) The Swartland and Valsrivier soils may have an influence on any foundations.
(7) Where the original vegetation was cleared or severely disturbed, rehabilitation measures should be put in place.
(8) It is important that a good long-term grazing strategy (with small stock). Maintaining the natural vegetation in an optimal state is seen as the best and most cost-effective method to limit soil erosion to the minimum.
(9) Any erosion channels developing during or after the construction period should be appropriately backfilled (and compacted where relevant) and the areas restored to a condition similar to the condition before the erosion occurred.

Management Outcome: Minimize loss of topsoil

Management Category: Stormwater Management and Erosion Control

Impact: Disturbing topsoil might result in increased turbidity, as well as siltation in watercourses.

Consequence: Increased turbidity and siltation in watercourses.

Mitigation:

(1) Storm water management and erosion control measures should be implemented. These should include the following:
    - The excavated soil should be placed on the upstream side of construction activities in order to act as a storm water diversion berm.

- Where such diversion berms create concentrated flows, as well as in steep and/or sensitive areas (such as wetlands) the use of swales, silt fences or other effective erosion control measures is recommended to attenuate runoff.
- All storm water management measures should be regularly maintained.

(2) The project areas are situated on Karoo sediments that are known for high sodium and magnesium content in the soil. Water infiltration can be improved by means of mechanical intervention and the application of gypsum or similar ameliorants.

Management Outcome: Preserve topsoil

Management Category: Rehabilitation

Impact: Areas cleared or disturbed around site might be affected by erosion of topsoil.

Consequence: Increased turbidity and siltation in watercourses.

Mitigation:

(1) Replanting activities should be undertaken at the end of the dry season (middle to end September) to ensure optimal conditions for germination and rapid vegetation establishment.
(2) The sowing of grass seeds in combination with the chemical and mechanical water infiltration improvement measures should also be considered for highly degraded areas.
(3) Should plants not successfully establish within two growing seasons after the first planting, new plant material should be provided.
(4) Any erosion channels developing during or after the construction period should be appropriately backfilled (and compacted where relevant) and the areas restored to a condition similar to the condition before the erosion occurred.
(5) Site rehabilitation should aim to restore surface draining patterns, natural soil and vegetation as far as feasible.

Management Outcome: Minimize loss of topsoil

Management Category: Alien plant management

Impact: Alien invasive plants: Prevent the cleared areas from degrading, as invasive non-native plants will spread into degraded areas.

Consequence: Loss of biodiversity, invasive species compete with indigenous plant species.

Mitigation:

(1) A weed and alien invasive species control plan should be implemented during the contract period.
(2) Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion.
(3) Any materials brought in to construction sites should be from sources free of invasive alien species.
(4) Clearing of invasive alien plants must take place coupled with the sowing of seeds of indigenous species to stabilise disturbed habitats.

Management Outcome: Reduce invasive alien plant recruitment

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Management Category: Rehabilitation

Impact: Alien invasive plants: Prevent the cleared areas from degrading, as invasive non-native plants will spread into degraded areas.

Consequence: Loss of biodiversity, invasive species compete with indigenous plant species.

Mitigation:

(1) Re-vegetation with appropriate indigenous species to prevent dust and erosion, as well as establishment of alien species.
(2) Compacted bare ground should be loosened and pitted, and covered with branches or stones. This will improve the ability of the surfaces to trap seeds and to absorb rainwater, thereby hastening vegetation recovery.
(3) Clearing of invasive alien plants must take place coupled with the sowing of seeds of indigenous species to stabilise disturbed habitats.

Management Outcome: Reduce invasive alien plant recruitment

Construction of linear structures: specific to overhead powerlines, road crossings, underground pipes crossing, underground cables crossing, a fire-break road and fencing posts.

Management Category: Planning and design

Impact: Areas cleared or disturbed around the pylon site might be affected by erosion of topsoil.

Consequence: Disturbing topsoil around the pylon site might result in increased suspended solids, as well as siltation in watercourses.

Mitigation:

(1) No pylons should be located within an area that would be expected to become inundated during a 1:100 flood event.
(2) Vegetation should be removed only where essential for the continuation of the powerline. Any disturbance to the adjoining natural vegetation cover or soils should not be allowed.
(3) The duration of construction activities at each pylon site should be minimised as far as is practical.
(4) The shallow soils may present a challenge for some construction items like poles that need to be planted.

Management Outcome: Preserve topsoil.

Management Category: Rehabilitation

Impact: Areas cleared or disturbed around the pylon site might be affected by erosion of topsoil.

Consequence: Disturbing topsoil around the pylon site might result in increased suspended solids, as well as siltation in watercourses.

Mitigation:

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
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(1) Once construction at a pylon site is complete, the site should be rehabilitated immediately by removing all waste material. The rehabilitation specification should be determined by the soils and vegetation specialists.

Management Outcome: Preserve topsoil.

Management Category: Planning and design

Impact: Altered surface water flow patterns, e.g., changing sheet flow (natural open system) to concentrated flows leads to erosion.

Consequence: Increased suspended solids, siltation in watercourses and soil erosion.

Mitigation:

(1) 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 if there is proper runoff management from roads and other bare areas.
(2) Where new water course crossings are required, the engineering team must provide an effective means to minimise the potential up- and downstream effect of erosion and sedimentation (erosion protection) as well as minimise the loss of riparian vegetation (reduce footprint as much as possible).
(3) The area of disturbance should be kept to a minimum to allow clearing of the construction right of way. Especially the roads that cross the large flood plains and severe gulley erosion (observed outside the three project areas) should be planned well to reduce soil erosion. This is also true for temporary access roads to install the solar panels.
(4) Ensure dust abatement measures are in place during and post construction.
(5) Existing roads should be used for access as far as possible.
(6) Avoid routes through drainage lines and riparian zones wherever possible. Where access through drainage lines and riparian zones is unavoidable, only one road is permitted, constructed perpendicular to the drainage line.
(7) Avoid roads that follow drainage lines within the floodplain.
(8) Build water diversion structures at 20 to 50 m intervals (depending on the steepness of the slope) along veld tracks.
(9) Berm ends should be extended on the downslope side of the road with rocks to prevent diverted water eroding the soil. These will prevent veld roads acting as water channels, causing donga erosion. It will also facilitate vegetation recovery on closed roads.
(10) Slight deviations of alignment are permitted, so as to avoid significant vegetation specimens and communities, natural features and sites of cultural and historical significance. These deviations must be approved by the ECO.
(11) The width of the construction corridor should be kept to a minimum.
(12) Existing two-track road crossings occur within the corridors demarcated for Road Crossing Numbers 1, 2, 3 and 6 but (except for No. 6) they are at oblique angles to the principal direction of flow within the watercourse, making them longer than necessary. Consequently, it is advised that the Engineers realign those crossings, effectively designing new (shorter) crossings (as opposed to upgrading existing two-track roads) to reduce the physical footprint and scale of the ecological impact.
(13) Slight deviations of roads and route alignments must be permitted in order to avoid plants of conservation concern that are located within the pipeline route.

(14) Where new roads need to be constructed, the existing road infrastructure should be rationalised and any unnecessary roads decommissioned and rehabilitated to reduce the disturbance of the area in the river beds.
(15) Storm water crossings at access roads should be provided in the form of drifts, rather than pipes or culverts. Drifts should be constructed from concrete or grouted stone pitching. Drifts should be provided at frequent spacings, again to minimise the concentration of flows.

Management Outcome: Preserve topsoil, control soil erosion.

Management Category: Stormwater Management and Erosion Control

Impact: Altered surface water flow patterns, e.g., changing sheet flow (natural open system) to concentrated flows leads to erosion.

Consequence: Increased suspended solids, siltation in watercourses and soil erosion.

Mitigation:

(1) Storm water runoff off all roads must be spread as much as possible, to avoid concentration of flows off compacted or hardened surfaces.
(2) During the rainy season terrain mobility on high clay soils in low lying areas with drainage lines will be difficult and might increase soil erosion when drainage lines are disturbed. However, it is important to note that rainfall is highly unpredictable with frequent droughts for the project areas.
(3) The clayey soils and most noticeably the Swartland and Valsrivier soils may restrict vehicle movement during the wet season.
(4) There should be reduced activity at the site after rainfall events when the soils are wet. No driving off from hardened roads should occur immediately following large rainfall events until soils had dried out and the risk of bogging down has decreased.
(5) Maintain all access routes and roads adequately in order to minimise erosion and undue surface damage. Repair rutting and potholing and maintain stormwater control mechanisms.

Management Outcome: Preserve topsoil, control soil erosion.

Management Category: Maintenance

Impact: Altered surface water flow patterns, e.g., changing sheet flow (natural open system) to concentrated flows leads to erosion.

Consequence: Increased suspended solids, siltation in watercourses and loss of topsoil.

Mitigation:

(1) Maintain all access routes and roads adequately in order to minimise erosion and undue surface damage. Repair rutting and potholing and maintain stormwater control mechanisms.
(2) Ensure that all access roads utilised during construction (which are not earmarked for closure and rehabilitation) are returned to a usable state and / or a state no worse than prior to construction.
(3) Any erosion problems observed to be associated with the project infrastructure should be rectified as soon as possible and monitored thereafter to ensure that it does not re-occur.

Management Outcome: Preserve topsoil, control soil erosion.

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Management Category: Layout and Design, and Stormwater Management and Erosion Control.

Impact: Inadequate storm water management and soil stabilisation measures might result in increased suspended solids

Consequence: Siltation of watercourses.

Mitigation:

(1) All storm water drainage discharge points should be provided with outlet structures, designed with adequate erosion protection, to ensure that storm water is discharged from formal structures onto the natural ground at a safe and acceptable velocity.
(2) No stormwater runoff must be allowed to discharge directly into any water course along roads, and flows should thus be allowed to dissipate over a broad area covered by natural vegetation.
(3) The size and lining of the drain would be dependent on the peak flow rates and velocities, which should be determined through hydrological modelling.
(4) Storm water crossings at access roads should be provided in the form of drifts, rather than pipes or culverts.
(5) No off-road driving in wet conditions, and for two weeks afterwards. In particular, no driving in veld should take place on clay or fine-textured soils following rain.
(6) Silt traps should be used where there is a danger of topsoil eroding and entering streams and other sensitive areas.

<u>Management Outcome:</u> Preserve topsoil

Management Category: Planning and design

Impact: Road crossings interfering with surface- or sub-surface flows.

Consequence: Altering hydrological patterns.

Mitigation:

(1) Minimise new crossings over wetlands and watercourses. If wetlands or watercourses cannot be avoided, ensure that road crossings are constructed using riprap, gabion mattresses, and/or other permeable material to minimise the alteration of surface and sub-surface flow.
(2) All crossings over watercourses should be such that the flow within the channels is not impeded and should be constructed perpendicular to the river channel.
(3) Flow of water under roads must be allowed to occur without leading to concentration of surface flow. This can be achieved through designing bridges that span the entire width of aquatic ecosystems where possible or laying down pipes or culverts to ensure connectivity and avoid fragmentation of surface aquatic ecosystems.

<u>Management Outcome:</u> Minimize disturbance to hydrological flows

Management Category: Planning and design

Impact: Removal of vegetation and disturbing topsoil by laying underground pipelines at watercourse crossings.

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Consequence: Increased erosion and siltation of watercourse.

Mitigation:

(1) Road infrastructure and other linear development such as underground pipes, should coincide as far as possible to minimise the impact.

Management Outcome: Preserve topsoil

Management Category: Linear Infrastructure development - Underground pipelines/cables

Impact: Removal of vegetation and disturbing topsoil by laying underground pipelines at watercourse crossings.

Consequence: Increased erosion and siltation of watercourse.

Mitigation:

(1) Implement best management practices for underground linear structures (underground pipelines and underground cables): The following mitigation is aimed at both these underground linear structures:
- Suitable demarcation must be erected around the construction area, including the servitude, areas where material is stored and the actual footprint of the development to prevent access to sensitive areas.
- Site demarcations should be maintained until the cessation of all construction activities.
- Vehicular or pedestrian access must be prohibited in natural areas beyond the demarcated boundary of the construction site.
- **Construction activities must be restricted to previously disturbed areas, as far as possible.**
- Cordon off areas under rehabilitation as “no-go areas” to prevent vehicular, pedestrian and livestock access.
- Implement source-directed controls.
- Maintain buffer zones to trap sediments.
- Implement appropriate stormwater management around the excavation areas to prevent the ingress of run-off into the excavation trenches.

Management Outcome: Preserve topsoil

Management Category: Planning and design

Impact: Disturbing topsoil by laying underground cables at watercourse crossings might result in increased erosion.

Consequence: Siltation of watercourse.

Mitigation:

(1) Underground cables from the field transformers to the on-site substation will cross the watercourse at three different locations. It is advised that the Engineers use the same crossings for the underground cables and roads.

(2) Road infrastructure and other linear development such as underground cables, should coincide as far as possible to minimise the impact.

Management Outcome: Preserve topsoil

PV Panels

Management Category: Planning and design

Impact: Disturbing topsoil by installing the perimeter fence at watercourse crossings might result in increased erosion.

Consequence: Siltation of watercourse

Mitigation:

(1) Fence sites as appropriate to ensure safe restricted access.
(2) The shallow soils may present a challenge for some construction items like poles that need to be planted.
(3) A rehabilitation plan must be implemented that will restore the natural vegetation to what it was prior to the construction of the fence line, so that the long-term impact could be negligible.

Management Outcome: Preserve topsoil

Management Category: Rehabilitation

Impact: Disturbing topsoil by installing the perimeter fence at watercourse crossings might result in increased erosion.

Consequence: Siltation of watercourse

Mitigation:

(1) A rehabilitation plan must be implemented that will restore the natural vegetation to what it was prior to the construction of the pipeline, so that the long-term impact could be negligible.

Management Outcome: Preserve topsoil

Management Category: Planning and Design

Impact: Risk of erosion at the base of the panels.

Consequence: Erosion, sedimentation of watercourse.

Mitigation:

(1) Disturbance of the natural topography and vegetation cover should be minimised. The natural contours should be preserved as far as is practical in order to preserve the existing site drainage patterns as far as possible.

(2) Clearing of vegetation for the construction of substations and other infrastructure that will be covered with weatherproof surfaces should preferably be done outside the main rainfall periods. This will ensure there will not be unnecessary sediment load in the water courses before the cleared areas can be stabilized.
(3) Correct panel level and aspect should be provided in the design of the support structures and not through earthworks.
(4) Utilisation of low impact construction techniques should be encouraged, with the footprint of disturbed areas being minimised.
(5) Allows growth of vegetation beneath and between panels.
(6) Good rangeland management for the areas underneath the solar panels will be essential to maintain a good vegetation cover and to reduce soil erosion and runoff.
(7) It is possible that the shading effect of the proposed solar panels will increase soil moisture content and therefore improve the general grazing capacity of the study areas.
(8) The mounting foundations of the panels should occupy minimal space.

<u>Management Outcome:</u> Preserve topsoil, control erosion.

Management Category: Rehabilitation

Impact: Risk of erosion at the base of the panels.

Consequence: Erosion, sedimentation of watercourse.

Mitigation:

(1) Reseed bare areas.
(2) Repair of erosion channels as soon as they develop.

<u>Management Outcome:</u> Preserve topsoil, control erosion.

Management Category: Monitoring

Impact: Risk of erosion at the base of the panels.

Consequence: Erosion, sedimentation of watercourse.

Mitigation:

(1) Monitoring in the form of visual inspections of the vegetation cover and erosion and sediment control features.
(2) Grass cover at base of panels, particularly on drip line, should be actively maintained.
(3) Inspection of the area frequently especially after intense rainfall and runoff events, with particular emphasis on the dripline areas and at access roads.
(4) A vegetation cover that at least matches the natural, pre-development cover, should be maintained at all times between and beneath the solar panels.

<u>Management Outcome:</u> Preserve topsoil, control erosion

Management Category: Planning and design

Impact: Sedimentation in wetlands and watercourses.

Consequence: Loss of riparian habitat.

Mitigation:

(1) Allow runoff to flow easily between each panel set and decrease the event of concentrated runoff from taking place.
(2) Guidelines for the arrangement of panels (spacing between arrays) in order to minimise the impact on storm water runoff characteristics are provided by the Minnesota Pollution Control Agency (2017).
(3) All storm water drainage discharge points should be provided with outlet structures, designed with adequate erosion protection, to ensure that storm water is discharged from formal structures onto the natural ground at a safe and acceptable velocity.
(4) Disturbance of the natural topography and vegetation cover should be minimised. The natural contours should be preserved as far as is practical in order to preserve the existing site drainage patterns as far as possible.
(5) Natural, dispersed, drainage should be encouraged, by maintaining the natural drainage characteristics of the land as far as possible, thereby minimising the concentration of flows and consequently the risk of erosion.
(6) Diversion of upslope surface runoff around the solar PV area should be considered. Berms and/or open drains can be provided for this purpose.
(7) The size and lining of the drain would be dependent on the peak flow rates and velocities, which should be determined through hydrological modelling.
(8) A storm water drain should be provided along all access roads. The size and lining of the drain would be dependent on the peak flow rates and velocities, which should be determined through hydrological modelling.

<u>Management Outcome:</u> Minimal sedimentation of watercourses

Management Category: Stormwater Management and Erosion control

Impact: Sedimentation in wetlands and watercourses.

Consequence: Loss of riparian habitat.

Mitigation:

(1) Any sediment build-up should be removed immediately.
(2) Develop and implement a storm water management plan.
(3) The objective of a Storm Water Management Plan (SWMP) is to control storm water runoff from the site. It should be designed to improve the storm water quality (i.e., sediment removal) and control runoff directly being discharged from the designated site.
(4) Disturbance of the natural topography and vegetation cover should be minimised. The natural contours should be preserved as far as is practical in order to preserve the existing site drainage patterns as far as possible.
(5) Natural, dispersed, drainage should be encouraged, by maintaining the natural drainage characteristics of the land as far as possible, thereby minimising the concentration of flows and consequently the risk of erosion.

<u>Management Outcome:</u> Minimal sedimentation of watercourses.

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Management Category: Planning and design

Impact: Risk of erosion at the base of the panels.

