K2022578692 SOUTH AFRICA (PTY) LTD

BASIC ASSESSMENT PROCESS FOR THE SOLAR PHOTOVOLTAIC FACILITY, "RHINO PV" ON REMAINDER OF FARM RHENOSTERKOP 155 AND "SUNNYSIDE PV" ON FARM 400, BEAUFORT WEST

Final Basic Assessment Report

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Document Title:	Basic Assessment Process for the Solar Photovoltaic Facility, “Rhino PV” on Remainder of Farm Rhenosterkop 155 and “Sunnyside PV” on Farm 400, Beaufort West
Revision Number	2.0 (Final Basic Assessment Report)
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Confidentiality Statement

KEY PROJECT INFORMATION

PROJECT TECHNICAL INFORMATION

Component	Description/ Dimensions	
	Rhino SEF	Sunnyside SEF
Location of site (centre point)	32°14'9.254"S; 22°50'26"E	22°49'59.587"S; 32°21'4.729"E
Application site area	Remainder of farm Rhenosterkop 155: 4 247 ha, only 563 ha available for development	Farm 400: 4 035 ha, only 525.2 ha available for development
Solar PV development area	533.94 ha	494.93 ha
SG codes	Remainder of farm Rhenosterkop: C00900000000015500000	Farm 400: C00900000000040000000
Export capacity	Up to 250 MW	Up to 250 MW
PV Panels	Mono- or bifacial panels will be used, not thin film Panel width and height (to be confirmed during the detailed design phase) Expected panel dimensions: Width: 1 – 1.3 m Height: 2 – 2.4 m	Mono- or bifacial panels will be used, not thin film Panel width and height (to be confirmed during the detailed design phase) Expected panel dimensions: Width: 1 – 1.3 m Height: 2 – 2.4 m
On-site Substation	One 132 kV 21 m height 1 ha Substation will step up voltage from 33 to 132 kV Various transformers will be located within the PV area. These will combine the power from multiple inverters and step up the supply voltage from 800 V to 33 kV. The expected capacity of the transformers are in the range of 2.5 megavolt ampere each. Note that the voltage levels are estimates and subject to confirmation/change during the detail design phase of the project.	One 132 kV 21 m height 1 ha Substation will step up voltage from 33 to 132 kV Various transformers will be located within the PV area. These will combine the power from multiple inverters and step up the supply voltage from 800 V to 33 kV. The expected capacity of the transformers are in the range of 2.5 megavolt ampere each. Note that the voltage levels are estimates and subject to confirmation/change during the detail design phase of the project.
BESS	5 to 5.8 ha The final BESS capacity is subject input by DMRE, NERSA and Eskom regarding the dispatchability and ancillary services to be provided by the hybrid Solar PV and BESS facility. This may range between 77 MW/ 308 MWh (in line with the latest ESIPPPP bidding round 2) and 240 MW/ 960 MWh (in line with 4 hours of rated capacity). These stated capacities are also subject to the charging, discharging and augmentation regime established during the subsequent design phases of the project.	5 to 5.8 ha The final BESS capacity is subject input by DMRE, NERSA and Eskom regarding the dispatchability and ancillary services to be provided by the hybrid Solar PV and BESS facility. This may range between 77 MW/ 308 MWh (in line with the latest ESIPPPP bidding round 2) and 240 MW/ 960 MWh (in line with 4 hours of rated capacity). These stated capacities are also subject to the charging, discharging and augmentation regime established during the subsequent design phases of the project.

Component	Description/ Dimensions	
	Rhino SEF	Sunnyside SEF
Proximity to grid connection	The facility is planned to connect to a new MTS which will be established near the project site. The new MTS will tie in via loop-in-loop-out connection to the existing Droërivier/Hydra 400 kV lines. Alternatively, the project can tie into the existing Droërivier MTS via a 132 kV connection. This does not form part of this application	The facility is planned to connect to a new MTS which will be established near the project site. The new MTS will tie in via loop-in-loop-out connection to the existing Droërivier/Hydra 400 kV lines. Alternatively, the project can tie into the existing Droërivier MTS via a 132 kV connection. This does not form part of this application
O&M buildings	The 1 ha construction camps will become the operational site camp offices, workshop areas, O&M building, permanent parking area, storage area	The 1 ha construction camps will become the operational site camp offices, workshop areas, O&M building, permanent parking area, storage area
Access roads	6 – 8 m access roads +/-15% 4 m internal roads	6 – 8 m access roads +/-15% 4 m internal roads
Site Access	Turn southward off from N1, 30 km outside Beaufort-West, between Beaufort-West and Three Sisters. This will lead to a Transnet service road used by the local population for access to farms and smallholdings. The site will be located immediately to the right at the T-junction of the road that connects the service road and the N1.	Approximately 3.2 km outside Beaufort-West on the R61, turn onto the Hopewell Road in an Eastern direction. After 24.1 km, turn right onto Farm 400 through the gate to the farm. This will be the main access point to the site.
Construction camp	One 1 ha temporary containers	One 1 ha temporary containers
Temporary construction laydown/ staging area	2 ha within the development area – laydown (x 2)	2 ha within the development area – laydown (x 1)
Fence/ security (per site)	Triple wire fence, electrical fencing: Maximum height 3 m Length – 11 076 m	Triple wire fence, electrical fencing: Maximum height 3 m Length – Sunnyside PV west at 11 408.45 m and east 3 959 m
Boreholes and storage tanks (if applicable), per site	Existing boreholes will be tested. If no potential boreholes (existing), new boreholes will be required. Water will be stored on site using jojo tanks storing borehole or municipal water.	Existing boreholes will be tested. If no potential boreholes (existing), new boreholes will be required. Water will be stored on site using jojo tanks storing borehole or municipal water.