Mitigation:

(1) Disturbance of the natural topography and vegetation cover should be minimised. The natural contours should be preserved as far as is practical in order to preserve the existing site drainage patterns as far as possible.
(2) Clearing of vegetation for the construction of substations and other infrastructure that will be covered with weatherproof surfaces should preferably be done outside the main rainfall periods. This will ensure there will not be unnecessary sediment load in the water courses before the cleared areas can be stabilized.
(3) Correct panel level and aspect should be provided in the design of the support structures and not through earthworks.
(4) Utilisation of low impact construction techniques should be encouraged, with the footprint of disturbed areas being minimised.
(5) Allows growth of vegetation beneath and between panels.
(6) Good rangeland management for the areas underneath the solar panels will be essential to maintain a good vegetation cover and to reduce soil erosion and runoff.
(7) It is possible that the shading effect of the proposed solar panels will increase soil moisture content and therefore improve the general grazing capacity of the study areas.
(8) The mounting foundations of the panels should occupy minimal space.
(9) Natural, dispersed, drainage should be encouraged, by maintaining the natural drainage characteristics of the land as far as possible, thereby minimising the concentration of flows and consequently the risk of erosion.
(10) Formal infrastructure, in the form of access roads, pipes, culverts, etc. should be kept to a minimum.
(11) A vegetation cover that at least matches the natural, pre-development cover, should be maintained at all times between and beneath the solar panels.
(12) Grass cover at base of panels, particularly on drip line, should be actively maintained.
(13) Regular visual inspections are required to identify problems as they occur.
(14) Reseed bare areas.
(15) Inspection of the area frequently especially after intense rainfall and runoff events, with particular emphasis on the dripline areas and at access roads.
(16) Repair of erosion channels as soon as they develop.
(17) Monitoring in the form of visual inspections of the vegetation cover and erosion and sediment control features.

<u>Management Outcome</u>: Preserve topsoil, minimize soil erosion.

Pollution Potential

Management Category: Planning and design

Impact: Chemical pollution of the water resources.

Mitigation:

(1) Sites of oiling and refuelling points to be located away from rivers, surface water sewers or other watercourses.

Management Outcome: No incidents of chemical pollution of watercourses

Management Category: Handling of hazardous substances

Impact: Chemical pollution of the water resources.

Mitigation:

(1) Prevent the spillage of oil, grease and diesel from construction plant (increased hydrocarbon concentrations in surface waters) which will Impact on the quality of storm water runoff from the project area.

(2) Drip trays should be placed under any activity requiring active lubrication or oiling.

(3) Spill clean-up kits should be available on site for immediate remediation of any spills and removal of contaminated soils.

(4) No fuel should be stored at the pylon sites and no refueling or servicing of construction plant should take place at the construction sites.

(5) No construction materials should be disposed of within the delineated riparian zone or within the ecological buffer of the watercourse.

(6) No concrete batching should take place within the delineated riparian zone or within the ecological buffer of the watercourse.

(7) All surplus spoil material from the foundation excavations (i.e., not used as backfill) should be removed from the site as soon as is practically possible.

(8) Waste material should be removed to a licensed waste disposal facility, if it cannot be re-used or recycled.

Management Outcome: No incidents of chemical pollution of watercourses.

Management Category: Handling of hazardous substances/general waste management

Impact:

Pollution due to accidental releases of contaminated liquids.

Mitigation:

(1) Develop and implement waste management plan.

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(2) Black water (flush toilet sewerage) and grey water (kitchen, change rooms, medical room, and workshop) shall be treated to general or special limits with a bio-box package plant
(3) The treated effluent will need to be treated further if it is to be used for cleaning the modules (or panels).
(4) Storing treated effluent (and rainwater) during operation for reuse and/or disposal in tanks will be used for storing treated wastewater (and rainwater) for reuse (toilet flushing and/or dust suppression) and/or disposal.
(5) Storing untreated effluent (concrete slurry from e.g., concrete mixer trucks) will be used to store concrete slurry for reuse or disposal.
(6) Storing contaminated soil for reuse (bioremediation and rehabilitation) for storage and bioremediation of soil contaminated with hydrocarbon spills or storage and collection for disposal at the De Aar licensed landfill site.

Management Outcome:

No incidents of pollution of watercourses due to contaminated liquids.

Reasoned Opinion

During the risk assessment, 16 potential impacts were identified. For these potential impacts identified during the risk assessment, all were assigned mitigation measures that reversed potential impacts to “Low” risk rating posed to the resource quality of the watercourse. No impact was identified to cause loss of irreplaceable resources.

By implementing all the mitigation measures and managing the system on a continuous basis as prescribed by the Risk Assessment, all the impacts will be addressed to a satisfactory level. Therefore, it is proposed that the project should be authorised with the provision that the mitigation measures prescribed in this document, where applicable, are included in the EMP.

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Avifauna Impact Assessment

The following was taken from the *Avifauna Specialist Assessment (Final) prepared by Enviro-Insight CC (Sam Laurence and A.E. van Wyk) dated October 2022* attached as **Appendix E: Annexure J.**

Results

The proposed solar farm occurs in the Platberg-Karoo Conservancy (SA037) Important Bird and Biodiversity Area (IBA). The Platberg-Karoo Conservancy IBA covers c. 1240 000 ha and is located in the Northern Cape Province with a protected status of “Unprotected”. The folding process has forged several large peaks and plateaus in this area. The IBA encompasses a continuous chain of mountains and includes several State forests, mountain catchment areas and provincial nature reserves. A total of 289 bird species have been recorded in the IBA during SABAP2. With regards to the conservation, the IBA contributes greatly to the large terrestrial bird and raptor species. The priority species includes Blue Crane (Anthropoides paradiseus), Ludwig’s Bustard (Neotis ludwigii), Kori Bustard (Ardeotis kori), Blue Korhaan (Eupodotis caerulescens), Black Stork (Ciconia nigra), Secretarybird (Sagittarius serpentarius), Martial Eagle (Polemaetus bellicosus), Verreauxs’ Eagle (Aquila verreauxii) and Tawny Eagle (Aquila rapax).

84 bird species were observed within and around the Combined Project Area out of an expected total of 104 species, based on previous surveys, the SABAP Pentad analysis and habitat suitability, based Probability of Occurrences.

The observed avian species richness and abundance is considered low to moderate for an area of this size in the South African context although the proportion of observations related to SCC was considered high, as was the overall SCC diversity.

Generally, small passerine flight activity was surprisingly low and flight paths mainly low, short and local with very few higher-flying commuting individuals observed. However, observations of medium to larger species, including large flocks of commuting waterfowl and cranes were observed, as were ground congregations of species such as Blue Cranes and Northern Black Korhaan. Abundances of powerline collision-prone species such as Ludwig’s Bustard and Kori Bustard were moderate.

Notable Priority Species recorded during walked transects included Blue Cranes, Verreaux’s Eagle, Ludwig’s Bustards that were often flushed from foraging positions as well as numerous Northern Black Korhaans and Karoo Korhaans.

Blue Cranes were observed throughout the study area but especially in association with drainage lines and artificial water points.

Ludwig’s Bustards were in frequent in their observations and were mostly observed close to koppies, drainage lines, adjacent to roadsides and in adjacent livestock fields. Larger raptors persisted throughout the survey area but were often congregated near perching habitat (pylons).

Due to the high diversity and density of the above mentioned Red-Listed species recorded during the survey, (including regionally and globally listed Endangered and Vulnerable birds), the region as a whole is considered to be an area of very high avifaunal importance and activities should be managed in a holistic manner at a policy level, prioritising mitigation and monitoring of avifaunal species of conservation concern.

The most significant breeding habitat recorded during the survey were the active Verreaux’s Eagle and Tawny Eagle nests. The nesting site is at this stage the highest sensitivity found within proximately of the study area. The nest is found just over 6km from the proposed study area. However, the proposed connecting powerline as per the layout of the study area falls within 1.9km of the nest. The Tawny Eagle was last observed in September 2022 incubating eggs on the nest. Ludwig’s Bustard and Secretary Birds are considered a resident and to be breeding on site although no nests were located.

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In summary, the following key findings include:

- A high richness of Red-Listed and species of conservation concern occur within the study areas;
- A total of six SCC were confirmed to be present in the study areas out of 17 possible species with nine being highly likely in total; and
- High frequency of observations for the Vulnerable Verreaux's Eagle, the Near Threatened Blue Crane and Karoo Korhaan as well as the Endangered Ludwig's Bustard.

Impacts

Typical potential impacts include (but are not necessarily limited to):

- Habitat loss (including foraging and breeding) and fragmentation due to displacement (avoidance of disturbance). Habitat loss has the tendency to not only destroy existing habitat but also displace bird species from large areas of natural habitat. This specifically has a greater impact on bird species restricted to a specific habitat and its requirements.
- Collision and electrocution with above-ground power transmission lines. In some cases, collision can be associated with polarised light pollution and waterbird species mistaking large PV panels areas as wetlands or other waterbodies, a case known as the "lake effect" (as per Jenkins et al. 2017). The mitigation of these impacts will be addressed in the final EIA report with operational phase monitoring to be designed in the EMPr.
- Disturbance due to noise such as, machinery movements and maintenance operations during the construction and operational phase of the proposed PV solar farm.
- The attraction of some novel bird species due to the development of a solar farm with associated infrastructure such as perches, nest and shade opportunities
- Chemical pollution: Chemicals being used to keep the PV panels clean from dust (suppressants) etc.

Cumulative Impacts

There are a number of existing renewable energy projects (both solar and WEFs) that already have quantified negative impacts on the avifauna community in the region. Therefore, any impacts anticipated from the proposed solar facility will add to these existing impacts and require assessment under a Cumulative Impacts assessment.

Results obtained during this preconstruction survey and from the subsequent impact analysis should be considered in conjunction with the impacts created by the proposed development. The current developments within the region raise the possibility of significant cumulative impacts, especially concerning collision risk, habitat loss and fragmentation and loss of suitable habitat for threatened species.

The following current impacts will be exacerbated through increased solar developments regionally;

- Habitat loss: The destruction of highly sensitive habitat (for example drainage line habitats for Blue Cranes) will potentially increase. Many SCC exist within a narrow ecological and distributional belt and loss of its ecologically specific habitat may be highly significant.
- Road-kills: Many birds are commonly killed on roads and flushed into fences associated with the facility (e.g. Karoo Korhaan).
- Regional saturation of solar facilities: This has implications for several priority species, both in terms of lake effect, collision mortality from additional powerline infrastructure (see below) for some species, especially Bustards and Raptors, and displacement due to transformation of habitats

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- Powerlines: Numerous existing and new power lines are significant threats to large terrestrial priority species in the region as powerlines may kill significant numbers of all large terrestrial bird species.

Mitigation measures for inclusion in the EMPr:

Management Category: Layout and Design – Installing panel arrays and associated infrastructure

Impact:

Habitat loss and fragmentation due to displacement as a result of infrastructure installation (panels, powerlines, roads, fences and sub surface cables).

Consequences:

Destroy existing habitat but also displace bird species from large areas of natural habitat. This specifically has a greater impact on bird species restricted to a specific habitat and its requirements.

Mitigation:

1. Avoid avifaunal specific highly sensitive areas and their associated buffers, such as the local drainage lines, impoundments, smaller watercourses, pans and rocky koppies.
2. A rehabilitation plan must be commissioned before construction commences.
3. During construction, laydown areas must be located in uplands a minimum of 35 metres from the wetland edge.
4. Avoid the construction of a crossing or staging area by either choosing an alternative route or by using aerial or overhead equipment.
5. Limit the number of crossings and the number of equipment trips to as few as possible. Limit the number of equipment staging areas and spoil storage areas.
6. Consider criteria when locating crossing sites to minimize disturbance, such as shortest crossing point, avoiding unstable or steep banks, avoiding highly erodible soi8ls, avoid unstable portions of stream channels.

Management Outcome:

Sensitive avifauna habitats are protected and maintained.

Management Category: Linear Infrastructure Crossings - Underground Pipelines and Cables

Impact:

Habitat loss and fragmentation of watercourse areas due to displacement as a result of infrastructure installation (panels, powerlines, roads, fences and sub surface cables).

Consequences:

Destroy existing habitat but also displace bird species from large areas of natural habitat. This specifically has a greater impact on bird species restricted to a specific habitat and its requirements.

Mitigation:

1. All Pipelines corridors (affected areas) should be implemented to a maximum 10 metres wide through wetlands during construction.

2. All underground cables bisecting sensitive habitats must be placed below the subsurface flow of the ephemeral wetlands with the linear construction pits subjected to full rehabilitation in order to maintain normal subsurface slow.
3. Horizontal directional drilling is preferred for the crossing of wetlands,
4. All roads and crossings must be engineered not to impede surface or subsurface flow in any way.
5. The method of pipeline construction used in wetlands depends on the stability of the soils. Overall, topsoil is first removed and stored separately from the subsoil. Where wetland soils are saturated, segregating topsoil is not possible. Large timber mats placed ahead of the construction equipment can provide a stable working platform and protect wetland soils by spreading the weight of the construction equipment over a broad area.
6. Generally, the preferred method for crossing an actively flowing waterbody with a pipeline is horizontal directional drilling as compared to open-cut trenching. With this method, a hole is dug below the stream crossing and pulling a prefabricated section of pipe through the hole. The goal is for zero interruption to flow.
7. Open-cut crossings involve cutting a trench across the waterbody while water flows through the trenching area. Where the water is shallow enough, it may be diverted by flumes and pumps. A flume pipe may be placed to divert the water around the trenching area. Pumps in combination with dams may also be used to divert the water during open-cut trenching.
8. Where possible, pipelines can be installed using the push-pull technique-- stringing and welding the pipeline outside of the wetland and excavating and backfilling the trench using a backhoe supported by equipment mats or timber riprap. The prefabricated pipeline is installed in the wetland by pushing or pulling it across the trench. After the pipeline is floated into place, the floats are removed and the pipeline sinks into place. The trench is backfilled to the proper grade to maintain wetland hydrology and grades are restored to the original elevation.
9. If topsoil is segregated from subsoil, then subsoil is backfilled first.
10. All topsoil harvesting must take place in the dry season (late dry season).
11. As emergent wetlands will recover more quickly than others, artificial seeding is not advised as it creates competition for reestablishment of native facultative and obligate wetland vegetation.

Management Outcome:

Sensitive avifauna habitats are protected and maintained.

Management Category: Linear Infrastructure Crossings - Roads

Impact:

Habitat loss and fragmentation of watercourse areas due to displacement as a result of infrastructure installation (panels, powerlines, roads, fences and sub surface cables).

Consequences:

Destroy existing habitat but also displace bird species from large areas of natural habitat. This specifically has a greater impact on bird species restricted to a specific habitat and its requirements.

Mitigation:

1. All roads and crossings must be engineered not to impede surface or subsurface flow in any way.
2. Roads must utilise or upgrade existing farm roads as far as possible.
3. Construction equipment used while working in wetlands is limited to only those pieces that are essential and non-essential equipment is allowed to travel through wetlands only once during deployment and once during extraction.
4. A temporary road in a wetland needs to provide adequate crossroad drainage at all natural drainageways. Temporary drainage structures include culverts, bridges, and porous material.
5. Prior to construction, areas of infrastructure placement must be graded flat so as not to cause vegetation root mat loss or restriction to sub surface flow. Topsoil storage must be enacted. Construction of roads must occur at natural ground level (not below) to minimize to restricting water flow.
6. Limit or restrict the construction of fill roads. All fill roads must use a permeable fill material (such as gravel or crushed rock) for at least the first layer of fill in order to maintain the natural flow regimes of subsurface water.
7. It is preferable to eliminate fill roads and utilise raised bridges and culverts with adequate sizing and spacing of water crossing structures, proper choice of the type of crossing structure, and installation of drainage structures at a depth adequate to pass subsurface flow.

Management Outcome:

Sensitive avifauna habitats are protected and maintained.

Management Category: Planning - commencement

Impact:

Habitat loss and fragmentation due to displacement as a result of dust effects.

Consequences:

Destroy existing habitat but also displace bird species from large areas of natural habitat. This specifically has a greater impact on bird species restricted to a specific habitat and its requirements.

Mitigation:

1. Construction should be restricted to the months of April, May, June and July (latest) to minimise dust effects and subsequent destruction of the avifaunal habitats.

Management Outcome:

Sensitive avifauna habitats are protected and maintained.

Management Category: Layout and Design - Buffers

Impact:

The destruction or disturbance of bird roosts during the construction phase.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Consequences: Decrease in avifauna population due to loss of offspring/breeding pairs for generation

Assumption:

Bird nesting sites and roosts varied from artificial structures such as pylons and windmills to some trees within the project footprint and infrastructure development will be associated with the destruction or disturbance of such roosts.

Mitigation:

1. Timing construction to May, June, July and August in order to avoid breeding periods of species within the sensitive drainage lines, wetlands and the general region.
2. All Verreaux's and Tawny Eagle nests must be buffered by at least a 1 km exclusion zone of ALL project activities with a preferable "non-disturbance" exclusion of 1.5 km during breeding season.
3. No construction vehicles or personnel may approach the Verreaux's/ Tawny Eagle nests within 1.5 km during the construction phase.

Management Outcome:

Bird roosts and nests are not disturbed.

Management Category: Layout and Design – Installing perimeter fence

Impact:

Bird mortalities during the operational phase due to vehicle collisions, collisions with infrastructure and/or combustion.

Consequence:

Decrease in avifauna population.

Assumption:

Impacts due to bird mortalities during the operational phase are practically unavoidable for any large facility, but with the appropriate mitigation measures these impacts can be minimised. It is likely that most of the avifaunal populations will be largely displaced from the majority of the project infrastructure, although significant risks are associated with the likelihood of project vehicles flushing birds into fencing infrastructure as well as collisions of large bodied species with powerlines. Although the current overall bird activity qualifies the proposed solar development boundary as a high-density area, there are certain times of the year (and day) when it appears that large flocks of birds (such as cranes bustards and large birds of prey) are far more prevalent.

Mitigation:

1. In all areas where service road intersect with semi natural or natural habitat, all fences must be set back at least (strictly) 75 metres from the edge of every service road in order to allow for vulnerable species such as cranes and korhaans to obtain adequate height after being flushed by vehicle traffic. Alternative 2 and where a 75 metre buffer is not possible, new fences must be set back no more than 2 metres (directly adjacent) from the edge of service roads. Through the essential elimination of habitat, this will limit any chance of vulnerable species foraging on verge side vegetation and causing subsequent fence collisions.

Management Outcome:

Minimal bird mortalities recorded.