COORDINATES

Rhino PV

Corner/ Point	South	East
SEF Site		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°14'1.007"S	22°49'3.273"E
2	32°13'47.007"S	22°49'40.72"E
3	32°13'59.832"S	22°50'5.062"E
4	32°13'15.598"S	22°51'10.757"E
5	32°13'17.692"S	22°51'21.75"E
6	32°13'25.282"S	22°51'23.059"E

Corner/ Point	South	East
7	32°13'33.476"S	22°51'28.535"E
8	32°13'39.728"S	22°51'34.885"E
9	32°13'43.733"S	22°51'37.132"E
10	32°13'58.995"S	22°51'27.932"E
11	32°14'52.917"S	22°50'3.975"E
12	32°14'23.362"S	22°48'59.96"E
Coordinates at Centre Point (DD MM SS.sss)		
13	32°14'9.254"S	22°50'26"E
On-site Substation		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°14'50.452"S	22°50'1.733"E
2	32°14'48.614"S	22°50'4.797"E
3	32°14'50.953"S	22°50'6.941"E
4	32°14'52.847"S	22°50'4.017"E
Coordinates at Centre Point (DD MM SS.sss)		
5	32°14'50.814"S	22°50'4.49"E
Operation and Maintenance Building		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°14'1.212"S	22°49'3.247"E
2	32°13'59.235"S	22°49'8.232"E
3	32°14'1.658"S	22°49'7.898"E
4	32°14'3.551"S	22°49'2.912"E
Coordinates at Centre Point (DD MM SS.sss)		
5	32°14'1.435"S	22°49'5.307"E
BESS		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°14'47.369"S	22°50'4.145"E
2	32°14'40.595"S	22°50'14.809"E
3	32°14'43.982"S	22°50'17.882"E
4	32°14'50.819"S	22°50'7.031"E
Coordinates at Centre Point (DD MM SS.sss)		
5	32°14'46.115"S	22°50'10.543"E
Site Laydown Area 1		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°14'49.445"S	22°50'0.414"E
2	32°14'47.308"S	22°50'3.72"E
3	32°14'48.41"S	22°50'4.665"E
4	32°14'50.479"S	22°50'1.359"E
Coordinates At Centre Point (DD MM SS.sss)		
5	32°14'49.018"S	22°50'2.551"E
Site Laydown Area 2		
Coordinates At Corner Points (DD MM SS.sss)		
1	32°13'17.447"S	22°51'11.019"E
2	32°13'16.448"S	22°51'16.208"E
3	32°13'16.741"S	22°51'17.812"E
4	32°13'17.034"S	22°51'17.95"E
5	32°13'18.74"S	22°51'17.794"E
6	32°13'18.844"S	22°51'9.933"E
Coordinates At Centre Point (DD MM SS.sss)		
7	32°13'17.896"S	22°51'13.898"E
Site Access Road		

Corner/ Point	South	East
Coordinates (DD MM SS.sss)		
Start	32°12'41.222"S	22°50'24.815"E
Middle	32°12'43.792"S	22°51'24.434"E
End	32°13'17.371"S	22°51'11.071"E
Internal Road Network		
Coordinates (DD MM SS.sss)		
Start	32°13'19.084"S	22°51'16.211"E
Middle	32°14'10.652"S	22°50'21.731"E
End	32°14'23.464"S	22°49'2.421"E