Management Category: Layout and Design – Distribution Line

Impact:

Bird mortalities during the operational phase due to vehicle collisions, collisions with infrastructure and/or combustion.

Consequence:

Decrease in avifauna population.

Assumption:

Impacts due to bird mortalities during the operational phase are practically unavoidable for any large facility, but with the appropriate mitigation measures these impacts can be minimised. It is likely that most of the avifaunal populations will be largely displaced from the majority of the project infrastructure, although significant risks are associated with the likelihood of project vehicles flushing birds into fencing infrastructure as well as collisions of large bodied species with powerlines. Although the current overall bird activity qualifies the proposed solar development boundary as a high-density area, there are certain times of the year (and day) when it appears that large flocks of birds (such as cranes bustards and large birds of prey) are far more prevalent.

Mitigation:

1. All powerlines must be flapped with appropriate diverters and no elevated powerlines are to cross drainage line habitats.
2. Avoid siting lines in areas where birds concentrate.
3. Where possible, construction should involve the burying of lines underground.
4. In order to reduce avian mortalities related to bird collisions or nests, perch guards should be installed on all infrastructure (such as poles and platforms).

Management Outcome:

Minimal bird mortalities recorded.

Management Category: Facility Management

Impact:

Bird mortalities during the operational phase due to the addition of grazing sheep to the footprint which may attract raptor SCC who may scavenge on dead lambs/ adult sheep or prey upon livestock.

Consequence:

Decrease in avifauna population.

Mitigation:

1. Strict carcass retrieval must be incorporated into the EMP where carcasses are removed and correctly disposed of within the same day of death. This will require constant monitoring of all sheep herds in the footprint.

Management Outcome: Livestock carcasses are removed from site.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Management Category: Facility Management

Impact:

Bird mortalities during the operational phase due to vehicle collisions, collisions with infrastructure and/or combustion.

Consequence:

Decrease in avifauna population.

Mitigation:

1. An EMPr for the Operational Phase must be created and be updated every three years in order to revaluate the effectiveness of the mitigations.

Management Outcome:

Sound environmental management during the operational phase.

Management Category: Layout and Design – Buffers

Impact:

Loss of Bird Foraging Habitat.

Consequence:

Alteration/disturbance to bird ecology.

Mitigation:

1. Avoid avifaunal specific sensitive areas and their associated buffers, such as the local drainage lines, impoundments, smaller watercourses, pans and koppies.
2. A green buffer should be maintained around all habitats with a SEI designated as High or above. This includes a 50 m no-go buffer proposed around small artificial water points (borehole pans and livestock watering troughs).
3. All large impoundments (dams) require a 1000 metre buffer from any infrastructure activity although this may be reduced to 800 metres if no new powerline infrastructure impacts the 1000 metre threshold. The 1000 metre buffer will not apply to roads and fences.

Management Outcome:

Sensitive avifauna habitats are protected and maintained.

Management Category: Layout and Design - Buffers

Impact:

Disruption of bird migratory pathways during the operational phase.

Consequence:

Alteration/disturbance to bird migration.

Assumption:

Migratory pathways of birds cannot be changed and the resulting impacts are unavoidable. However, severity of the impacts can be reduced with appropriate mitigation measures. Some significant discernible migratory flight pathways were able to be established which could be explained by large areas of generic habitats punctuated by some distinguishing geographic features in the landscape, such as large ridges. large impoundments, wetlands and drainage lines.

Mitigation:

1. The linear Drainage line habitats must be buffered by a minimum of 50 metres from the edge of the demarcated wetland.

Management Outcome:

Bird migration pathways are maintained.

Management Category: Layout and Design – Installing panel arrays

Impact:

The attraction of some novel bird species due to the development of a solar farm with associated infrastructure such as lake effect perches, nest and shade opportunities.

Consequence:

Damage to the infrastructure through acidic defecation by certain species and draws birds closer to infrastructure and cause significant direct mortality risks.

Assumption:

Essentially, all habitat attractants should be eliminated so that avifaunal populations will not embedded themselves within the infrastructure over time.

Lake Effect can attract aquatic birds and insects (food) as panels mimic reflective surfaces of waterbodies.

Mitigation:

1. Bird diverters, perch deterrents and the application of Non-polarising white tape can be used around and/or across panels to minimise reflection.

Management Outcome:

Minimal bird mortalities resulting from the "lake effect" of the panels.

Impact: Chemicals being used to keep the PV panels clean from dust (suppressants) etc. could contaminate the ecosystem.

Consequence:

Pollution of the ecosystem and watercourse could result in a decrease in ecological function.

Mitigation:

1. The application of strict chemical control protocols as per the EMPR.

Management Outcome:

No disturbance to ecosystems as a result of chemical products.

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Management Category: Maintenance and monitoring – Avian study monitoring

Impact:

Cumulative impact of the project and other projects in the area concerning collision risk, habitat loss and fragmentation and loss of suitable habitat for threatened species.

Consequence:

Decline in numbers of avifauna/ disturbance to ecological patterns of avifauna

Assumption:

The purpose of monitoring would be to establish if and to what extent displacement of priority species has occurred through the altering of breeding and foraging behaviour post-construction, and to search for and identify carcasses near panels and newly erected powerlines (mortality).

Mitigation:

1. Formal post construction monitoring must be applied once the development has been activated, as per the most recent edition of the best practice guidelines (Jenkins et al. 2017).
2. Post-construction monitoring should be undertaken as per the EMPr. The exact scope, nature and frequency of the post-construction monitoring will be informed on an ongoing basis by the results of the monitoring through a process of adaptive management.
3. High value target species such as Tawny Eagle, Verreaux's Eagle, Secretary Bird, Bustards and Martial Eagles can be tracked using periodic ECO monitoring regimes to monitor movement patterns and breeding success. These programs should be implemented during and post construction.

Management Outcome:

Cumulative impacts are monitored during post construction of the facility.

Management Category: Construction plant management – generating noise

Impact:

Disturbance (including of nesting SCC) due to noise such as, machinery movements and maintenance operations during the construction phase the proposed PV solar farm.

Consequence: Decrease in avifauna population due to loss of offspring/breeding pairs for generation.

Mitigation:

1. Timing construction to May, June, July and August in order to avoid breeding periods of species within the sensitive drainage lines, wetlands and the general region.

Management Outcome:

Bird roosts and nests are not disturbed.

Reasoned Opinion

Overall, the author sees no reason why an Environmental Authorisation (EA) should not be granted on the following conditions:

- All recommended buffering be strictly adhered to where possible.

- All recommended mitigation measures be applied preconstruction, post construction and operations.
- The Prescribed engineering mitigation measures must be supported by a pre-construction and Construction Phase rehabilitation plan to be commissioned prior to commencement of construction activities.
- An EMPr for the Construction Phase must be created and be subsequently updated every three years (during Operation) in order to revaluate the effectiveness of the mitigations. All mortalities must be recorded.

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Terrestrial Biodiversity Impact Assessment

The following was taken from the *Terrestrial Biodiversity Specialist Assessment – Soventix Phase 3 PV Project (Final) prepared by Simon Todd of 3 Foxes Biodiversity Solutions dated September 2022* attached as **Appendix E: Annexure H.**

Results

Within the study area, the vegetation consists of a mosaic of grassy and more shrubby areas, with shrubs being more prevalent on the stony and shallow soils of the site. No indigenous trees are present within the site and the vegetation consists of low grassland shrubland. Dominant and common species include *Lycium cinereum*, *Rhigozum trichotomum*, *Rosenia humilis*, *Pentzia incana*, *Asparagus glaucus*, *Berkheya annectens*, *Eriocephalus ericoides*, *E. spinescens*, *Felicia muricata*, *Melolobium candicans*, *Pegolettia retrofracta, Plinthus karooicus, Hertia pallens, Aristida adscensionis, A. diffusa, Enneapogon desvauxii, Eragrostis lehmanniana, E. obtusa, Fingerhuthia africana, Tragus berteronianus* and *T. koelerioides*.

FAUNAL COMMUNITIES

There are no amphibians or reptiles of concern that are likely to occur at the site with the result that the site is considered low sensitivity for these species. There are however several drainage features and some dams present that represent important habitat for amphibians and which should be excluded from the development footprint. There are three red-listed mammals which are known from the broader region, including the Black-footed Cat *Felis nigripes* (VU), South African Hedgehog *Atelerix frontalis* (NT) and the Brown Hyena *Hyaena brunnea* (NT). However, the site is considered relatively unfavourable for any of these species and it is considered unlikely that there are any resident individuals of these species present within the development footprint. Consequently, the site is considered low sensitivity for fauna overall.

CRITICAL BIODIVERSITY AREAS & BROAD-SCALE PROCESSES

Although there are no CBAs within the affected area, the whole of the Soventix Phase 3 site falls within an extensive ESA. According to the reasons layer that accompanies the CBA map, the ESA is based on the selection of the area as Northern Upper Karoo, the Platberg - Karoo Conservancy Important Bird Area, the presence of natural wetlands, rivers, and wetland FEPAs. However, the aquatic features listed above have been excluded from the development footprint, with the result that the impact of the development on these features would be minimal.

The Northern Upper Karoo is a very extensive vegetation type and the loss of the area within the PV footprint would have a negligible impact on the availability of this vegetation type for future conservation purposes.

The impact of the development on the IBA would also be minimal as the PV footprint represents a very small (>>1%) of the IBA and would not represent significant habitat loss within the IBA. However, most importantly, the primary purpose of ESAs is to ensure the broad-scale maintenance of ecological processes and within the site, the primary ecological features and associated processes would be around the drainage features of the site and the corridors associated with the drainage systems linking the wetlands and artificial dams of the site. As these would be outside of the PV footprint, the processes associated with these features would not be compromised by the development of the PV facility.

It would however be important to ensure that erosion within the development areas and consequent siltation of the nearby drainage systems does not occur. As such, an erosion plan and a runoff management system for the site would be important to ensure that the development does not negatively impact the adjacent hydrological features.

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Reg: 2006/023163/23

In terms of other conservation planning priorities and features or the site, there are no formal declared conservation areas within the site or NC-PAES focus areas. Not surprisingly, there are no forests or protected trees within the site.

Given the low transformation rate and extensive nature of the affected vegetation type, the development would have minimal impact on the future ability to meet conservation targets for this vegetation type. The overall impact of the development on the ability to meet future conservation targets would therefore be minimal.

Impacts

During construction, the major impact would likely be habitat loss and anthropogenic disturbance while during the operational phase, direct disturbance would be reduced but there would still be some potential impact due to a reduction in connectivity for some fauna within the site.

Impact 1. Impacts on ESAs and broad-scale ecological processes:

The majority of the site falls within an ESA and there would be approximately 650ha of habitat loss associated with the development of the PV facility. In addition, the development would cause some habitat fragmentation and pose some impact on broad-scale ecological processes in the area. These impacts cannot be fully mitigated and there is likely to be some minor residual impact on broad-scale ecological processes.

During operation, the level of anthropogenic disturbance associated with the PV facility would be significantly reduced as compared to the construction phase and is not considered to be significant.

Impact 2. Cumulative Impacts:

The development of the Soventix Phase 3 PV Facility would result in habitat loss and an increase in overall cumulative impacts on fauna and flora in the area. Although the area currently experiences a relatively low level of impact, there are several existing PV facilities towards De Aar as well as numerous developments currently being planned in the area, especially towards De Aar and it is highly likely that cumulative impacts are going to increasingly become a concern. The contribution of the Soventix Phase 3 PV Facility to direct habitat loss at 650 ha is however relatively small but would have some local impacts on connectivity.

Mitigation measures for inclusion in the EMPr:

Management Category: Layout and Design - Roads
Impact: Clearing of vegetation for roads
Consequences: Increase erosion, sedimentation of watercourse.
Mitigation:

1. The use of existing access roads should be used where possible to reduce the additional impact of the PV facility.

Management Outcome:
Minimize vegetation clearance.

Management Category: Site establishment - Site selection

Impact: Clearing of vegetation for construction camp, laydown areas etc.

Consequences: Increase erosion, sedimentation of watercourse, loss of ecological functioning.

Mitigation:

1. Minimise the development footprint as far as possible, which includes locating temporary-use areas such as construction camps and lay-down areas in low sensitivity or previously disturbed areas.
2. Minimise the development footprint near watercourses and other ecologically significant features.
3. Avoid impact to restricted and specialised habitats such as pans, wetlands and rock pavements. These areas should be demarcated and marked as no-go areas during construction with construction tape or similar.

Management Outcome:

Minimize disturbance to natural areas.

Management Category: Layout and Design – perimeter fencing

Impact: Fencing can cause death/injury to fauna particularly tortoises.

Consequence: Loss/injury to fauna due to fencing.

Mitigation:

(1) Ensure that the fencing around the facility is fauna-friendly, which includes ensuring that it does not have electric strands close to the ground which can shock and kill tortoises.

Management Outcome:

Prevent the death/injury of fauna caused by fencing.

Management Category: Facility Management

Impact: Impacts on Ecological Support Areas (ESAs) and general ecological processes within the site

Consequence: Disturbance to ecological functioning

Mitigation:

1. Adhere to the open space management plan which makes provision for the favourable management of the facility and the surrounding area for fauna.

Management Outcome:

Good environmental management of the facility.

Management Category: Layout and Design - Roads

Impact: Collision of traffic with fauna crossing roads etc.

Consequence: Death/loss of fauna species

Mitigation:

1. Appropriate design of roads and other infrastructure to minimise faunal impacts and allow fauna to pass over, through or underneath these features as appropriate.

Management Outcome:

Minimize the loss/injury to fauna caused by roads

Management Category: Facility Management and Road Management
Impact: Roadkill, electrocutions of fauna during construction and post-construction.
Consequence: Loss/injury to faunal species.
Mitigation:

1. A log should be kept detailing all fauna-related incidences or mortalities that occur on site, including roadkill, electrocutions etc. during construction and operation. These should be reviewed annually and used to inform operational management and mitigation measures.
2. Fence condition monitoring to ensure that the ground clearance of the electrified strands remains at least 30cm above the ground, so as not to increase the likelihood that fauna would be shocked by the fence.

Management Outcome:
Faunal mortalities are reduced.

Management Category: Maintenance Monitoring - Alien plant recruitment

Impact: Disturbance can favour the recruitment of pioneer species and alien invasive plants, threatening habitats and alter the composition, structure and functioning of ecosystems.

Consequence:

Altered or dysfunctional ecosystem and loss of biodiversity and climate change resilience.

Mitigation:

1. Vegetation within the PV facility should not be controlled using herbicides, and manual clearing methods should be used when necessary.

Management Category: Layout and Design - Buffers

Impact: Cumulative habitat loss, the ability to meet conservation targets and impact on broad-scale ecological processes

Consequence: Loss of sensitive environments and ecological functioning.

Mitigation:

1. Demarcate sensitive habitats such as riparian areas, pans, wetlands and rock pavements as no-go areas during construction and at decommissioning with construction tape or similar markers and signage. Linear infrastructure may traverse the emphemeral drainage lines and other areas mapped as high sensitivity.

Management Outcome:

Sensitive areas are protected.

Management Category: Facility Management

Impact: Impact on broad-scale ecological processes.

Consequence: Altered or dysfunctional ecosystem.

Mitigation:

1. Ensure that all the operational phase management plans are fully implemented and that the associated monitoring and feedback mechanisms to management are in place.

Management Outcome:

Good environmental management of the facility in accordance with management plans.

Reasoned Opinion

There are no impacts associated with the development of the Soventix Phase 3 site on terrestrial biodiversity that cannot be mitigated to an acceptable level. As such, should all the proposed mitigation be implemented, the Soventix Phase 3 development is deemed acceptable from a terrestrial ecological impact perspective. In terms of cumulative impacts, the affected area has not been significantly impacted by renewable energy development to date and the contribution of the current development to cumulative impact is considered acceptable. It is thus the reasoned opinion of the specialist that there the Soventix Phase 3 site development should be authorised subject to the various mitigation and avoidance measures as indicated.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Animal Species Compliance Statement

The following was taken from the *Terrestrial Animal Species Compliance Statement – Soventix Phase 3 PV Project (First Draft) prepared by Simon Todd of 3 Foxes Biodiversity Solutions dated September 2022.* attached as **Appendix E: Annexure H.**

Results

The DFFE Screening Tool indicates that the site is compromised entirely of medium sensitivity areas as a result of two avifaunal species, but that no terrestrial species of concern are known from the site. The low sensitivity of the site has been confirmed through the site verification study. Consequently, an Animal Species Compliance Statement is the recommended level of study for the EIA process.

Mammals

As many as 63 terrestrial mammals are listed for the wider study area in the MammalMap database. This includes the listed Black-footed Cat *Felis nigripes* (VU), South African Hedgehog *Atelerix frontalis* (NT) and the Brown Hyena *Hyaena brunnea* (NT). While these species are known from the broader area, their regular presence on the site is considered unlikely. Species that were observed in the area include Cape Porcupine *Hystrix africaeaustralis*, Steenbok *Raphicerus campestris*, Duiker *Sylvicapra grimmia*, Springbok *Antidorcas marsupialis*, Aardvark *Orycteropus afer*, Rock Hyrax *Procavia capensis*, Cape Hare *Lepus capensis*, Hewitt's Red Rock Rabbit *Pronologus saundersiae*, South African Ground Squirrel *Xerus inauris*, Springhare *Pedetes capensis*, Namaqua Rock Mouse *Aethomys namaquensis*, Black-backed Jackal *Canis mesomelas*, Bat-eared Fox *Otocyon megalotis*, Yellow Mongoose *Cynictis penicillata* and African Wild Cat *Felis silvestris*.

No listed mammals were observed on either occasion within the site and the Soventix Phase 3 site is therefore considered low sensitivity for terrestrial mammals.

Reptiles

According to the distribution maps available in the literature and the SARCA database, as many as 31 reptiles could occur at the site. Species observed on the site include Bibron's Gecko *Chondrodactylus bibronii*, Southern Rock Agama *Agama atra*, Karoo Girdled Lizard *Karusasaurus polyzonus*, Spotted Sand Lizard *Pedioplanis lineoocellata lineoocellata*, Western Three-striped Skink *Trachylepis occidentalis*, Variegated Skink *Trachylepis variegata*, Marsh Terrapin *Pelomedusa subrufa*, Verrox's Tent Tortoise *Psammobates tentorius verroxii*, Cape Cobra *Naja nivea* and Leopard Tortoise *Stigmochelys pardalis*. No listed species are known from the immediate area and no listed species were observed at the site.

Amphibians

Eleven frog species are known from the broad area around the site and does not include any listed species. The majority of species known from the area are toads and sand frogs which are relatively independent of water except for breeding purposes, which reflects the aridity of the area. There are some natural pans and man-made shallow water bodies present in the area and are confirmed as breeding sites for amphibians. The major freshwater features in close proximity to the Soventix Phase 3 site have been avoided and appropriate buffers have been included so as to limit potential negative impacts of the development on amphibians and their habitats.

Mitigation Measures for inclusion in the EMPR:

Management Category: Construction Plant Management including Deliveries - Driving Transport
Impact: Traffic on site could collide with fauna.

Consequence: Loss/injury to fauna

Mitigation:

1. All vehicles should adhere to a low speed limit on site. Heavy vehicles should be restricted to 30km/h and light vehicles to 40km/h.
2. Environmental induction for all staff and contractors on-site.

Management Outcome:

Faunal mortalities due to traffic incidents are reduced.

Management Category: General and Hazardous Waste Management

Impact: Animals could gain access to waste receptacles

Consequence: Ingestion of plastics could cause death/injury to animals. Waste distributed on the site.

Mitigation:

(1) All laydown areas, construction sites etc with waste disposal bins, should be provided with lockable bins that are tamper proof by baboons, monkeys and other fauna.

Management Outcome:

Good waste storage and management

Management Category: Clearing and Grubbing

Impact: Disturbance/loss of faunal species especially reptiles and other vulnerable species during vegetation clearing and other construction activities.

Consequence: Loss/injury to faunal species.

Mitigation:

1. Search and rescue for reptiles and other vulnerable species during construction, before areas of intact vegetation are cleared. Such search and rescue should be conducted by relevant experts with experience in search and rescue of the faunal groups concerned.

Management Outcome:

Preservation of reptiles and other vulnerable species

Management Category: Construction plant management

Impact: Damage to sensitive environmental areas by machinery and staff

Consequence: Loss/injury to faunal species.

Mitigation:

1. Limiting access to the site and ensuring that construction staff and machinery remain within the demarcated construction areas during the construction phase.

Management Outcome:

Minimize damage to the environment.

Management Category: Earthworks

Impact: Fauna may fall in exposed become trapped.

Consequence: Loss/injury to faunal species.

Mitigation:

1. No excavated holes or trenches should be left open for extended periods

Management Outcome:

Faunal mortalities due to entrapment in trenches/ditches are reduced.

Management Category: Layout and Design - Installing Perimeter Fence and Access Control

Impact: Tortoises and other animals become stuck against fences and are electrocuted to death.

Consequence: Loss/injury to faunal species.

Mitigation:

1. The design should ensure that there is no electrical fencing around substations (and associated battery facilities) or other features within 30cm of the ground as tortoises become stuck against such fences and are electrocuted to death. Alternatively, a guard wire set at 20cm can be used to keep larger tortoises away from the fence

Management Outcome:

Faunal mortalities as a result of fencing are reduced.

Management Category: Facility Management and Road Management

Impact: Roadkill, electrocutions of fauna during construction and post-construction.

Consequence: Loss/injury to faunal species.

Mitigation:

1. A log should be kept detailing all fauna-related incidences or mortalities that occur on site, including roadkill, electrocutions etc. during construction and operation. These should be reviewed annually and used to inform operational management and mitigation measures.

Management Outcome:

Faunal mortalities are reduced.

Reasoned Opinion

The DFFE Screening Tool identified the Soventix Phase 3 site as having a low sensitivity. The site verification confirmed the low sensitivity and it is unlikely that any red-listed fauna are present within the site. The proposed development footprint avoids areas of high sensitivity and the impact of the development on fauna is likely to be low with the application of the suggested EMPr inputs. Due to the low sensitivity of the site, there are no terrestrial faunal reasons that the Soventix Phase 3 site should not proceed into the development phase.

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Plant Species Compliance Statement

The following was taken from the *Plant Species Compliance Statement – Soventix Phase 3 PV Project prepared by Simon Todd of 3 Foxes Biodiversity Solutions dated September 2022* attached as **Appendix E: Annexure H.**

Results

Northern Upper Karoo is one of the most extensive vegetation types in the country and occupies over 40 000km^2 of the interior Karoo. The vegetation consists of shrubland dominated by dwarf Karoo shrubs, grasses and *Acacia mellifera* subsp. *detinens*, and other low trees particularly on the sandy soils. Four plant species are known to be endemic to the vegetation type, *Lithops hookeriana, Stomatium pluridens*, *Galenia exigua* and *Manulea deserticola*. Northern Upper Karoo has not been significantly affected by transformation and is still approximately 96% intact and is classified as Least Threatened.

Within the study area, the vegetation consists of a mosaic of grassy and more shrubby areas, with shrubs being more prevalent on the stony and shallow soils of the site. No indigenous trees are present within the site and the vegetation consists of low grassland shrubland. Dominant and common species include *Lycium cinereum*, *Rhigozum trichotomum*, *Rosenia humilis*, *Pentzia incana*, *Asparagus glaucus*, *Berkheya annectens*, *Eriocephalus ericoides*, *E. spinescens*, *Felicia muricata*, *Melolobium candicans*, *Pegolettia retrofracta, Plinthus karooicus, Hertia pallens, Aristida adscensionis, A. diffusa, Enneapogon desvauxii, Eragrostis lehmanniana, E. obtusa, Fingerhuthia africana, Tragus berteronianus* and *T. koelerioides*.

Mitigation measures for inclusion in the EMPr:

Management Category: Site Establishment

Impact: Direct loss of terrestrial plants from the development footprint.

Consequence: The loss of threatened (Red Data) species may result in a loss of biodiversity and alter the functioning of an ecosystem (direct).

Mitigation:

1. Undertake a pre-construction walk through of the development footprint to locate protected plant species that should be relocated outside of the development footprint.

Management Outcome:

Preserve protected plant species

Management Category: Alien Plant Management

Impact: Alien invasive plants: Prevent the cleared areas from degrading, as invasive non-native plants will spread into degraded areas.

Consequence: Loss of biodiversity, invasive species compete with indigenous plant species.

Mitigation:

1. Develop an alien vegetation management plan

Management Outcome:

Control of alien invasive species on site.

Management Category: Stormwater and soil erosion management

Impact: Construction activities could result in increased soil erosion due to vegetation clearing.

Consequence: Loss of topsoil and soil erosion

Mitigation:

1. Develop a soil erosion management plan

Management Outcome:

Manage soil erosion

Management Category: Revegetation

Impact: Revegetation may not be sufficient to bind and protect the topsoil from erosion.

Consequence:

Altered or dysfunctional ecosystem and loss of biodiversity and climate change resilience.

Mitigation:

1. Develop a revegetation and rehabilitation plan.

Management Outcome:

Successful revegetation and rehabilitation of disturbed areas.

Management Category: Contractor readiness - Acquiring permits, licenses, Letters of consent and permissions

Impact: Direct loss of terrestrial plants from the development footprint.

Consequence: The loss of threatened (Red Data) species may result in a loss of biodiversity and alter the functioning of an ecosystem (direct).

Mitigation:

1. Ensure that all vegetation-related preconstruction permits, surveys and walk-throughs have been conducted prior to the commencement of construction activity.

Management Outcome:

Preservation protected plant species.

Management Category: Clearing and Grubbing

Impact: Direct loss of flora through clearing.

Consequence:

The loss of threatened (Red Data) species may result in a loss of biodiversity and ecosystem resilience to climate change and may alter the functioning of an ecosystem.

Mitigation:

1. Monitoring of vegetation clearing during construction by the EO to ensure that any plant SCC within the development footprint area are translocated to safety where necessary. These would be identified during the preconstruction walk-through of the facility and a guide enabling the identification of such species should be provided as an output of the walk-through study.

Management Outcome:

Preservation of protected plant species.

Management Category: Maintenance and monitoring

Impact: Risk of erosion

Consequence: Erosion, sedimentation of watercourse.

Mitigation:

1. Annual rehabilitation activities in line with the EMPr requirements. Any erosion problems observed on-site should be rectified as soon as possible using the appropriate revegetation and erosion control works.

Management Outcome:

Control soil erosion

Reasoned Opinion

There are no threated vegetation types or specialised plant communities present within the site. There are however some habitats present that are considered sensitive but which are covered under the Combined Terrestrial Biodiversity Theme.

No plant species of conservation concern were observed within the site and overall, the site is considered low sensitivity from a Plant Species Theme perspective.

Given the low sensitivity of the development footprint and the avoidance of the sensitive habitats present at the site, there are no reasons that the development should not go ahead from a plant ecology perspective.

SECTION L: ENVIRONMENTAL IMPACT STATEMENT

3(1) A EIA report… must include –

(l) an environmental impact statement which contains-

(i) a summary of the key findings of the environmental impact assessment:

(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and

(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

Please refer to the Impact Assessment in **Appendix D.**

A summary of the key findings

The project area is zoned as Agriculture Zone 1 (not open space or conservation). Agriculture (mostly 'Karoo' mutton, sheep, and wool, with some hunting of small game) forms the backbone of the economy of the Emthanjeni Local Municipality and accounts for the largest labour/employment contributor to date.

The project area is in Ward 6 of the Emthanjeni Local Municipality that is located in the Pixley Ka Seme District Municipality in the Northern Cape province. The towns in the area are small and the proposed site is located between the towns of Hanover and De Aar. About 74% of the people in Ward 6 live in urban areas while the remaining 26% (one quarter) live on farms. There are no areas under traditional leadership in the district and the site is surrounded by commercial farms. Education levels are low (About two fifths (17,8%) of the people in Ward 6 aged 20 years or older have no schooling or only some primary education). In Ward 6, 45,3% of people aged between 15 – 65 years are employed, with about half of those people in the formal sector. Ward 6 has the lowest proportion of people (6,7%) with no annual household income. There are very few employment opportunities.

The proposed development area does not fall within any of the eleven (11) identified Renewable Energy Development Zones (GN No. 114, GG No. 41445 of 16 February 2018, as well as GN No. 786 of 17 July 2020), but it is located within a Strategic Transmission Corridor (GN No. 113 in GG No. 41445 of 16 February 2018, as well GN No. 383, GG No. 44504 of 29 April 2021), specifically within the "Central Corridor." Despite being in the Central Corridor, the applicant cannot follow the basic assessment procedure contemplated in Regulation 19 and 20 of the Environmental Impact Assessment Regulations, 2014 in order to obtain environmental authorisation because the scope of this application excludes LA 9 of LN2.

The project area falls within an Astronomy Advantage Area (AAA) under the Astronomy Geographic Advantage (AGA) Act, 2007 (Act No. 21 of 2007), but the proposed solar PV facility represents a low risk of interference to the SKA radio telescope (including MeerKAT) with a compliance surplus of 57.02 dBm/Hz (Response Letter from Mr Selaelo Matlhane, Spectrum & Telecommunication Manager of the South African Radio Astronomy Observatory (SARAO) and dated 16 March 2022).

The project area is not within (a) a protected area or within 5 km of a protected area, (b) the core area or within 5 km of the core area of a Biosphere Reserve, (c) a National Protected Area Expansion Strategy Focus Area according to the National Protected Area Expansion Strategy (2016), and (d) a sensitive area in terms of an EMF (as there is no EMF).

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The project area is not within an Air Quality Priority Area.

The geology of the project area is underlain by flat-lying sedimentary rocks of the Karoo Supergroup, which have been intruded by innumerable sills and dykes of dolerite.

The project area is not within a site identified in terms of an international convention, such as a RAMSAR site. The project area contains 3 Hydrological Response Units (HRU). Ninety-six percent (96%) of the project area falls within HRU2, which has an average slope of 0,56%. Consequently, the topography of the study area is generally flat with elevations on the site typically ranging from 1 335 to 1 370 m above mean sea level.

The drainage systems are predominantly classified as ephemeral, which means that the stream flows briefly in direct response to precipitation in the immediate vicinity, and the channel is at all times above the groundwater reservoir. These ephemeral tributaries of the Brak River and considered to be in a largely natural ecological state. These systems have a far less predictable flow regime compared to perennial or seasonal rivers and are frequently dry for long periods in arid regions. The ephemeral drainage system consists of one major ephemeral drainage channel which are fed by upstream catchment areas beyond the project area fence line. Three smaller tributaries are feeding into the main drainage line in the project area. The ecological importance and sensitivity category (EISC) of the ephemeral drainage system and associated alluvial floodplains is classified as “High” and therefore considered as a "no-go area" for all infrastructure apart from access roads, pipelines, cables and pylons. The no-go area includes the ecological buffer.

The delineated ephemeral drainage system is of conservation importance as it is considered a Freshwater Ecosystem Protected Area (FEPA) category. The entire sub-quaternary catchment indicates that the surrounding land and smaller stream network need to be managed in a way that maintains the good condition (A or B ecological category) of the river reach.

Micro sub-catchment sheet flow towards lower-lying depressions within the non-perennial river flood plains is likely to dominate flood propagation, and isolated flooded areas (or ponded flood occurrence zones) are predicted to occur. The flood line determination suggests a low flooding risk as no clearly defined drainage lines occur. As such, no clearly defined exclusion zones or protection buffer areas could be mapped or recommended.

The project area falls within a spring to summer rainfall area (October to April), ranging from 112,4 to 738,9 mm/yr but averaging 320 mm/yr. The Mean Annual Evaporation (2 000 – 2 150 mm/yr) exceeds the Mean Annual Precipitation (MAP) by about 85%, so non-perennial streams and rivers will only have water when there are flooding events. Run-off during the peak months (January to April), ranges from 0,3 to 1,1 mm/yr over the surface area of quaternary catchment D62D. The annual run-off from natural (unmodified) catchments in D62D is approximately 0,9% of the MAP.

Accounting for changes in soil type, slope angle and rainfall intensity, ground cover beneath solar arrays was found to have the most significant impact on run-off rates. So, if vegetation cover beneath the solar arrays is maintained, no significant increase in surface water run-off is anticipated compared to greenfield run-off rates. 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 if there is proper runoff management from roads and other bare areas.

De Aar is dependent on groundwater for agriculture and drinking water. The project area overlies a moderate to high yielding aquifer (median yields of 0,5 to 2 L/sec). However, the landowner, Willem Retief has indicated that each windmill pump (there are two pumps) yields approximately 0,33 L/s, which falls at the bottom of the aforesaid range. The landowner also noticed that the water table dropped by at least 3 ms over the last few years during the drought. Furthermore, water scarcity in the arid Pixley Ka Seme District Municipality is expected to be exacerbated by climate change, specifically drought. Under a low climate change mitigation scenario, model simulations indicated an average temperature increase by 2.3 °C, an increase of 16.1 in the total number of heat waves experienced and a decrease in rainfall to 17 mm - 74.3 mm annually. Based on the findings of the Geo-Hydrological Study, groundwater availability on all sub-catchments for the current setting is estimated that there is enough groundwater available on a sub catchment level to sustain the proposed 8-hour abstraction from the designated boreholes and the sub-catchments they fall in.

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The project area is not within a critically endangered or endangered ecosystem in terms of SANBI's latest NBA (2018). Northern Upper Karoo is one of the most extensive vegetation types in the country and occupies over 40 000km^2 of the interior Karoo. Northern Upper Karoo has not been significantly affected by transformation and is still approximately 96% intact and is classified as Least Threatened.

There are no threated vegetation types or specialised plant communities present within the site. No plant species of conservation concern were observed within the site and overall, the site is considered low sensitivity from a Plant Species Theme perspective.

The project area is located within an Ecological Support Area (ESA) because the planning units that occur within the project area (Unit ID: 5605, 5701, 5702, 5798 and 5895) have the following biodiversity features: Eastern upper Karoo veg type; Northern Cape Upper Karoo veg type; IBA area; NFEPA wetlands and rivers; and FEPA catchment. There are no impacts associated with the development of the Soventix Phase 3 site on terrestrial biodiversity that cannot be mitigated to an acceptable level.

In terms of animal species, the DFFE Screening Tool identified the Phase 3 site as having a low sensitivity. The site verification confirmed the low sensitivity, and it is unlikely that any red-listed fauna are present within the site. Three bat species out of a potential eight species were recorded over the proposed Phase 3 footprint namely: Tadarida aegyptiaca (Egyptian Free-tailed bat), Laephotis capensis (Cape Serotine), and Miniopterus natalensis (Natal Long-fingered bat). All three species are widespread and abundant and are classified as "Least Concern" on the IUCN Red Data List (IUCN 2021) and the Red List of Mammals of Southern Africa, Lesotho and Swaziland.

The project area is within an Important Bird Area (IBA) called Platberg-Karoo Conservancy (unprotected). 84 bird species were observed within and around the Combined Project Area out of an expected total of 104 species, based on previous surveys, the SABAP Pentad analysis and habitat suitability, based Probability of Occurrences. The observed avian species richness and abundance is considered low to moderate for an area of this size in the South African context although the proportion of observations related to SCC was considered high, as was the overall SCC diversity. Many of the birds observed are generally considered to be common, widespread and adaptable species which were observed within their expected habitats. Multiple nests of multiple raptor species were located within the project footprint with two SCC nests located within the combined project are. The Combined Project Area was confirmed to support resident and / or breeding populations of SCC.

Generally, small passerine flight activity was surprisingly low and flight paths mainly low, short and local with very few higher-flying commuting individuals observed. However, observations of medium to larger species, including large flocks of commuting waterfowl and cranes were observed, as were ground congregations of species such as Blue Cranes and Northern Black Korhaan. Abundances of powerline collision-prone species such as Ludwig's Bustard and Kori Bustard were moderate.

Notable Priority Species recorded during walked transects included Blue Cranes, Verreaux's Eagle, Ludwig's Bustards that were often flushed from foraging positions as well as numerous Northern Black Korhaans and Karoo Korhaans. Raptors and korhaans were the most frequently recorded priority species during drive transects.

Blue Cranes were observed throughout the study area but especially in association with drainage lines and artificial water points. Ludwig's Bustards were in frequent in their observations and were mostly observed close to koppies, drainage lines, adjacent to roadsides and in adjacent livestock fields. Larger raptors persisted throughout the survey area but were often congregated near perching habitat (pylons).

Due to the high diversity and density of the above mentioned Red-Listed species recorded during the survey, (including regionally and globally listed Endangered and Vulnerable birds), the region as a whole is considered to be an area of very high avifaunal importance and activities should be managed in a holistic manner at a policy level, prioritising mitigation and monitoring of avifaunal species of conservation concern.