Sunnyside PV

Corner/ Point	South	East
SEF Site		
Coordinates at Corner Points (DD MM SS.sss)		
West		
1	32°20'11.293"S	22°50'1.781"E
2	32°20'18.21"S	22°50'20.804"E
3	32°20'16.481"S	22°50'29.45"E
4	32°20'21.02"S	22°50'41.771"E
5	32°20'21.885"S	22°50'42.852"E
6	32°20'30.748"S	22°50'40.042"E
7	32°20'35.936"S	22°50'40.042"E
8	32°20'46.095"S	22°50'37.448"E
9	32°20'59.065"S	22°50'39.826"E
10	32°21'4.037"S	22°50'37.448"E
11	32°21'3.388"S	22°50'35.503"E
12	32°21'8.36"S	22°50'22.533"E
13	32°21'39.271"S	22°50'10.644"E
14	32°21'55.051"S	22°50'6.104"E
15	32°21'52.025"S	22°49'22.656"E
16	32°20'54.958"S	22°49'31.951"E
East		
1	32°21'7.063"S	22°50'52.796"E
2	32°21'9.873"S	22°51'7.927"E
3	32°21'56.565"S	22°51'5.117"E
4	32°21'57.213"S	22°50'46.743"E
5	32°21'24.16"S	22°50'44.743"E
6	32°21'16.488"S	22°50'49.94"E
Coordinates at Centre Point (DD MM SS.sss)		
West		
17	32°21'4.037"S	22°49'58.971"E
East		
7	32°21'33.315"S	22°50'56.283"E
On-site Substation		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°20'8.683"S	22°50'9.006"E
2	32°20'9.961"S	22°50'12.308"E
3	32°20'12.731"S	22°50'10.859"E
4	32°20'11.474"S	22°50'7.535"E
Coordinates at Centre Point (DD MM SS.sss)		

Corner/ Point	South	East
5	32°20'10.643"S	22°50'9.879"E
Operation and Maintenance Building		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°20'7.042"S	22°50'4.616"E
2	32°20'8.661"S	22°50'8.856"E
3	32°20'11.474"S	22°50'7.365"E
4	32°20'9.684"S	22°50'2.783"E
Coordinates at Centre Point (DD MM SS.sss)		
5	32°20'9.151"S	22°50'5.916"E
BESS		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°20'9.961"S	22°50'12.5"E
2	32°20'16.098"S	22°50'28.843"E
3	32°20'18.293"S	22°50'20.874"E
4	32°20'14.244"S	22°50'10.284"E
Coordinates at Centre Point (DD MM SS.sss)		
5	32°20'14.628"S	22°50'17.998"E
Site Laydown Area 1		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°20'9.977"S	22°50'2.778"E
2	32°20'12.908"S	22°50'10.807"E
3	32°20'14.183"S	22°50'10.074"E
4	32°20'11.092"S	22°50'2.109"E
Coordinates At Centre Point (DD MM SS.sss)		
5	32°20'11.793"S	22°50'5.996"E
Access Road		
Coordinates (DD MM SS.sss)		
West		
Start	32°19'37.751"S	22°50'22.916"E
Middle	32°19'53.17"S	22°50'11.781"E
End	32°20'8.589"S	22°50'3.214"E
East		
Start	32°21'6.41"S	22°50'28.27"E
Middle	32°20'58.272"S	22°50'45.831"E
End	32°21'8.337"S	22°50'52.898"E
Internal Road Network		
Coordinates (DD MM SS.sss)		
West		
Start	32°20'11.463"S	22°50'1.86"E
Middle	32°20'59.771"S	22°49'59.788"E
End	32°21'54.224"S	22°50'3.729"E
East		
Start	32°21'7.481"S	22°50'52.683"E
Middle	32°21'33.061"S	22°50'55.467"E
End	32°21'54.975"S	22°51'5.162"E

K2022578692 SOUTH AFRICA (PTY) LTD

BASIC ASSESSMENT PROCESS FOR THE SOLAR PHOTOVOLTAIC FACILITY, "RHINO PV" ON REMAINDER OF FARM RHENOSTERKOP 155 AND "SUNNYSIDE PV" ON FARM 400, BEAUFORT WEST

FINAL BASIC ASSESSMENT REPORT

EXECUTIVE SUMMARY

INTRODUCTION AND PROJECT DESCRIPTION

K2022578692 South Africa (Pty) Ltd is proposing to develop a solar PV facility and associated infrastructure on the Remainder of Farm Rhenosterkop 155 ("Rhino PV") and Farm 400 ("Sunnyside PV"), situated approximately 27 to 30 km to the east and north-east of Beaufort West in the Western Cape Province. The sites fall within the Beaufort West Local Municipality and Central Karoo District Municipality.

The proposed project is envisaged to generate an output of up to 500 MW AC energy, the project is being developed either to supply the national grid under the REIPPPP or similar procurement programme under the IRP.

The electrical grid energy connection infrastructure associated with this project is being done separately by the applicant, thus this BA only covers the SEF.