Impacts due to bird mortalities during the operational phase are practically unavoidable for any large facility, but with the appropriate mitigation measures these impacts can be minimised. It is likely that most of the avifaunal populations will be largely displaced from the majority of the project infrastructure, although significant risks are associated with the likelihood of project vehicles flushing birds into fencing infrastructure as well as collisions of large bodied species with powerlines. Although the current overall bird activity qualifies the proposed solar development boundary as a high-density area, there are certain times of the year (and day) when it appears that large flocks of birds (such as cranes bustards and large birds of prey) are far more prevalent.

All the IBA trigger species are predicted to be moderately susceptible to the various impacts of solar-energy facilities, whereas numerous existing and new power lines are considered significant threats to trigger species. There is currently no completely effective mitigation method to prevent collisions. Ludwig's Bustard was listed as globally Endangered on the IUCN Red List in 2010 as a result of potentially unsustainable collision mortality, but there is no evidence for a population decrease over the past 20 years despite extremely high annual power line mortality rates (41% of the Ludwig's Bustard population).

Landscape features and receptors that add to the medium to high levels of local Scenic Quality includes (a) proximity to ridgeline features and areas of prominence (b) neighbours who are sensitive to landscape changes to the existing rural agricultural landscape character, particularly by neighbouring landowners located to the north- and south-east of the development site, and (c) massing effects created by large scale coverage or expanses of solar PV panels in a rural agricultural landscape setting exacerbated by the location of the adjacent Phase 2 development with medium to high levels of Scenic Quality. However, proposed mitigations, specifically 'visual sensitivity' and 'massing' buffers hold the potential to produce a less dominant landscape change and maintain visual quality by visually buffering adjacent land uses/farms along north- and south-eastern property boundary (as these owners have indicated concern regarding the semi-industrial type of development in a deep rural setting).

The project area does not fall within a World Heritage Site or within 10 km of a World Heritage Site according to the PAR. A total of 31 sites were identified during the 2022 assessment in the study and development area (Sites 26-31 are located outside of the proposed development footprint). They included a fairly larger number of open-air Stone Age surface sites (with varying degrees of density), a recent stone kraal and some stone cairns that are most likely associated with an old road.

Although the age, origin and function of this possible old road is not known, it could date to the late 19th/early 20th century, with some cultural material dating to this period found in association (Martini Henry cartridge). This was likely an old wagon road linking farmsteads with each other, as well as these with Hanover and other towns. From this point of view this road and related features (cairns) are relatively significant from a Cultural Heritage point of view and at least should in part be preserved. Stone cairns can be demolished in sections where they cannot be avoided by development actions. The exact age and historical origin should also be researched.

The project area is underlain at depth by potentially fossiliferous continental bedrocks of the Lower Beaufort Group (Karoo Supergroup) of Middle Permian age that have yielded sparse but scientifically important vertebrate remains in the Hanover area as well as commoner petrified wood. Also present are non-fossiliferous dolerite intrusions and Late Caenozoic superficial sediments (e.g., alluvium, surface gravels) which might contain important fossil mammal and other remains as well as reworked fossil wood blocks. "The most likely outcome, based on comparable project areas in the Hanover - De Aar region of the Great Karoo, is that comparatively few scientifically useful fossil sites will be recorded, while No-Go palaeontological areas are very unlikely to be designated. Most Karoo fossil sites are of limited extent and can be effectively mitigated in the pre-construction phase, so palaeontological constraints on the project footprint are not anticipated, although they cannot be completely excluded in advance." Dr. John Almond, NATURA VIVA cc Palaeontological Impact Assessments & Heritage Management, Natural History Education, Tourism, Research Budget Proposal dated 20 January 2022.

Preferred Alternative Site

Based on the findings of the specialist studies and assessment of residual impacts post-mitigation, the proposed project is considered to have an overall Low negative environmental impact and an overall Moderate to High positive impact.

The construction of the proposed solar PV facility and its associated infrastructure will avoid the sensitive environmental features identified during the S&EIR process.

Based on the motivation for the need and desirability of the proposed project, it is concluded that the nature, scale, time and location of the proposed activities are needed and desirable for the proposed site and local communities as well as at provincial and national scale, and that the proposed solar PV facility complements national energy planning, provincial/regional economic development planning and provincial/regional spatial development planning.

Southern Africa is witnessing an increased frequency and intensity in climate change-associated extreme weather events, causing water, food, and energy insecurity. Reduced agricultural production, lack of access to clean water, sanitation, and clean, sustainable energy are the major areas of concern (Mpandeli S., et. al. 2018).

What is clear is that climate change impacts are cross-sectoral and multidimensional, and therefore require cross-sectoral mitigation and adaptation approaches. In this regard, a well-coordinated and integrated WEF nexus approach offers opportunities to build resilient systems, harmonise interventions, and mitigate trade-offs and hence improve sustainability (Mpandeli S., et. al. 2018).

The proposed development involving an 'Agrivoltaic' system can, if supported by sound ecological and water use management strategies (to be incorporated into the EMP), provide the kind of cross-sectoral climate change adaptation opportunity needed to respond to the challenge of climate change on the water-energy-food (WEF) nexus in southern Africa.

The proposed adoption of a symbiotic 'Agrivoltaic' system that combines agriculture, specifically good ecological management (grazing) practices, with green energy generation, simultaneously supports the agricultural and energy industries. Furthermore, diversification by changing the current land-use from Agriculture to an 'Agrivoltaic' system is potentially a powerful climate resilient tool, involving both climate change mitigation and adaption measures, compared with the increased pressures of extensive grazing on a terrestrial ecosystem under more frequent and intense drought periods.

The success of the proposed 'Agrivoltaic' system in building climate change resilience is further facilitated by proposed mitigations to halt and reverse existing degradation from extensive livestock production or other drivers and maintain ecosystem integrity by undertaking detailed soil mapping and veld condition assessments (during the environmental impact assessment) to determine the grazing capacity of the project area so that the landowner doesn't exceed recommended stocking densities thereby ensuring adequate vegetation cover necessary for the maintenance of ecosystem services.

The proposed development of a 400 MW Solar PV Facility, particularly when considered together with Phases 1 and 2 (1 GW in total), will make a significant contribution to our country's power deficit when supply falls behind demand, meeting basic needs and equity that the no-go option cannot achieve. At a local level, the landowner or farmer's livelihood is also protected as the additional income stream from leasing the land to Soventix SA (Pty) Ltd will help offset productivity and sales losses from reduced stocking densities when drought periods dictate lower carrying capacities, whilst ensuring good ecological management and maintenance of ecosystem integrity.

Based on the above considerations, it was concluded that the development of a 400 MW Solar Photovoltaic (PV) facility and associated infrastructure (Phase 3) does not represent a significant risk to the environment nor to the surrounding residents and local community, provided that the relevant best practices and applicable legislation is complied with and that the recommended mitigation measures and monitoring activities are implemented.

No-Go-option

The no-go option would remain agriculture, specifically extensive livestock grazing. Agriculture (mostly 'Karoo' mutton, sheep and wool, with some hunting of small game) forms the backbone of the economy of the Emthanjeni Local Municipality and accounts for the largest labour/employment contributor to date. However, according to the District Municipality's Climate Change Response Plan, it is at risk to drought, less grazing and increased livestock mortality, affecting commercial exports.

If stocking densities aren't reduced to counter the reduced carrying capacity during the predicted increase in drought periods and intensity, then ecosystem degradation, particularly of the ESA, NFEPA wetlands and Strategic Water Source Area, is inevitable.

Extensive Livestock grazing on its own, unless diligently managed, cannot offer the same protection to the land and landowner as that afforded by diversification, in this case the cross-sectoral land-use option of an 'Agrivoltaic' system.

Other opportunity costs for maintaining the status quo include depriving citizens of such socio-economic outcomes as employment opportunities during development (and operation), and much needed green electricity.

Cumulative Environmental Impact Statement

Several other renewable energy developments occur within a 30km radius of the proposed site, which together with the current proposed development, would potentially generate significant cumulative impacts on habitat loss and fragmentation and negative impact on broad-scale ecological processes such as dispersal and climate change resilience.

However, the location of the proposed layout within low sensitivity habitat is seen to reduce the significance of its potential contribution to cumulative impact on the area.

Positive impact associated with project expenditure and the funding of local socio-economic development initiatives would increase to a cumulative positive impact of high significance.

There are a number of existing renewable energy projects (both solar and WEFs) that already have quantified negative impacts on the avifauna community in the region. Therefore, any impacts anticipated from the proposed solar facility will add to these existing impacts and require assessment under a Cumulative Impacts assessment. The current developments within the region raise the possibility of significant cumulative impacts, especially concerning collision risk, habitat loss and fragmentation and loss of suitable habitat for threatened species

The construction of the solar PV facility development and other renewable energy facilities in the area would result in visual Impacts resulting from the presence of the solar PV facility in the landscape and the change in land use. The visual recommendations from the scoping phase reporting were all incorporated into the layout design, accommodating a wide buffer on the adjacent properties, as well as accommodating wide ecological corridors between the four PV blocks.

Overall, and based on the above cumulative environmental impact considerations, it is recommended that the proposed development proceed.

Environmental Management Programme (EMPr)

In order to ensure the effective implementation of the mitigation measures and recommendations made in this EIA report, an EMPr has been compiled and is included in **Appendix F** of this Draft EIA Report. The

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management outcomes included in the EMPr aim to ensure that the project is planned and constructed in an environmentally responsible manner. This EMPr is a working document and the management actions contained in the EMPr should be updated during the lifecycle of the proposed development, under the supervision of an Environmental Control Officer.

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Table 31: A summary of the positive and negative impacts and risks

	Specialist Study	Impacts (positive and negative)
1	Aquatic	Loss of riparian systems and disturbance of the alluvial water courses
		Areas cleared or disturbed around site might be affected by erosion of topsoil
		Disturbing topsoil might result in increased turbidity, as well as siltation in watercourses
		Alien invasive plants: Prevent the cleared areas from degrading, as invasive non-native plants will spread into degraded areas
		Altered surface water flow patterns, e.g., changing sheet flow (natural open system) to concentrated flows leads to erosion
		Inadequate storm water management and soil stabilisation measures might result in increased suspended solids
		Road crossings interfering with surface- or sub-surface flows
		Removal of vegetation and disturbing topsoil by laying underground pipelines at watercourse crossings
		Chemical pollution of the water resources
2	Avi Fauna	Habitat loss and fragmentation due to displacement as a result of infrastructure installation (panels, powerlines, roads, fences and sub surface cables).
		Habitat loss and fragmentation due to displacement as a result of dust effects.
		The destruction or disturbance of bird roosts during the construction phase.
		Disturbance (including of nesting SCC) due to noise such as, machinery movements and maintenance operations during the construction phase the proposed PV solar farm.
		Bird mortalities during the operational phase due to vehicle collisions, collisions with infrastructure and/or combustion.
		Loss of Bird Foraging Habitat.

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		Bird mortalities during the operational phase due to the addition of grazing sheep to the footprint which may attract raptor SCC who may scavenge on dead lambs/ adult sheep or prey upon livestock.
		Disruption of bird migratory pathways during the operational phase.
		The attraction of some novel bird species due to the development of a solar farm with associated infrastructure such as lake effect perches, nest and shade opportunities.
		Chemicals being used to keep the PV panels clean from dust (suppressants) etc. could contaminate the ecosystem.
		Cumulative impact of the project and other projects in the area concerning collision risk, habitat loss and fragmentation and loss of suitable habitat for threatened species.
3	Terrestrial Biodiversity	Clearing of vegetation.
		Disturbance/loss of faunal species especially reptiles and other vulnerable species during vegetation clearing and other construction activities.
		Damage to sensitive environmental areas by machinery and staff.
		Fauna may fall in exposed holes and become trapped.
		Fencing can cause death/injury to fauna particularly tortoises.
		Impacts on Ecological Support Areas (ESAs) and general ecological processes within the site.
		Collision of traffic with fauna crossing roads etc.
		Animals could gain access to waste receptacles.
		Roadkill, electrocutions of fauna during construction and post-construction.
		Disturbance can favour the recruitment of pioneer species and alien invasive plants, threatening habitats and alter the composition, structure and functioning of ecosystems.
		Cumulative habitat loss, the ability to meet conservation targets and impact on broad-scale ecological processes.
		Direct loss of terrestrial plants from the development footprint.
		Construction activities could result in increased soil erosion due to vegetation clearing.

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		Revegetation may not be sufficient to bind and protect the topsoil from erosion.
4	Grazing Potential	Reduced grazing carrying capacity and loss in agricultural potential or production
		Landscape degradation from under grazing
		Landscape degradation from overgrazing
		Erosion and desertification
5	Soil	Shading effect of the proposed solar panels will increase soil moisture content and therefore improve the vegetation cover underneath the solar panels (POSITIVE)
		Potential enhanced soil erosion
		The Swartland and Valsrivier soils may also have an influence on any foundations
		The shallow soils may present a challenge for some construction items like poles that need to be planted.
		Overgrazing negatively impacts on veld condition
		Clearing of vegetation can cause sediment load in the water courses before the cleared areas can be stabilized.
		The clayey soils and most noticeably the Swartland and Valsrivier soils may restrict vehicle movement during the wet season
6	Geotechnical	No fatal flaws requiring relocation or re-alignment of proposed locations (POSITIVE)
		The usage of poor-quality aggregate is unsafe and will increase the costs of maintenance.
		Commercially available sources of concrete aggregate may prove to be too distant.
		Fly rock from blasting.
		Noise and dust generation.
		Oil spills can contaminate topsoil.
		A new quarry will transform the local habitat.
		Access roads crossing a drainage channel will be subject to submerged conditions from time to time.

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		Poor foundation conditions or ineffective support will cause the solar panel structures to overturn.
7	Cultural Heritage	Disturbance to or destruction of Stone Age open-air surface scatters
		Disturbance to or destruction of Stone Cairns indicating an old Wagon Road
		Damage to previously unknown or invisible sites, features or material heritage artifacts/gravesites
8	Hydrology	Potential run-off and stormwater discharge from the site into the surrounding causing soil erosion and sedimentation
		Disturbance, including pollution, of vadose zone during excavations activities, contractor laydown areas.
		Hydrocarbon (fuel or oil) spills will contaminate the soil, surface water run-off and possibly seepage.
		Alteration of natural drainage lines may lead to ponding or increased runoff.
9	Geo-Hydrology	Leakages from construction and contractor vehicles accessing the site may cause soil pollution.
		Dewatering of the aquifer via groundwater boreholes (only if overproduced).
		Sedimentation runoff from areas where no stormwater management measures are implemented; or where vegetation is not maintained.
		Scaling in piping or on solar panels if borehole water is applied and left to evaporate (high salt content).
10	Palaeontology	Earthmoving activities could damage or destroy artefacts.
		The loss of a heritage resources undermines the understanding of previous generations that is vital to creating a sense of unity, belonging, and even pride among South Africans.
11	Visual	National energy objectives for renewable energy and job creation will be met (POSITIVE)
		Neighbours who are sensitive to landscape change; receptor sensitivity to the landscape changes to the existing rural agricultural landscape character, particularly by neighbouring landowners located to the north- and south-east of the development site.
		Proximity to ridgeline features and areas of prominence that add to the medium to high levels of local Scenic Quality.
		Loss of landscape character.

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		Massing effects would degrade local landscape resources.
		Cumulative impacts are caused mainly by multiple power lines being routed adjacent to each other, or converging on a specific area, resulting in a massing effect and subsequent landscape degradation.
		Light pollution and glare.
		Energy wastage.
		Dust generation.
		Wind-blown litter.
		Soil erosion.
12	Bats	The change in the microclimate between and beneath the solar panels may provide different ecological conditions which may encourage or provide suitable conditions for botanical diversity and thus in turn may positively influence and possibly increase bat foraging activity (POSITIVE)
		If bat roosting sites were not considered in the assessments of the nearby solar PV facilities, bats could be displaced and may impact on occupied roosting sites and or encourage bats to use anthropogenic structures as alternative roosting sites which could lead to human-wildlife conflict.
		If the main seasonal water resources/drainage lines were not protected in the other facilities, inter- and intra-specific competition could occur at neighbouring existing ephemeral water resources.
		Removal of vegetation and disruption to the ephemeral watercourse.
		Navigation and/or commuting routes could be negatively impacted or altered if landscape features such as ridges are developed or removed for the solar PV facilities.
		Decrease in species composition, activity and abundance.
		Light pollution could alter species composition, foraging patterns and predation rate of bats.
		Possible bat fatalities incurred from collisions with infrastructure associated with the solar PV facility including solar arrays, security fencing, transmission lines, and buildings.
		Cumulative impact of nearby solar PV facilities on regional bat populations.
13	Social	Businesses and contractors that can supply goods and services to the project will be utilized (POSITIVE)

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		Job creation (POSITIVE)
		Renewable energy generation that will feed into the national electricity grid (POSITIVE)
		Cumulative social impacts as it relates to social ills such as increases in crimes, theft, HIV rates, unemployment levels, alcohol and drug abuse, gambling, fighting etc. due to the presence of people from outside the area.
		Decrease in the “sense of place” as it relates to noise, visual and light pollution.
		Indirect economic opportunities for local entrepreneurs, opportunities include transport, fencing, road maintenance, accommodation, meals, and laundry services. These economic benefits may not be achieved by local residents/service providers.
		Workers on site may be at risk to stray bullets or hunting accidents from neighbouring game farms.
		During the clearing of the site this may pose a risk to the workers and during the operation there may also be snake encounters.
		Damage to farm infrastructure.
		Increases in stock theft and other crimes.
		Farm gates being left open, or not being closed properly by construction teams.
		Poaching.
		Large antelope can get trapped inside the fenced area and smaller animals such as tortoises could get trapped along the fence line.
		Change of land use and livelihoods.
		Decrease in property values.
		Stakeholders are concerned about the quality of the roads, increases in traffic and traffic safety.
		There is a level of uncertainty amongst the directly affected landowners with regards to timelines for the project.
		There is an expectation from the affected communities and municipalities that the project will result in similar benefits and opportunities as other existing renewable projects in the area.