SiVEST Environmental Division has subsequently been appointed as the independent EAP to undertake the required EA application process in terms of the EIA Regulations, promulgated under Chapter 5 of the NEMA for proposed development and associated infrastructure. The proposed SEF and associated infrastructure are to be situated within a REDZ, namely Zone 11 Beaufort West, which have formally been gazetted in South Africa as per GN No. 114 of 2018 and 144 of 2021 enacted under of Section 24(3) of the NEMA, for the purpose of development of solar and wind energy generation facilities. Thus, a BA process in terms of the EIA Regulations, is being undertaken. The **DFFE Reference Number 14/12/16/3/3/1/2921**.

APPLICABILITY OF NEMA EIA REGULATIONS

The proposed project comprises activities identified in terms of GN No. R. 327, 325 and 324 (Listing Notice 1, 2 and 3 respectively), activities which must, therefore, follow a Scoping and Environmental Impact Assessment Reporting process. However, due to the sites being situated with REDZ 11 Beaufort West, the assessment to be followed in a BA. The triggered, listed activities are depicted below:

Activity No.:	Relevant Listed Activity as set out in of the EIA Regulations	Describe the portion of the proposed project to which the applicable Listed Activity relates	
		Rhino	Sunnyside
Listing Notice 1			
11.(i)	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 kV; or…	The developer proposes to install 33 kV MV underground cables and 132 kV on-site substation.	The developer proposes to install 33 kV MV underground cables and 132 kV on-site substation.
12.(ii)(a)(c)	The development of:…(ii) infrastructure or structures with a physical footprint of 100 square metres (m^2) or more; where such development occurs: (a) within a watercourse;…(c) if no development setback exists, within 32 m of a watercourse, measured from the edge of a watercourse…	Drainage lines were delineated within and outside the site, the development will include developing over drainage lines.	Wetland and drainage lines were delineated within and outside the sites, the development will encroach wetlands and include developing over drainage lines.
19.	The infilling or depositing of any material of more than 10 cubic metres (m^3) into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 m^3 from a watercourse…	Drainage lines were delineated within and outside the site, some drainage lines are envisaged to be infilled.	Drainage lines and wetlands were delineated within and outside the sites, the development will either encroach the wetlands and some drainage lines are envisaged to be infilled on both sites.
24.(ii)	The development of a road:…(ii) with a reserve wider than 13.5 m, or where no reserve exists where the road is wider than eight metres…	Access roads (upgrading) of 6 m to 8 m +/-15% are planned as part of the Rhino and Sunnyside solar PV facility.	Access roads (upgrading) of 6 m to 8 m +/-15% are planned as part of the Rhino and Sunnyside solar PV facility.
28.(ii)	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:…(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 ha…	The proposed site is currently used and zoned for agricultural purposes, i.e., grazing. The proposed development will result in an area of agricultural land greater than 1 000 ha being transformed to industrial/ commercial use.	The proposed sites are currently used and zoned for agricultural purposes, i.e., grazing. The proposed development will result in an area of agricultural land greater than 1 000 ha being transformed to industrial/ commercial use.
48.i.(a)(c)	The expansion of (i) infrastructure or structures where the physical footprint is expanded by 100 m^2 or more…where such expansion occurs (a) within a watercourse;…or (c) if no development setback exists, within 32 m of a watercourse, measured from the edge of a watercourse…	The proposed development will entail the expansion (upgrading) of roads by approximately 186 000 m^2 within drainage lines.	The proposed development will entail the expansion (upgrading) of roads by approximately 150 000 m^2 within drainage lines and 32 m from the edge of wetlands.

Activity No.:	Relevant Listed Activity as set out in of the EIA Regulations	Describe the portion of the proposed project to which the applicable Listed Activity relates	
		Rhino	Sunnyside
56.(ii)	The widening of a road by more than six metres, or the lengthening of a road by more than 1 kilometre:…(ii) where no reserve exists, where the existing road is wider than eight metres...	Internal and access roads (upgrade) of 4 m and 6 m to 8 m +/-15%, respectively, are planned as part of the SEF (36.26 km).	Internal and access roads (upgrade) of 4 m and 6 m to 8 m +/-15%, respectively, are planned as part of the SEF (44.26 km).
Listing Notice 3			
4.i.ii.(aa)	The development of a road wider than 4 m with a reserve less than 13.5 m. **i. Western Cape** ii. Areas outside urban areas; (aa) Areas containing indigenous vegetation…	Parts of the proposed site were delineated as “Grassy Shrubland” and “Arid Karoo Shrubland" with some designated “Calcrete Ridge” and “Degraded Sandveld”. Access and internal roads (upgrading) of 6 to 8 m +/-15% and 4 min width, respectively, are planned where indigenous vegetation exists on site.	Parts of the proposed site were delineated as “Grassy Shrubland” and “Arid Karoo Shrubland" with some designated “Calcrete Ridge” and “Degraded Sandveld”. Access and internal roads (upgrading) of 6 to 8 m +/-15% and 4 min width, respectively, are planned where indigenous vegetation exists on the sites.
12.i.ii.	The clearance of an area of 300 m^2 or more of indigenous vegetation… **i. Western Cape** ii. Within critical biodiversity areas (CBAs) identified in bioregional plans;	Parts of the proposed site were delineated as “Grassy Shrubland” and “Arid Karoo Shrubland" with some designated “Calcrete Ridge” and “Degraded Sandveld”. The site measures approximately 561.17 ha and therefore approximately 5 000 000 m^2 of this vegetation will be cleared in preparation for the development. The site encroaches a CBAs with no CBAs situated inside the site.	
14.(ii)(a)(c)i. i.(ff)	The development of…(ii) infrastructure or structures with a physical footprint of 10 m^2 or more; where such Development occurs: (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 m of a watercourse, measured from the edge of a watercourse… **i. Western Cape** i. Outside urban areas:… (ff)	The infrastructure development on site which encroaches a CBAs, is 5 611 700 m^2 and some will be situated within and in 32 m of wetlands. The site is situated 30 km outside of Beaufort West.	

Activity No.:	Relevant Listed Activity as set out in of the EIA Regulations	Describe the portion of the proposed project to which the applicable Listed Activity relates	
		Rhino	Sunnyside
	CBAs or ecosystem service areas as identified in systematic biodiversity plans adopted by the CA or in bioregional plans…		
18.(i)(ii)(aa)	The widening of a road by more than four metres, or the lengthening of a road by more than one kilometre. **(i) Western Cape** (i) Areas zoned for use as public open space or equivalent zoning; (ii) All areas outside urban areas: (aa) Areas containing indigenous vegetation…	Parts of the proposed site were delineated as "Grassy Shrubland" and "Arid Karoo Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". Access roads (upgrading) of 6 to 8 m +/-15% are planned as part of the SEF (36.26 km). The site is situated 30 km outside of Beaufort West.	Parts of the proposed site were delineated as "Grassy Shrubland" and "Arid Karoo Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". Access roads (upgrading) of 6 to 8 m +/-15% are planned as part of the SEF (44.26 km) solar PV facility. The sites are situated 27 km outside of Beaufort West.
23.(ii)(a)(i)(ii)(ff)	The expansion of:…(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs: (a) within a watercourse; **(i) Western Cape** (i) Outside urban areas: (ff) CBAs or ecosystem service areas as identified in systematic biodiversity plans adopted by the CA or in bioregional plans;	Parts of the proposed site were delineated as "Grassy Shrubland" and "Arid Karoo Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". Drainage lines were also delineated on or in close proximity to site. The site encroaches a CBAs. Expansion (186 000 m^2) of existing internal roads is planned to occur within or close to these resources. The site is situated 30 km outside of Beaufort West.	
Listing Notice 2			
1.	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 MW or more…	The proposed development will entail the construction of a SEF where the respective electricity output will be up to 500 MW. In addition, the proposed SEF development will be located outside urban areas.	The proposed development will entail the construction of a SEF where the respective electricity output will be up to 500 MW. In addition, the proposed SEF development will be located outside urban areas.
15.	The clearance of an area of 20 ha or more of indigenous vegetation…	Parts of the proposed site were delineated as "Grassy Shrubland" and	Parts of the proposed site were delineated as "Grassy Shrubland" and

Activity No.:	Relevant Listed Activity as set out in of the EIA Regulations	Describe the portion of the proposed project to which the applicable Listed Activity relates	
		Rhino	Sunnyside
		"Arid Karoo Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". The site measures approximately 533.94 ha and therefore indigenous vegetation of approximately 533.94 ha of vegetation will be cleared in preparation for the development.	"Arid Karoo Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". The site measures approximately 494.93 ha and therefore indigenous vegetation of approximately 494.93 ha of vegetation will be cleared in preparation for the development.

DETAILS OF ALTERNATIVES CONSIDERED

As per Chapter 1 of the EIA Regulations, feasible and reasonable alternatives are required to be considered during the BA process. Alternatives are defined as "different means of meeting the general purpose and requirements of the activity". These alternatives may include the:

- property on which or location where it is proposed to undertake the activity;
- type of activity to be undertaken;
- design or layout of the activity;
- technology to be used in the activity;
- operational aspects of the activity; and
- option of not implementing the activity.

Each of these alternatives are discussed in relation to the proposed development in the sections to follow.

Location/ Site Alternatives

Originally, for the solar PV facility, the farm Rhenosterkop 155 was identified as most suitable from a topographic, local, and environmental perspective. However, due to an avifauna (Martial Eagle) no-development buffer, the development area was significantly reduced. Furthermore, the landowner did not support solar PV facility development on some sections of the property due to (a) agriculture preference, and (b) the development's potential visual impact as the development would be within direct view of the guest house located on the farm.