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14	Traffic	Decrease in condition of gravel roads.
		Dust and noise generation.
		Potential congestion and delays on the surrounding road network.
		Potential impact on traffic safety and increase in accidents with other vehicles or animals.
		Traffic accidents at primary access location off the N10.
		Haulage of imported materials incur a cost relating to distance travelled and time.
		Transport of abnormal roads could be delayed.

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SECTION M: IMPACT MANAGEMENT OBJECTIVES AND IMPACT MANAGEMENT OUTCOMES (EMPR).

3(1) A EIA report… must include –

(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

Please refer to the Impact Assessment (**Appendix D**) and EMPr(s) (**Appendix F**) for a full list of proposed management outcomes.

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Proposed Impact Management Outcomes included in the EMPr

Phase	Proposed Management Outcome
Planning and Design	Optimising generational efficiency whilst simultaneously improving the economic feasibility of the project as well as the social and ecological integrity of the local community and ecosystem that supports it, or at the very least without compromising either aspect.
	Minimise the risk of erosion on dispersive soils.
	Maintain the quantity of groundwater available for construction and operation without compromising the ecological reserve and other water users of the same aquifer.
	Reduce deterioration in water quality due to increased salt concentrations in dams, wetlands and soil/plant systems from enhanced evaporation.
	Minimise negative health impacts (and mortality) on livestock due to decreases in rainfall and reduction in herbage yields.
	Preserve the agricultural potential and maintain or improve the agricultural productivity of the land.
	Minimise dust generation.
	Minimise the effects of artificial light on wildlife (and humans).
	Fragmentation must be limited by the exclusion of 'High' sensitive habitats from the perimeter fenceline and the preservation of ecological corridors connecting these 'High' sensitive habitats.
	Preservation of heritage resources and expansion of knowledge of the archaeology of the area.
	The conservation of the natural vegetation, seasonal resources (such as the aquatic system), rocky outcrops and ecosystem functionality.
	Maintain optimum generation capacity of solar modules.
	Good road conditions.
	Preserve stream or river channel hydrological pattern.
	Required permits/authorisations/licenses are obtained.

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	Maintain visual quality by visually buffering adjacent land uses/farms along north- and south-eastern property boundary.
Pre-construction	Avoid the unnecessary loss of or harm to terrestrial plants, particularly protected or threatened plants.
	Minimal noise generated by traffic.
	Minimise risk of congestion and delays to local farmers.
	Clarity/transparency on project outcomes with landowners/stakeholders.
	Build and maintain trusting relationships with affected landowners/stakeholders.
	Zero traffic safety incidents.
	Continuous bat monitoring for one year during pre-construction will provide much needed insight into the changes in bat activity, species composition and ecology over the affected property (passive recording monitoring system).
Construction	Ensure least impact on animal behaviour.
	Avoid the unnecessary loss of or harm to terrestrial/aquatic plants, particularly protected or threatened plants.
	Minimise water usage during construction to avoid depleting the underground aquifer/Minimize the impact of borehole abstraction on the groundwater reserve.
	Adopt an Integrated Pest Management (IPM) approach to avoid the use of chemical pesticides and minimize risks to human health and the environment while maintaining economically viable management.
	Reduce sedimentation of watercourses and erosion.
	Reduce invasive alien plant recruitment.
	Avoid spillage onto soil or into water while mixing or using chemicals.
	Prevent contamination of ecologically sensitive environments.
	To ensure the safe exit of Single-Unit Trucks (SU) and especially Single-Unit Truck plus Trailers (SU+T) at the junction of the N10 with the existing Burgerville (District) Road.
	Continuous bat monitoring for one year during construction will provide much needed insight into the changes in bat activity, species composition and ecology over the affected property. Should it be found that the

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	construction phase extends beyond a year, the monitoring period can be reduced to the spring/summer months (passive recording monitoring system).
	Implement the surface and groundwater monitoring protocol during construction.
	Good waste management
Post-construction	Restoration of ecological functioning or ecosystem services.
	Restoration of provisioning services, particularly food or grazing for livestock, and regulating services such as erosion control.
	Reinstate the 'riparian' habitat.
	Preserve stream or river channel hydrological pattern.
	Surface water monitoring bi-annually for up to 2 years after the completion of development.
	Retain aesthetic values and sense of place or restore ecosystem cultural services.
	Improve surface water infiltration and minimise erosion.
	Restoration of ecological functioning/ecosystem services/biodiversity pattern.
	Achieve good to excellent veld condition classes.
	Ecological restoration to improve climate change resilience and increase the production potential for improved grazing capacity.
	A record of veld condition and grazing capacity under different rainfall conditions.
	Good rangeland management
	Continuous bat monitoring for two years during operation will provide much needed insight into the changes in bat activity, species composition and ecology over the affected property (passive recording monitoring system).
	Implement the groundwater monitoring protocol during operation. Permanent monthly monitoring of abstraction rates and an annual hydrocensus is to be undertaken.
	Faunal mortalities are reduced.

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	Cumulative impacts regarding avifauna are monitored during post construction of the facility.

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Proposed Impact Management Outcomes for inclusion as conditions of authorisation

Based on the assessment and recommendations from the various specialist reports, the following impact management outcomes for the development are proposed for inclusion as conditions of authorisation:

a. Permanent monthly monitoring of groundwater abstraction rates and an annual hydrocensus is to be undertaken.

b. Surface water monitoring bi-annually for up to 2 years after the completion of development.

c. Continuous bat monitoring (passive recording monitoring system) for one year during pre-construction and construction. Should it be found that the construction phase extends beyond a year, the monitoring period can be reduced to the spring/summer months. Continuous bat monitoring for two years during operation (passive recording monitoring system).

d. Ecological restoration to improve climate change resilience and increase the production potential for improved grazing capacity.

e. Good rangeland management. A record of veld condition and grazing capacity under different rainfall conditions.

f. Retain aesthetic values and sense of place or restore ecosystem cultural services.

g. Build and maintain trusting relationships with affected landowners/stakeholders.

h. Maintain visual quality by visually buffering adjacent land uses/farms along north- and south-eastern property boundary.

i. Fragmentation must be limited by the exclusion of 'High' sensitive habitats from the perimeter fence line and the preservation of ecological corridors connecting these 'High' sensitive habitats.

j. Formal post construction avifauna monitoring must be applied once the development has been activated, as per the most recent edition of the best practice guidelines (Jenkins et al. 2017).

k. An EMPr for the Operational Phase must be created and be updated every three years in order to revaluate the effectiveness of the mitigations.

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SECTION N: FINAL PROPOSED ALTERNATIVES AND MITIGATION MEASURES.

3(1) A EIA report… must include –

(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

Please refer to the Impact Assessment (**Appendix D**) and EMPr (**Appendix F**).

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SECTION O: CONDITIONAL FINDINGS OF EAP AND SPECIALISTS

3(1) A EIA report… must include –

(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

Please refer to the Impact Assessment (**Appendix D**), Specialist Studies (**Appendix E**) and EMPr (**Appendix F**).

Aspects to be included as conditions of authorisation

The following aspects are recommended to be included as conditions of authorisation based on the findings of the EAP and the specialists reports:

1. The holder of the authorisation must appoint an experienced independent Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations referred to in this environmental authorisation are implemented and to ensure compliance with the provisions of the approved EMPr.
2. The authorisation is valid for 10 years and there should be no restriction on commencement of construction.
3. If the project is launched 5 years after the authorisation is granted there should be a review of the EA and EMPr against all legislation, technology and renewable energy best practice.
4. The adoption of a symbiotic ‘Agrivoltaic’ system that combines agriculture, specifically good ecological management (grazing) practices and green energy.
5. The maintenance and monitoring of vegetation cover through ecologically sustainable grazing management practices and veld condition assessments.
6. Commencement with construction, specifically civil works may only take place after the peak monthly rainfall and run-off period (from January to April), and preferably during the winter months (e.g., June to September) when there is a decreased probability of storm events. Civils works should as far as is practical be completed before the next rainfall season. Timing of construction to May, June, July and August in order to avoid breeding periods of species within the sensitive drainage lines, wetlands and the general region is also recommended.
7. Maintain visual quality by visually buffering adjacent land uses/farms along north- and south-eastern property boundary.
8. Maintain ecological integrity by the exclusion of 'High' sensitive habitats from the perimeter fence line and the preservation of ecological corridors connecting these 'High' sensitive habitats.

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SECTION P: ASSUMPTIONS AND UNCERTAINTIES

3(1) A EIA report… must include –

(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

Please refer to the Impact Assessment in **Appendix D** and Specialist Studies in **Appendix E.**

Assumptions and limitations

The renewable energy sector, particularly at a commercial scale, is a relatively young but rapidly expanding industry. This rapid expansion, combined with the diversity of applications in terms of technology, design and different socio-ecological contexts has created a gap in research relating to impacts on local biodiversity. It is critical, therefore, that the construction and post-construction monitoring programmes based on the assessment and specialist reports, are not just implemented, but used by the holder of the authorisation to inform and adapt ongoing management of the facility to synergise its operations with ecosystem processes, pathways, and patterns (that is, create a joint effect greater than the sum of both agents).

<u>Water Use</u>

Estimated Yields

There are two existing boreholes in the study area; Borehole No. 4 or BH4 (30°49'43.62"S and 24°20'55.07"E) is located on the Remainder of Farm Goede Hoop 26C. and Borehole No. 5 or BH5 (30°49'30.17"S and 24°22'5.58"E) is located on Portion 3 of Farm Goede Hoop 26C. The sustainable abstraction yields, based on the recommended abstraction rate of 8 hrs pumping per day, are 6,58 l/s (or **189,5 m^3/day**) and 5,11 l/s (or **147,17 m^3/day**) for BH4 and BH5, respectively (Geohydrological Assessment Report (Final Rev 3), prepared by GCS Water and Environmental Consultants, dated 10th August 2022, GCS Project Number: 22-0401). Consequently, the combined sustainable abstraction yields for both properties is **336,67 m^3/day**.

A third borehole is proposed within proximity to the construction camp/operational area (PV Block 4) to reduce the cost (and impacts) of transferring or transporting water from Boreholes No. 4 and 5 to the said area for potable usage (e.g., kitchen and ablutions). A third borehole could also supplement the supply of water from Boreholes No. 4 and 5 for dust suppression, and if equipped with the correct water purification system (e.g., a deionisation plant), for washing solar panels in the adjacent blocks. Two potential sites have been identified on the Remainder of Farm Goede Hoop 26C; T1 (30°51'3.60"S and 24°21'26.89"E) and T2 (30°51'5.04"S and 24°21'28.30"E).

Estimated Water Demand

<u>Construction</u>

Excluding dust control, it is estimated that approximately **22,05 m^3/day** of groundwater shall be required during construction for mixing concrete (**5,8 m^3/day**) and potable usage (**16,25 m^3/day**) but dust control (suppression) along principal access roads would require an additional **674,4 m^3 per spraying**. The use of certain environmentally friendly soil binders can, however, reduce water consumption per spraying to **168,6 m^3**.

If dust control is required daily on areas with continuous traffic, then the total daily demand for water during the construction phase is estimated to be **190,65 m^3**. <u>The permissible groundwater abstraction rate (in terms of the</u>

GA) for both properties combined (**216 m³/day**) will therefore be sufficient to meet the estimated demand for water during construction.

Furthermore, based on the pump test data generated from both boreholes (**336,67 m³/day**), BH4 and BH5 will be able to meet the estimated demand.

Dust control (suppression)

It is assumed that the two-track roads in between the solar panel arrays and the firebreak road will not contribute significantly to dust by maintaining the native vegetation in the middle 'mannetjie'. The principal sources of dust have been identified as those graded/cleared roads that will be used regularly to access key areas during construction, including:

(a) The access road from N10 to the main entrance (and construction camp/laydown area/operational area) of Phase 3, including the servitude road under the Eskom 132 kV powerline (**18,5 km**);

(b) An access road along the length of the proposed 132 kV distribution line from the on-site substation on Phase 3 to the on-site substation on Phase 2 (**2,3 km**);

(c) Three access roads linking the two areas separated by a watercourse (**3,8 km**) via three existing road crossings (NW Boundary 0,5 km, Middle of Property 0,5 km and SE boundary 3,8 km). However, considering these areas are likely to be built in sequential phases only one crossing (with the greatest length of access road) will be included in the calculation for dust control: 3,8 km.; and

(d) Access roads to the field transformers (**3,5 km**). The access roads to the field transformers are assumed to be aligned perpendicular (north-south) to the alignment (west-east) of the solar arrays or racks. Preliminary investigations propose three separate PV block systems (to avoid ecologically sensitive areas). PV Block 1 is approximately 2 250 m wide (east-west) at its widest point, PV Block 2 is approximately 2 000 m wide (east-west) at its widest point, and PV Block 3 is approximately 1 500 m wide (east-west) at its widest point. Assuming that a field transformer is located every 5 000 m (1 rack is 25,3 m long and generates 0,0253 MW, 5 inverters per MW and 25 inverters (or 5MW) per field transformer), no more than one or two access roads may be required for each block. Given the maximum 'depth' (north-south distance) of each PV Block (PV Block is ± 1 750 m, PV Block 2 is 1 250 m and PV Block 3 is 1 500 m), the longest access roads for Blocks 1, 2 and 3 are 1 750 m, 1 250 m and 1 500 m, respectively. Therefore, the total length for two access roads to the field transformers should not exceed 3 500 m for PV Block 1, 2 500 m for PV Block 2, and 3 000 m for PV Block 3. However, considering these blocks are likely to be built in sequential phases only one PV Block (with the greatest length of access road) will be included in the calculation for dust control: 3,5 km.

In total, dust control will be required on an estimated 28,1 km of 5 to 6 m-wide dirt road, covering a surface area of 168 600 m².

Outdoor dust control operations in typically dry areas require "about four litres of water on every square meter, every day." Applying this formula, a road roughly 28,1 km long and 6 m wide would require the use of roughly 674 400 L or **674,4 m³** of water for every spraying (https://blog.midwestind.com/water-is-a-poor-dust-control-method/).

Using water as a form of dust control is an ineffective, wasteful, and short-term solution. Regular, light watering is better than infrequent, heavy watering. However, alternative dust control products or palliatives are recommended. Another effective mitigation is to reduce speed to 30 km/hr, good

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road drainage (maintenance), and restricting the width of the dirt road (e.g., preferably 5 m, but not wider than 6 m).

Some environmentally friendly soil binders, such as Roadtech™ can reduce water use to less than 1000ml of water per sqm. Roads with continuous daily traffic would still need to maintained daily (pers. comm. Willem Schaap, FlowCentric Mining Technology (flowcentric-mining.com)). If the same or a similar binding agent is used, then water consumption per spraying can be reduced to **168,6 m^3**.

Mixing Concrete

Most if not all concrete mixing will take place during the initial civil construction phase (pers. comm. JP De Villiers, Managing Director, Soventix), including such construction items as:

(a) Fencing (**190,6 m^3**),

(b) Road culvert crossings (n=6) (**2 700 m^3**),

(c) Field transformers (**540 m^3**).

(d) On-site substation (**45 m^3**),

(e) Pylon footings (**648 m^3**), and

(f) Operational offices (**60 m^3**).

TOTAL: 4 183,6 m^3

The total expected volume of water required for mixing concrete assumes an upper limit of 250 L/m^3 (Conservative average is usually approximately 150 L/m^3). In conclusion the total estimated volume of water required for mixing 4 183,6 m^3 of concrete is 1 045 900 L or 1 045, 9 m^3 (250 L × 4 183,6 m^3).

Considering concrete mixing will be largely confined to the 6-month civil construction phase, I'll divide the total 1 046 m^3 by 180 (6 months × 30 days = 180 days) to arrive at **5,8 m^3 of water per day**.

(a) Fencing

Fragmentation of the aquatic ecosystem will be reduced by fencing two separate areas north and south of the watercourse. The perimeter of each area is assumed to be 9 500 m. The amount of concrete foundation required for 1 straining post (600x400x400 mm) and 2 stay posts (2x400x400x600 mm) for the first 30 m of fence line is 0,6 m^3. Thereafter every 30 m requires an additional 0,3 m^3 for the next straining post and two stay posts. So, 9 500 m – 30 m = 9 470 m ÷ 30 m = 315,7

Each fenced area requires 0,6 m^3 + 0,3(315,7) m^3 = 95,3 m^3 of concrete.

Both areas will require **190,6 m^3** of concrete.

(b) Road culvert crossings (n=6)

Based on previous experience, a Low-level Rubble Masonry Concrete (RMC) Culvert Crossing with indicator blocks above a reinforced concrete slab used 450 m^3 of concrete. The length of the entire crossing was 183 m, the bridge deck width was 3,66 m and the bridge height to deck level was 1,4 m.

Considering the 6 proposed road crossings range from 185 m to 245 m and will comprise a similar design, e.g., low-level culvert crossings, I have assumed the same quantity of concrete.

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Six road crossings will therefore require **2 700 m^3** (6 crossings × 450 m^3) of concrete.

(c) Field transformers

Regarding the field transformers, the larger units will most likely be used thereby reducing the quantity to 45 units. Each unit requiring approximately 12 m^3 of concrete (pers. comm. JP De Villiers, Managing Director, Soventix). Total concrete required for all field transformers will therefore be **540 m^3**.

(d) On-site substation

The on-site substation would be approximately **45 m^3** of concrete (pers. comm. JP De Villiers, Managing Director, Soventix).

(e) Pylon footings

Around 8 m^3 of concrete will be required per pylon, and 132 kV pylons are typically 100 m apart (pers. comm. JP De Villiers, Managing Director, Soventix). We have assumed a maximum length for the distribution line of 8 km. This would require up to 81 pylons or **648 m^3** of concrete.

(f) Operational offices

The operational building will require around **60 m^3** of concrete (pers. comm. JP De Villiers, Managing Director, Soventix).

Potable usage (construction – toilets, drinking)

The National Norms and Standards for Domestic Water and Sanitation (Government Gazette No. 411011, 08th September 2017) refers:

- Free basic water supply is affordable ongoing services to at least the basic volume of water for indigent households, e.g., the provision of a minimum of 25 litres of potable water per person per day, or as prescribed by the Minister responsible for water supply.

Consequently, the demand for potable water during construction (no accommodation shall be provided on site), shall be estimated using 25 l/p/day.

Assuming 650 construction staff during peak construction (pers. comm JP De Villiers, Managing Director, Soventix), and the provision of 25 litres of potable water per person per day, the estimated demand shall be 16 250 L/day or **16,25 m^3/day** during peak construction.

The use of on-site supplementary water sources such as grey water could reduce the Average Annual Daily Demand (AADD) requirement from the borehole water supply system (underground aquifer). The potential reduction in AADD to be supplied by the underground aquifer depends on the extent that such measures can be implemented for construction demand (**Table 32**).

Table 32: Breakdown of assumed construction water use and the potential for supplementary water use.

Construction			
Type of usage	Activity	Supplementary water use	
		Potential	Source

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Non-potable usage	dust control/suppression (regular and extensive)	✓	Excess 'unrecycled' grey water from the NEWGen100 flush toilet sewage treatment system.
	mixing concrete	✓	*Wastewater generated by the washing of the concrete mixer trucks and/or in the production of concrete.
Potable usage	Toilet flushing	✓	NEWGen100 treats and recycles >99% of the flush toilet sewage for re-use in the toilets.
	Taps/basins • Hand washing • Drinking • Preparing food • Washing dishes	✗	

The Sewerage flow contribution as a percentage of Average Annual Daily Demand (AADD) for business, commercial, industrial land use categories is 80% (DHS Redbook, Section K, Table K.4).

> DHS Redbook, Section K, Sanitation, The Neighbourhood Planning and Design Guide, Part II, Planning and design guidelines, developed by Department of Human Settlements, published by the South African Government ISBN: 978-0-6399283-2-6, version 1.1, printed January 2019.

Consequently, assuming the estimated demand shall be **16,25 m^3/day** during construction (650 staff and the provision of 25 litres of potable water per person per day), **13 m^3/day** of treated effluent would normally be available for supplementing construction demand. However, the NewGen100 is a self-contained system that treats and recycles >99% of the flush toilet sewage for re-use in the toilets. Therefore, only a minimal portion of 'unrecycled' treated effluent synonymous with the inputs from all internal (containerised toilet blocks) and external (staff welfare area or kitchens) taps/basins will be available for supplementing dust control.

> *Botton, Julia & Lucas, Lindomar & Gheller, Rafael & Mello, Josiane & Dalconton, Francieli & Onofre, Sideney. (2018). Reuse of the Concrete Mixer Truck Wash Water in the Production of Concrete - A Clean Production Proposal. International Journal of Advanced Engineering Research and Science. 5. 4-10. 10.22161/ijaers.5.3.2
>
> **Abstract**
>
> Concrete is a material used on a large scale in civil construction. In concrete plants, it is manufactured by concrete mixer trucks and this process consumes a large quantity of drinking water. In addition to the production of concrete, the water used to wash the concrete mixer trucks should also be considered, since this also generates a considerable amount of residual water that cannot be disposed of without prior treatment. As such, the objective of this study is to **reuse the wastewater generated by the washing of the mixer trucks in the production of concrete, thus avoiding the consumption of drinking water, considering that the reuse of this wastewater**

doesn't require chemical treatment. Three compositions were developed: A reference composition produced with drinking water; a composition with 50% drinking water and 50% residual water; and a composition with 100% of residual water. To analyze the concrete, its properties were checked in the fresh and the hardened state, assessing the workability through the slump test and its compressive strength at 14 days and 28 days. In total, 9 test specimens were moulded in accordance with age, which meant 3 specimens per composition. The results showed that the concrete produced with the residual water presented the same compression strength as the concrete that used drinking water. It is estimated that a replacement of up to 50% should be used, since the composition containing 50% of residual water showed the greatest gains in strength in relation to the other compositions.

Mitigation: Any residual water in the Rady Mix Concrete (RMC) or other concrete waste can be re-used by replacing domestic water for making new mortar or concrete. It is estimated that a replacement of up to 50% should be used to achieve the greatest gains in strength in relation to either 100% domestic water or 100% residual water.

Operation

It is estimated that approximately **13,4 m^3/day** of groundwater shall be required during operation for potable usage (**5,5 m^3/day**), washing the modules (**4,5 m^3 per day**), and livestock watering for the sheep (**3,4 m^3/day**).

However, dust suppression during operation along the main access road from the N10 would require an additional **444 m^3** per spraying. The use of certain environmentally friendly soil binders can reduce water consumption per spraying to **111 m^3**. On areas with less or no traffic at all, the application rate for maintenance purposes would be around twice a month but should be managed (pers. comm. Willem Schaap, FlowCentric Mining Technology (flowcentric-mining.com)). So, 8 km of 5 to 6 m-wide internal access roads (48 000 m^2 - excluding two-track roads), may require an additional **48 m^3** of solution (water dosed with binding agent) every two weeks.

If dust control is required daily on areas with continuous traffic, then the total daily demand for water during the operation phase is estimated to be **124,4 m^3**. The permissible groundwater abstraction rate (in terms of the GA) for both properties combined is **216 m^3/day**, but **150 m^3/day** should be sufficient to meet the estimated demand for water during operation.

Furthermore, based on the pump test data generated from both boreholes (**336,67 m^3/day**), BH4 and BH5 will be able to meet the estimated demand.

The frequency of spraying for dust suppression purposes can be reduced during operation by providing employees with a prearranged taxi or bus charter service. Additionally, a maximum volume of 30 m^3 of treated and disinfected effluent from the Biorock treatment system would be available at any one time (notwithstanding the 4 to 6 days it would take to refill all three empty tanks).

Potable usage (operation - toilets, showering, washing food and dishes, and drinking water)

The National Norms and Standards for Domestic Water and Sanitation (Government Gazette No. 411011, 08th September 2017) refers:

- Basic plus water - A volume of 25 litres up to 50 litres of potable water per person per day shall be made available to a household.

However, according to the Department of Human Settlements Redbook, typical residential Average Annual Daily Demand (AADD) per capita for “House connection/Residential” is 230 L/c/d and “House connection/Flats” is 150 L/c/d (DHS Redbook, Section J, Table J.3). AADD unit demands

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for the special land use category, "Factories" is 100L per worker (DHS Redbook, Section J, Table J.4).

DHS Redbook, Section J, Water Supply, The Neighbourhood Planning and Design Guide, Part II, Planning and design guidelines, developed by Department of Human Settlements, published by the South African Government ISBN: 978-0-6399283-2-6, version 1.1, printed July 2019.

Consequently, the demand for potable water during operation (domestic uses) shall be estimated using 100 l/day.

Assuming 55 staff during operation (pers. comm JP De Villiers, Managing Director, Soventix), and the provision of 100 litres of potable water per person per day, the estimated demand shall be 5 500 L/day or **5,5 m^3/day** during operation (domestic uses).

Washing solar modules (or panels)

Assuming 0,5 L of freshwater to clean 1 module (2,42 m^2) per wash cycle, and 2 070 modules per MW (pers. comm JP De Villiers, Managing Director, Soventix), 1 035 L or 1,035 m^3 of freshwater will be required to clean 1 MW, 103,5 m^3 to clean 100 MW and 414 m^3 to clean 400 MW per wash cycle.

So, more than four hundred cubic metres (414 m^3) of water will be required to clean all 400 MW or approximately 2 003 760 m^2 or 200,38 ha of solar panels. The water must be 'cleaned' or deionized so that there won't be any white streaks on the glass. Traditionally solar panels need to be watered 4 times each year or every 3 months (pers. comm JP De Villiers, Managing Director, Soventix). High pressure could damage the modules, so they are cleaned using a special soft bristle broom, where water is fed through the shaft and out through the bristles. However, if the dust is removed from the solar panels using compressed air, then the frequency of watering the panels can be reduced to 2 times each year or every 6 months (pers. comm JP De Villiers, Managing Director, Soventix).

Four wash cycles per year (every 3 months) will need 1 656 m^3 per year or **4,5 m^3 per day**.

- It is permissible to abstract 4,5 m^3 groundwater per day in terms of the GA (the upper limit for both properties is **216 m^3 per day**), and achievable given the estimated yield of each borehole is 25,25 m^3/day. Consequently, only one borehole would be needed to meet the demand from four wash cycles per year (every 3 months).
- A 10 000 L or 10 m^3 vertical water storage tank weighs 180 kg and is 2,2 m (dm) by 3 m (height) (https://www.rototank.co.za/products/water-tank/); the surface area is 3,8 m^2 ($A=3,14r^2$). Ten tanks will be installed at each borehole. Ten tanks with a combined surface area of at least 48,4 m^2 (2,2 m by 2,2 m X 10) would have a total storage capacity of 100 m^3. Although five (n=5) tanks will be used for storing dirty water (groundwater before being deionized) and five (n=5) tanks will be for clean water (deionized groundwater), the clean water is replenished as soon as it is drawn off. Consequently, the maximum available volume of stored groundwater on any given day remains 100 m^3 (or roughly 4 days of drawing 25,25 m^3 per day with the wind pump).
- The rate at which the modules can be cleaned (or the rate of water usage) will be limited by the estimated yield of each borehole (25,25 m^3 per day) and the available storage capacity (not more than 100 m^3). If 414 m^3 is required for each 400 MW wash cycle, then 16,4 consecutive days or roughly 2 weeks (of drawing 25,25 m^3 per day) from one borehole will be needed to supply the water, wind permitting. Alternatively, three boreholes drawing 75,75 m^3

per day would require 1 week to wash all panels. If the available storage from 3 boreholes (300 m^3) is considered, then washing can be completed within 3 days.

Two wash cycles per year (every 6 months) will need 828 m^3 per year or **2,3 m^3 per day**.

- It is permissible to abstract 2,3 m^3 groundwater per day in terms of the GA (the upper limit for both properties is **216 m^3 per day**), and achievable given the estimated yield from each borehole (25,25 m^3/day). Consequently, only one borehole would be needed to meet the demand from two wash cycles per year (every 6 months).
- The rate at which the modules can be cleaned (or the rate of water usage) will be limited by the estimated yield of each borehole (25,25 m^3 per day) and the available storage capacity (not more than 100 m^3). If 414 m^3 is required for each 400 MW wash cycle, then 16,4 consecutive days or roughly 2 weeks (of drawing 25,25 m^3 per day) from one borehole will be needed to supply the water, wind permitting. Alternatively, three boreholes drawing 75,75 m^3 per day would require 1 week to wash all panels. If the available storage from 3 boreholes (300 m^3) is considered, then washing can be completed within 3 days.

Consumption of water by sheep (Luke, G J., 1987. Consumption of water by livestock. Department of Primary Industries and Regional Development, Western Australia, Perth. Report 60.)

A set of standard conditions have been defined for the concept of a dry sheep equivalent (D.S.E.). A D.S.E. is defined as a sheep which is:

1. non lactating,
2. with a liveweight of 45 kg,
3. in forward store condition (livestock market reporting condition score 3),
4. grazing a maintenance diet of sub clover-based pasture/ or something similar, and
5. drinking relatively fresh water (< 1,000 mg/L T.S.S.).

The relationship between drinking rate and average maximum daily temperature can be described by the equation: DR = 0.191183T - 2.88245

DR = Drinking Rate (L/day) and T = Average maximum daily temperature (°C)

The mean daily maximum temperature during the hottest months in the study area (January and February) is 31 ºC but ranges up to 36ºC (Hydrology Assessment). Consequently, the DR in January or February = 0.191183(36) - 2.88245 = **4 L/day**

The mean daily maximum temperature during April is 24 ºC but ranges up to 29ºC (Hydrology Assessment). Consequently, the DR in April = 0.191183(29) - 2.88245 = **2,7 L/day**

Deviations from the standard conditions upon which the model is based will result in changes to the average daily water requirement:

- At maturity the average Dohne Merino ram weighs 80 to 100 kg and the ewe approximately 50 to 65 kg (http://safariostrich.co.za/2017/05/the-dohne-merino-sheep/). It is assumed the average liveweight of the Dohne Merino sheep within the study area is 65kg. As the D.S.E. model is based on sheep of 45 kg L.W. the allowance for drinking water should be changed in proportion to weight. The 65 kg sheep will drink 1.35 times as much as the D.S.E.
- Increasing the salt concentration in the drinking water to 7 000 mg/l increases the water consumption (140%) of sheep grazing non-saline feed compared to a DSE. The borehole water within the study area is hard. Considering, the safe upper limit of total salts in water for

lactating ewes is 6 000mg/l, it's assumed the borehole water has a TSS of not more than 7 000mg/l.

- It is estimated that lactating ewes require 100 per cent more water than non-lactating ewes. The Dohne merino sheep in the study area lactate from February to April and Oct to November (pers. comm. Willem Retief)

Therefore, the average DR (L/day) is:

DSE (January/February) = 4 L/day + allowance for size = 4 X 1,35 = 5,4 L/day + allowance for saline water = 5,4 X 1,4 = 7,56 L/day + allowance for lactating ewes = 7,56 X 2 = 15,12 L/day The average January and February allowance for lactating ewes is **15,12 L/day**	DSE (April) = 2,7 L/day + allowance for size = 2,7 X 1,35 = 3,6 L/day + allowance for saline water = 3,6 X 1,4 = 5,04 L/day + allowance for lactating ewes = 5,04 X 2 = 10,08 L/day The average April allowance for lactating ewes is **10,08 L/day**
According to the Water Quality Guidelines for Livestock Watering (Department of Water Affairs and Forestry, 1996. South African Water Quality Guidelines (second edition). Volume 5: Agricultural Use: Livestock Watering) the average daily water intake for a 68 – 91 kg sheep grazing on veld and salty veld ranges from 1,9 to 5,7 L/day and up to 8 L/day, respectively.	

The carrying capacity of the study area is just less than 23 ha/LAU across all veld conditions in the study area for rainfall conditions ranging between 250 - 350 mm (Soventix Solar PV Project in the Hanover District, Northern Cape, De Aar/Hanover Area, Grazing Assessment Report by S. F. de Wet Pr.Sci.Nat, February 2017)

A large stock unit (LSU) or animal unit is defined as an ox which weighs 450 kg. A ewe = 0,17 LSU and a ram is 0,35 LSU. A carrying capacity of 23 ha/LSU on Portion 3 of the Farm Goede Hoop 26C therefore translates into 222,6 ewes on 870,380 ha.

The DR for 222,6 lactating ewes on Portion 3 in February will be 3 365,8 L/day or **3,4 m^3/day.**

Dust control (suppression)

It is assumed that the two-track roads in between the solar panel arrays and the firebreak road will not contribute significantly to dust by maintaining the native vegetation in the middle 'mannetjie'.

It is further assumed that dust suppression will be significantly less compared with the volume of traffic expected during construction. Internal roads, including the access roads to the field transformers, the access road along the length of the proposed 132 kV distribution line, and the three access roads linking the two areas separated by a watercourse via three existing road crossings, will not be used daily but rather only when required to fulfil routine weekly and/or monthly inspections or maintenance.

Consequently, the only remaining principal source of dust that will be used regularly by 55 staff to access the operational area is the access road from the N10 to the main entrance of the operational area, including the servitude road under the Eskom 132 kV powerline (18,5 km)

In total, dust control will be required on an estimated 18,5 km of 5 to 6 m-wide dirt road, covering a surface area of 111 000 m^2.

Outdoor dust control operations in typically dry areas require "about four litres of water on every square meter, every day." Applying this formula, a road roughly 18,5 km long and 6 m wide would require the use of roughly 444 000 L or **444 m^3** of water every dry day (https://blog.midwestind.com/water-is-a-poor-dust-control-method/).

Using water as a form of dust control is an ineffective, wasteful, and short-term solution. Avoid or reduce the need for dust suppression/control during operation by providing employees with a prearranged bus charter service.

Some environmentally friendly soil binders, such as Roadtech™ can reduce water use to less than 1000ml of water per sqm. Roads with continuous daily traffic would still need to maintained daily (pers. comm. Willem Schaap, FlowCentric Mining Technology (flowcentric-mining.com)). If the same or a similar binding agent is used, then water consumption per spraying can be reduced to **111 m^3**.

On areas with less or no traffic at all, the application rate for maintenance purposes would be around twice a month but should be managed (pers. comm. Willem Schaap, FlowCentric Mining Technology (flowcentric-mining.com)). So, 8 km of 5 to 6 m-wide internal access roads (48 000 m^2 - excluding two-track roads) may require an additional **48 m^3** of solution (water dosed with binding agent) every two weeks.

The use of on-site supplementary water sources such as rainwater and grey water could reduce the Average Annual Daily Demand (AADD) requirement from the borehole water supply system (underground aquifer). The potential reduction in AADD to be supplied by the underground aquifer depends on the extent that such measures can be implemented for operation demand (**Table 33**).

Table 33: Breakdown of assumed operation water use and the potential for supplementary water use.

Operation			
Type of usage	**Activity**	**Supplementary water use**	
		Potential	**Source(s)**
Potable usage	Toilet flushing	✓	Excess treated effluent from the Biorock sewage treatment system. Rainfall run-off from roof.
	Showers	✗	
	Taps/basins • Hand washing • Drinking • Preparing food • Washing dishes		
	Washing Solar Panels	✗	
Non-potable usage	Livestock watering	✗	

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	Dust control/suppression (irregular and limited to access road from N10 to main entrance)	✓	Excess treated effluent from the Biorock sewage treatment system. Rainfall run-off from roof.

The Sewerage flow contribution as a percentage of Average Annual Daily Demand (AADD) for business, commercial, industrial land use categories is 80% (DHS Redbook, Section K, Table K.4).

DHS Redbook, Section K, Sanitation, The Neighbourhood Planning and Design Guide, Part II, Planning and design guidelines, developed by Department of Human Settlements, published by the South African Government ISBN: 978-0-6399283-2-6, version 1.1, printed January 2019.

Consequently, assuming the estimated demand shall be **5,5 m^3/day** during operation (55 staff and the provision of 100 litres of potable water per person per day), **4,4 m^3/day** of treated effluent will be available for supplementing demand for toilet flushing and/or dust control, excluding any contributions from rainwater harvesting. Having said that, three (3) 10 m^3 storage tanks will be used to store and disinfect the treated water from the Biorock treatment system. Consequently, once filled the total combined capacity of treated effluent that will be available for reuse (e.g., dust control) will be 30 m^3.

<u>Construction and operation</u>

Excluding dust control, it is estimated that approximately **27,45 m^3/day** of groundwater shall be required during construction and operation, for potable usage (**16,25 m^3/**day for construction and **5,5 m^3/day** for operation), washing the modules (**2,3 m^3 per day**) and watering livestock (**3,4 m^3/day**) when it is safe to do so. Dust control (suppression) along principal access roads will require an additional **674,4 m^3 per spraying**, or **168,6 m^3 per spraying** if an environmentally friendly soil binder is added to the groundwater.