To ensure that the project remains feasible, alternative sites were identified to compensate for the 'lost' capacity. The landowners were consulted, and due to the discussions undertaken, agreed to the solar PV facility development under certain conditions.

Development proposed on Farm 400 needed to be located to the southwest of the property so that it is not visible from the farmstead. A layout was then developed and discussed with the landowner which was agreed upon. Presented with the proposed development area, the landowner noted their support

of the development, and that development would be within an area that is not preferred by sheep for grazing that always migrate back to the preferred areas (green polygon) as shown in **Figure 13-4**.

For Farm Rhenosterkop 155, the development footprint was reduced to what is shown in **Figure 13-5**. The layouts consider the ESE results, and the landowner's comments and recommendations.

Other alternative locations were identified and assessed from a development perspective. The alternative locations, including surrounding farms, are less desirable to develop due to increased distance from the cluster. From a financial and environmental perspective, the development of other properties would also require additional servitudes that may not be feasible from a cost perspective.

Considering the above, no further alternatives have been considered for the proposed solar PV facility. RE development in South Africa is highly desirable from a social, environmental and development point of view and a solar energy installation is more suitable for the site due to the high solar resource.

The type of activity to be undertaken

No other activity alternatives have been considered. RE developments in South Africa are highly desirable from a social, environmental, and development perspective. The importance of RE has been outlined in Section 10 and 11 of this BAR highlighting national, district and local support of such developments. The solar resource in this area along with the rapid advancements in solar energy technology efficiency serves as further motivations for the proposed development.

South Africa is under immense pressure to provide clean sources of electricity generating capacity in order to reduce the current electricity demand from aging and polluting coal-fired power stations. With the global focus on climate change, the government is under severe pressure to explore alternative energy sources in addition to coal-fired power stations. Although solar energy is not the only solution to solving the energy crisis in South Africa, it is a suitable sustainable solution to the energy crisis and this project could contribute to addressing the problem. This project will thus aid in achieving South Africa's goals in terms of sustainability, energy security, mitigating energy cost risks, local economic development and national job creation.

The technology to be used in the activity

The importance of the proposed development has been outlined in **Section 10** and **11** below highlighting national, district and local support. The solar resource in this area advocates for the use of solar PV technology in order to generate energy (refer **Section 12**). Advancements in solar PV technology presents a renewable and sustainable way for countries like South Africa to generate low-cost energy from a natural resource.

Design or Layout of the Activity

The specialist constraints were considered in developing the proposed design and layout. This exercise also fed into the constraints mapping to identify the most suitable areas for the development of a solar PV facility which is envisaged to result in the least environmental and social impact.

In considering the specialist limitations identified in the screening phase, three no-go areas have been identified and excluded from the proposed development as restricted areas are not suitable for the installation of PV modules. The final available land area covers 1 080.15 ha.

The proposed final layout has, therefore, considered the sensitivities identified throughout the process and has informed the final proposed development footprint and layout put forward for authorisation. The mitigation hierarchy has been followed in that the avoidance of all no-go areas has been implemented from project onset. The layout was designed as an iterative process in conjunction with a specialist team to avoid impacts as far as possible. All residual impacts will be minimized as far as possible in accordance with a well-designed layout as well as an EMPr.

Comparative Assessment of Alternatives

Full site layout alternatives were not comparatively assessed, but rather a single layout was refined as additional information became available throughout the BA process (e.g., specialist input, additional site surveys, and ongoing stakeholder engagement) and is based on an avoidance approach. As a result, the layout provided was updated and assessed in the BA process.

No – Go Option

The 'no-go' alternative is the option of not undertaking the proposed SEF project. Hence, if the 'no-go' option is implemented, there would be no further development. This alternative would result in no additional environmental impacts from the proposed project on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the BA process.

PUBLIC PARTICIPATION PROCESS

Steps taken to notify key stakeholders and potential I&APs

Notification of BA Process was undertaken as follows:

- Placement of site notices in English and Afrikaans (as per the EIA Regulations) were placed along the entrance road to the application sites and around the site itself including at the Public Library and other areas of interest on **27 to 28 November 2023** (proof included in **Appendix 5**).
- Public notification of the BA process was advertised, in a local newspaper (namely Die Courier) on the **09 February 2024**, as required according to Regulation 41(2)I of the EIA Regulations, as amended. Proof is included in the Final BAR.
- Issuing of the notifications was circulated to I&APs on **14 February 2024** as part of the Draft BAR (proof included in Appendix 5).
- The Draft BAR underwent a 30-day comment and review period that ran from the **14th of February 2024 until the 15th of March 2024**.
- Reminder notifications of the closing date of the Draft BAR comment period were sent out on the **8th and 15th of March 2024**.
- The I&AP database was updated and includes both affected landowners, adjacent landowners, occupiers of affected and adjacent land, other I&APs, key stakeholders (such as OoS and other surrounding project developers. The I&AP database is included in Appendix 5.
- All comments received from I&APs, during the PPP period, and the responses thereto have been included in this Final BAR, which is submitted to DFFE.
- A CRR has been included in this Final BAR, which records the date that issues were raised, and the response to address the issues. The Final BAR with all comments and responses included is

submitted to DFFE for review and decision-making.

- All registered I&APs will be notified via email, sms or fax after having received written notice from DFFE on the final decision of the application. These notifications will include the process required to lodge an appeal, as well as the prescribed timeframes in which documentation should be submitted.

Availability of report for review:

- The Report was available on SiVESTs website for download and review/ review.
- Electronic copies were made available to parties via a secure digital link upon request for the documentation.
- CDs / Flash drives were posted, where requsted.
- The Draft BAR was located and available for review at the following location:
  - Beaufort West Library, 15 Church Street, Beaufort West, Western Cape)

POTENTIAL IMPACTS IDENTIFIED FOR THE PREFERRED ALTERNATIVE

The potential impacts for the identified environmental aspects have been assessed as per the methodology provided and mitigation measures identified below. Except where specifically specified, the potential impacts apply to all the sites.

Planning

None identified.

Construction

Impact	Pre-mitigation	Post-mitigation
Impacts to Biophysical Systems		
Terrestrial and Aquatic /Wetland		
Habitat destruction, ecosystem fragmentation, habitat degradation	Negative Medium	Negative Low
Exposure of soil to wind and rain could result in erosion and sedimentation into neighbouring habitat, leading to changes in habitat characteristics and modified habitats. Soil compaction.	Negative Low	Negative Low
Increase in construction personnel to the project site and heavy vehicle movement leading to increased poaching of animals or medicinal plants or destruction of protected species	Negative Low	Negative Low
Increased noise during construction may affect behaviour and distribution of fauna	Negative Low	Negative Low
Activities related to the construction of the solar PV facility can cause the spread and establishment of AIP	Negative Low	Negative Low
Heavy machinery can result in spillages of harmful substances and potential contamination of soil with hydrocarbons	Negative Low	Negative Low
Loss of ecological connectivity and faunal movement corridor due to habitat fragmentation from fencing	Negative Low	Negative Low
Geotechnical		
Ground disturbance during access road construction, foundation earthworks, platform earthworks	Negative Low	Negative Low

Impact	Pre-mitigation	Post-mitigation
Increased erosion due to vegetation clearing, alteration of natural drainage	Negative Low	Negative Low
Agricultural – compliance statement – none identified		
Avifaunal		
Displacement of priority species due to disturbance associated with construction of the PV plants and associated infrastructure.	Negative High	Negative Medium
Traffic Impact		
Temporary increase in traffic due to construction vehicle trips on the external road network / increase in noise and dust pollution levels during construction period / possible damage to road surface of access routes	Negative Medium	Negative Low
Impacts to Socio-Economic Component		
Socio-economic		
Rhino		
Expenditure associated with the construction of the proposed development will impact the production of the local economy.	Positive High	Positive High
Temporary increase in country's GDP due to capital expenditure during the construction period	Positive High	Positive High
The construction of the proposed development will positively impact the community and beyond by creating a number of job opportunities (albeit temporary).	Positive High	Positive High
Employees will develop and enhance skills thereby increasing experience and knowledge.	Positive Medium	Positive Medium
Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	Positive High	Positive High
The investment in the facility will generate revenue for the government during the construction period through a combination of personal income tax, VAT, companies' tax etc.	Positive Medium	Positive Medium
Negative impact on sense of place (noise, dust and visual) for farmers where construction activities will take place	Negative Medium	Negative Medium
Farmers might feel that the increase of accessibility will increase theft in the area	Negative Medium	Negative Low
Loss of agricultural space	Negative Medium	Negative Medium
An increase in traffic due to construction vehicles and heavy vehicles could create short-term disruptions and safety hazards for current road users.	Negative Medium	Negative Low
Sunnyside		
Expenditure associated with the construction of the proposed development will impact the production of the local economy.	Positive High	Positive High
Temporary increase in country's GDP due to capital expenditure during the construction period	Positive High	Positive High
The construction of the proposed development will positively impact the community and beyond by creating a number of job opportunities (albeit temporary).	Positive High	Positive High
Employees will develop and enhance skills thereby increasing experience and knowledge.	Positive Medium	Positive Medium
Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	Positive High	Positive High