If dust control is required daily on areas with continuous traffic, then the total daily demand for water during the construction phase is estimated to be **196,05 m^3**. <u>The permissible groundwater abstraction rate (in terms of the GA) for both properties combined (**216 m^3/day**) will therefore be sufficient to meet the estimated demand for water when construction and operation overlap</u>.

Furthermore, based on the pump test data generated from both boreholes (**336,67 m^3/day**), BH4 and BH5 will be able to meet the estimated demand.

Assumptions

(a) Considering that most if not all concrete mixing will take place during the initial civil construction phase (pers. comm. JP De Villiers, Managing Director, Soventix), and the civil works shall be completed before commencing with the 100 MW blocks, it is assumed that water shall not be needed for mixing concrete when the construction and operational phases overlap.

(b) Considering the construction of each 100 MW block typically takes 12 to 15 months from start to finish (pers. comm. JP De Villiers, Managing Director, Soventix), the first year of constructing the first 100 MW will not require any water for washing the modules, the second year of constructing the second 100 MW block shall require enough water to clean one 100 MW block, the third year of constructing the third 100 MW block shall require enough water to clean two 100 MW blocks, and the final year of constructing the fourth 100 MW block shall require enough water to clean three 100 MW blocks. In other words, the facility will on average during the construction period be operating at less than half of its capacity. As such, the lesser of the

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two water usage estimates (**4,5 m^3 per day** for four wash cycles per year or every 3 months and **2,3 m^3 per day** for two wash cycles per year or every 6 months) shall be used for quantifying water usage when washing the modules during the construction and operation phase.

Cultural Heritage

Fairly dense ground cover (grass, shrubs/bushes) hampered visibility in some sections during the survey, while the water-logged situation on the ground also limited access and visibility. It is however envisaged that most of the areas will be similar in nature to those already identified and recorded (mostly open-air surface scatters of Stone Age material).

Although all efforts are made to cover a total area during any assessment and therefore to identify all possible sites or features of cultural (archaeological and/or historical) heritage origin and significance, that there is always the possibility of something being missed. This will include low stone-packed or unmarked graves.

Terrestrial Biodiversity

Conditions during the site visit were excellent for sampling and the vegetation of the site was very green and included a large abundance of forbs, annuals and grasses. Given the amount of time spent on-site as well as the favourable sampling conditions, the full complement of flora present is likely to have been represented, with the result, that there are considered to be few limitations with regards to the sampling of the vegetation, which has been well-characterised during the current study.

The site is large and not all parts of the site could be assessed and directly sampled in the field. However, specific effort was made to investigate all the different habitats present and obtain a representative sample of all the areas and habitats present.

In terms of fauna, there are some limitations regarding detecting the presence of rare or shy species, but overall, it is unlikely that the site is a significant site for any of these species as the areas affected by the PV footprint are typical of the wider area and not considered particular favorable for any of the listed fauna that are known from the wider region. It is not possible to confirm the absence of a species with 100% certainty. A species may be absent from an area during sampling but may move through the area occasionally or seasonally. Some species are rare or difficult to locate and it may be very difficult to confirm either the absence or presence of such species without long-term studies.

In terms of ecological process and the habitats present, there are few limitations in this regard as the site is open and all significant features present are readily visible and can easily be accessed.

Avifauna

Owing to the heavy rain occurring during the reconnaissance site visit in March 2022, certain areas of the property were not accessible.

Visual

Digital Elevation Models (DEM) and viewsheds were generated using ASTER elevation data (NASA, 2009). Although every effort to maintain accuracy was undertaken, as a result of the DEM being generated from satellite imagery and not being a true representation of the earth's surface, the viewshed mapping is approximate and may not represent an exact visibility incidence. Thus, specific features identified from the DEM and derive contours (such as peaks and conical hills).

Bats

The poorly understood cumulative impacts of renewable energy (RE) facilities on bats, including scant data on bat collisions, combined with rapid expansion of the sector creates a sense of haste in:

(a) Standardising methodologies for monitoring,

(b) Quantifying and understanding the impacts, and

(c) Searching for fatalities at RE projects to ensure more accurate data is collected.

Prevailing weather conditions impacted bat activity, thus even though nearly two weeks of data was collected, the bat activity across the site was most likely under-represented. The study was also conducted late in the generally accepted bat season and as such, may also account for the low activity and low number of species recorded across the site. It is assumed that during the peak summer period (mid-summer months), bat activity will be significantly higher than reported in the current report and during this time, additional species may be recorded.

The “whispering” Common slit-faced bat Nycteris thebaica is not easily detected and recorded by bat detectors, thus the species presence across the site could not be verified acoustically.

Social

The social environment constantly changes and adapts to change, and external factors outside the scope of the project can offset social changes, for example changes in local political leadership, droughts or economic conditions. It is therefore difficult to predict all impacts to a high level of accuracy, although care has been taken to identify and address the most likely impacts in the most appropriate way for the current local context within the limitations.

Social impacts are not site-specific but take place in the communities surrounding the proposed development.

SECTION Q: REASONED OPINION.

3(1) A EIA report… must include –

(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

Reasoned Opinion

South Africa needs to increase its electricity generation capacity to combat an energy crisis that is crippling the country's economy and bruising the well-being of its citizens. This need combined with international commitments to take action against the global threat of climate change dictates the adoption of renewable energy alternatives as opposed to our historical reliance on coal-fired power stations and the polluting mines required to supply their furnaces. The renewable energy sector, particularly at a commercial scale, is a relatively young but rapidly expanding industry. This rapid expansion, combined with the diversity of applications in terms of technology, design and different socio-ecological contexts has created a gap in research relating to impacts on biodiversity. The restoration and maintenance of biodiversity is considered a fundamental tool to build ecosystem resilience in the face of stresses or pressures such as climate change. The benefit of a Solar PV facility (in terms of climate change mitigation through carbon dioxide emission reductions) is therefore not justified if exceeded by the cost of lost biodiversity and ecosystem regulating services, such as carbon sequestration, particularly when considering the scale of areas impacted by these facilities (1,5 ha per MW). So, a logical risk-averse approach must ensure that the land use does not threaten its ecosystems (a risk identified in the District Municipality's Climate Change Response Plan), but instead conserve them. A fundamental premise of our assessment is that diversification by changing the current land-use (Agriculture) to an Agrivoltaic system is potentially a powerful climate resilient land-use, involving both climate change mitigation and adaption measures, that simultaneously supports the agricultural and energy industries. It is critical, therefore, that the Solar PV facility is operated as an Agrivoltaic system that combines agriculture, specifically sustainable ecological management (grazing) practices, with green energy generation to promote both terrestrial and aquatic ecosystem resilience (ability of an ecosystem to maintain key functions and processes) and the continued provision of ecosystem services to current and future generations.

The above motivation for making the Agrivoltaic system a condition in respect of the authorisation also applies to the potential PV "heat island" (PVHI) effect (local atmospheric warming) as the retention and maintenance of vegetation will contribute to a reduced effect.

Further, the reasoned opinions of the appointed specialists are summarised below:

<u>Soil and Grazing Potential</u>

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 if there is proper runoff management from roads and other bare areas. Good rangeland management for the areas underneath the solar panels will be essential to maintain a good vegetation cover and to reduce soil erosion and runoff. The shallow soils may present a challenge for some construction items like poles that need to be planted. The clayey soils and most noticeably the Swartland and Valsrivier soils may restrict vehicle movement during the wet season. The Swartland and Valsrivier soils may also have an influence on any foundations. It is possible that the shading effect of the proposed solar panels will increase soil moisture content and therefore improve the general grazing capacity of the study areas.

From a grassland ecological perspective, the opinion is that the current planned development (and the cumulative effect of 30km from other PV-projects), will not have a significant impact on the determined potential

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grazing potential. This opinion comes with an important condition, that the mitigations and recommendations are applied.

Furthermore, if the management guidelines are not followed in this report, it is envisaged that further deterioration in grass basal cover will occur, associated with increased bare ground and accelerated soil erosion, and it is envisaged that the potential impact from the planned development would then also need to be considered and be mitigated for.

Follow-up grazing assessments and annual monitoring of veld condition is recommended to record veld condition and grazing capacity under different rainfall conditions.

Terrestrial Biodiversity Specialist

There are no impacts associated with the development of the Soventix Phase 3 site on terrestrial biodiversity that cannot be mitigated to an acceptable level. As such, should all the proposed mitigation be implemented, the Soventix Phase 3 development is deemed acceptable from a terrestrial ecological impact perspective. In terms of cumulative impacts, the affected area has not been significantly impacted by renewable energy development to date and the contribution of the current development to cumulative impact is considered acceptable. It is thus the reasoned opinion of the specialist that there the Soventix Phase 3 site development should be authorised subject to the various mitigation and avoidance measures as indicated.

Avifauna Specialist

Overall, the author sees no reason why an Environmental Authorisation (EA) should not be granted on the following conditions:

- All recommended buffering be strictly adhered to where possible.
- All recommended mitigation measures be applied preconstruction, post construction and operations.
- The Prescribed engineering mitigation measures must be supported by a pre-construction and Construction Phase rehabilitation plan to be commissioned prior to commencement of construction activities.
- An EMPr for the Construction Phase must be created and be subsequently updated every three years (during Operation) in order to revaluate the effectiveness of the mitigations. All mortalities must be recorded.

Chiropteran (Bat) Specialist

Based on the data collected during the bat baseline survey and available literature, there is little reason for the development of Phase 3 of the proposed Soventix solar PV facility not to be approved provided mitigation measures are put in place during the development, operation and decommissioning of the Soventix solar PV facility. The rehabilitation and management of the operational solar PV facility will be a critical activity as this will have a direct impact on biodiversity and ecosystem functioning further afield than within the boundary of the solar PV facility.

Heritage Specialist

From a Cultural Heritage point of view it can be said that the proposed development should be allowed to continue once the recommended mitigation measures related to the archaeological & historical sites and features have been implemented.

Visual Specialist

The visual recommendations from the scoping phase reporting were all incorporated into the layout design, accommodating a wide buffer on the adjacent properties, as well as accommodating wide ecological corridors between the four PV blocks. While the local sense of place will be modified, the impacted visual resources are localised to some degree and are not highly significant such that a No-go Option would be preferred. Good Hope Farmstead (Remainder of Farm 149) *could* experience partial views of the panels at 4.5km (the dwelling is at the fringe of the viewshed analysis), with direct views from Skilpadskuil Farmstead (Portion 2 of Taaibosch Fountain 41) screened by local vegetation. As such, the Preferred PV development option is recommended with mitigation.

Social Specialist

None of the social impacts identified are so severe that the project should not continue. Based on the findings of this report, it is recommended that the project continues, on the conditions that the mitigation measures are implemented.

Hydrological Specialist

The hydrological assessment cannot find any grounds or identify high hydrological risks to not proceed with the development. This is grounded on the assumption that the proposed mitigation measures, Concept Stormwater Management Plan (CSWMP), EMPr and EIA recommendations are implemented during the construction and operational phase of the development.

Geo-Hydrological Specialist

The risk assessment for both construction and post-construction phases of the project is considered marginal, with mostly reversible and manageable impacts. This assessment cannot find any grounds or identify high hydrological risks to not proceed with the development. This is grounded on the assumption that the proposed mitigation measures, EMPr and EIA recommendations are implemented during the construction and operational phase of the development.

Geotechnical Specialist

No fatal flaws requiring relocation or re-alignment of proposed locations are present. However, if the alternative access route from the Staging Area to the Phase 1 area is eventually decided upon, maintenance costs will be high for a large part of the road.

Aquatic Specialist

During the risk assessment, 16 potential impacts were identified. For these potential impacts identified during the risk assessment, all were assigned mitigation measures that reversed potential impacts to “Low” risk rating posed to the resource quality of the watercourse. No impact was identified to cause loss of irreplaceable resources.

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By implementing all the mitigation measures and managing the system on a continuous basis as prescribed by the Risk Assessment, all the impacts will be addressed to a satisfactory level. Therefore, it is proposed that the project should be authorised with the provision that the mitigation measures prescribed in this document, where applicable, are included in the EMPr.

Paleontology Specialist

Provided that the Chance Fossil Finds Protocol is incorporated into the EMPrs and fully implemented during the construction phase, there are no objections on palaeontological heritage grounds to authorisation of the proposed developments. Pending the discovery of significant new fossil finds before or during construction, no further specialist palaeontological studies, monitoring or mitigation are recommended for these renewable energy projects.

Traffic Specialist

Provided that the recommendations are adhered to, the proposed development of the 400MW Solar PV facility (Phase 3) can be supported from a traffic engineering perspective.

Conclusion

In consideration of the investigated cumulative impacts, the nature and extent of the proposed development, compliance with the relevant legal, policy and planning documentation (i.e. “need and desirability”) and the findings of the specialist studies, it is the opinion of ECOLEGES that the proposed 400 MW Solar Photovoltaic (PV) facility and associated infrastructure (Phase 3) on the Remainder of Farm Goede Hoop 26C, Portion 3 of Farm Goede Hoop 26C and other properties is supported from an environmental perspective and should be considered for Environmental Authorisation, subject to the implementation of the identified recommendations.

Recommended conditions within the Environmental Authorisation

9. The holder of the authorisation must appoint an experienced independent Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations referred to in this environmental authorisation are implemented and to ensure compliance with the provisions of the approved EMPr.
10. The authorisation is valid for 10 years and there should be no restriction on commencement of construction.
11. If the project is launched 5 years after the authorisation is granted there should be a review of the EA and EMPr against all legislation, technology and renewable energy best practice.
12. The adoption of a symbiotic ‘Agrivoltaic’ system that combines agriculture, specifically good ecological management (grazing) practices and green energy.
13. The maintenance and monitoring of vegetation cover through ecologically sustainable grazing management practices and veld condition assessments.
14. Commencement with construction, specifically civil works may only take place after the peak monthly rainfall and run-off period (from January to April), and preferably during the winter months (e.g., June to September) when there is a decreased probability of storm events. Civils works should as far as is practical be completed before the next rainfall season. Timing of construction to May, June, July and

August in order to avoid breeding periods of species within the sensitive drainage lines, wetlands and the general region is also recommended.

15. Maintain visual quality by visually buffering adjacent land uses/farms along north- and south-eastern property boundary.
16. Maintain ecological integrity by the exclusion of 'High' sensitive habitats from the perimeter fence line and the preservation of ecological corridors connecting these 'High' sensitive habitats.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
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SECTION R: OPERATIONAL ASPECTS AND POST CONSTRUCTION MONITORING

3(1) A EIA report… must include –

(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

The authorisation is valid for 10 years and there should be no restriction on commencement of construction.

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SECTION S: APPOINTED INDEPENDENT EAP

3(1) A EIA report… must include –

An undertaking under oath or affirmation by the EAP in relation to-

(i) the correctness of the information provided in the report;

(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties;

(iii) the inclusion of inputs and recommendations from specialists reports where relevant; and

(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

EAP Affirmation

Appendix 3 Section 3 (s) of the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of the National Environmental Management Act 107 of 1998, as amended - NEMA), require an undertaking under oath or affirmation by the Environmental Assessment Practitioner (EAP) in relation to the correctness of the information provided in the report, the inclusion of comments and inputs from stakeholders and interested and affected parties, and any information provided by the EAP to interested and affected parties as well as any responses by the EAP to comments or inputs made by interested or affected parties.

I, **Shannon Farnsworth**, on behalf of Ecoleges, hereby affirm that all information provided herein is to the best of my knowledge correct, all comments and inputs received from stakeholders and interested and affected parties have been accurately recorded herein (**Annexure E of the PPP Report attached as Appendix C**) and any information or responses provided by the EAP to comments or inputs made by interested or affected parties are recorded in the Comments and Response Report (**Annexure H of the PPP Report attached as Appendix C**).

Signature of the EAP

08th November 2022

Date

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SECTION T: FINANCIAL PROVISIONS FOR REHABILITATION, CLOSURE AND DECOMMISSIONING

3(1) A EIA report… must include –

(t) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

N/A

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SECTION U: ANY DEVIATION FROM THE SCOPING REPORT

3(1) A EIA report… must include –

(u) an indication of any deviation from the approved scoping report, including the plan of study, including-

(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and

(ii) a motivation for the deviation;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

N/A

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SECTION V: COMPETENT AUTHORITY SPECIFIC INFORMATION

3(1) A EIA report… must include –

(v) where applicable, any specific information required by the competent authority;

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended

N/A

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SECTION W: OTHER INFORMATION REQUIRED BY REGULATIONS

3(1) A EIA report… must include –

(w) any other matter required in terms of section 24(4)(a) and (b) of the Act.

Appendix 3 (Content of the EIA Report) of the EIA Regulations, 2014 as amended.

N/A

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
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APPENDICES

APPENDIX A: SITE PLAN(S)

Annexure A: Overall Site Layout

Annexure B: General Site Layout

Annexure C: Layout Map for solar PV site

Annexure D: Layout Map of substation

Annexure E: Layout Map for the distribution line

Annexure F: Sensitivity and Layout Map for solar PV site and substation

Annexure G: Sensitivity Map for Phase 3

Annexure H: Sensitivity Map for All infrastructure

Annexure I: Cumulative Impact Map

APPENDIX B: SITE PHOTOGRAPHS

APPENDIX C: PUBLIC PARTICIPATION PROCESS REPORT

APPENDIX D: IMPACT ASSESSMENT

APPENDIX E: SPECIALIST REPORTS

Annexure A: Visual Impact Assessment

Annexure B: Heritage Impact Assessment

Annexure C: Paleontology Assessment

Annexure D: Grazing Potential Assessment

Annexure E: Soil Mapping Assessment

Annexure F: Hydrological Assessment

Annexure G: Geo-Hydrological Assessment

Annexure H: Terrestrial Biodiversity Impact Assessment

Annexure I: Aquatic Assessment

Annexure J: Avifauna Assessment

Annexure K: Chiropteran Assessment (Bat Survey)

Annexure L: Geotechnical Assessment

Annexure M: Traffic Impact Assessment

Annexure N: Socio-Economic Impact Assessment

APPENDIX F: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORTS (EMPR'S)

Annexure A: Generic EMPr's for the development of substation infrastructure, overhead electricity transmission and distribution infrastructure (as per Government Gazette No. 42323)

Annexure B: Solar PV Facility EMPr

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