Impact	Pre-mitigation	Post-mitigation
The investment in the facility will generate revenue for the government during the construction period through a combination of personal income tax, VAT, companies' tax etc.	Positive Medium	Positive Medium
Negative impact on sense of place (noise, dust and visual) for farmers where construction activities will take place	Negative Medium	Negative Medium
Farmers might feel that the increase of accessibility will increase theft in the area	Negative Medium	Negative Low
Loss of agricultural space	Negative Medium	Negative Low
An increase in traffic due to construction vehicles and heavy vehicles could create short-term disruptions and safety hazards for current road users.	Negative Medium	Negative Low
Heritage		
Rhino & Sunnyside		
Construction activities that take place near to archaeological resources may result in their destruction.	Negative Low	Negative Low
Construction activities that take place near to palaeontological resources may result in their destruction.	Negative Low	Negative Low
Visual		
Rhino		
Dust generated during construction will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the construction site, during the construction period.	Negative Medium	Negative Low
Sunnyside		
Dust generated during construction will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the construction site, during the construction period.	Negative Medium	Negative Low
Risk		
SSLB Energy Storage Systems		
Causes – Construction materials such as cement, paints, solvents, welding fumes, truck fumes, etc. Consequences – Employee / contractor illness.	Negative Medium	Negative Low
Causes – Drilling, piling, generators, air compressors. Consequences – Adverse impact on hearing of workers. Possible nuisance factor in near-by areas.	Negative Medium	Negative Low
Causes – Heat during the day. Cold in winter. Consequence – Heat stroke. Hypothermia.	Negative Low	Negative Low
Causes – Large projects bring many contractor workers into a small, isolated community. Consequences – Lack of sufficient accommodation, entertainment, etc. Increase in alcohol abuse, violence	Negative Low	Negative Low
Causes – Lifting heavy equipment. Awkward angles during construction. Consequences – Back and other injuries.	Negative Low	Negative Low
Causes – Involvement in an external fire. Fire involving fuels used in construction vehicles or vehicles themselves (e.g., tyre fire). Fire due to uncontrolled welding or other hot-work Consequences – Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire.	Negative Medium	Negative Low

Impact	Pre-mitigation	Post-mitigation
Causes – SSB containers damaged on route, e.g., dropped in port (drops do happen about 1/2000 containers) and importing possibly < 750 containers for the site. With this it is possible, although unlikely, that one will be dropped, traffic accident on-route. Involvement in an external fire, e.g., at the port or on route. Data indicates installed facility events are 0.001/year. Transport of 750 units per installation assumed to take 4 weeks each so f= 0.058 – once in 17 years so likelihood is moderately high. Consequences – Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire (refer to noxious smoke in Appendix A of the Risk Assessment Report for the major impact).	Negative High	Negative Low
Causes – With SSLB containers, flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces, static. Consequences – Potential fatalities amongst first responders. Damage to container, transport truck or other nearby items, e.g., other container in the port.	Negative Medium	Negative Low
Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants. Consequences – Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms, etc	Negative Medium	Negative Low
Causes – Damaged SSBs release fumes, leak electrolyte, are completely broken exposing hazardous chemicals. Thermal runaway and hazardous fumes released. Consequences – Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns or lung damage.	Negative Medium	Negative Low
Causes – Construction moving equipment, heavy loaded, elevated loads, working at heights Consequences – Injury or possibly fatality. Damage to equipment. Delays in starting the project, financial losses.	Negative High	Negative Low
Causes – Use of electrical machines, generators, etc. Hot dry area static generation is highly likely. Lightning strike. Consequences – Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	Negative Medium	Negative Low
Causes – Dust from construction and generally hot dry area. Consequences – Adverse impact on employee health.	Negative Low	Negative Low
Causes – Diesel for equipment, paints and solvents. Transformer oil spills. Sewage and kitchen/mess area wastewater. Consequences – Environmental damage, particularly to the surface and underground water in the area.	Negative Low	Negative Low
Causes – Mess area and other solid waste. Consequences – Environmental damage.	Negative Low	Negative Low
Causes – Water usage not controlled. Battery containers damaged. Consequences – Delays.	Negative Low	Negative Low
Causes – Bright surfaces reflecting light. Tall structures in a flat area. Consequences – Irritation.	Negative Low	Negative Low
Causes – Defective technology. Extreme project delays. Consequences – Financial loss	Negative Medium	Negative Low
Causes – On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences – Theft. Injury to burglars. Damage to equipment possibly setting off	Negative Medium	Negative Low
Causes – Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse. Inadequate emergency response to small event leads to escalation. Consequences – Injuries turn to fatalities, small losses become extended down time.	Negative Medium	Negative Low

Impact	Pre-mitigation	Post-mitigation
Causes – Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences – Unknown hazards manifest due to using “cheaper supplier or less developed technology”.	Negative Medium	Negative Low
VRFB Energy Storage Systems		
Causes – Construction materials such as cement, paints, solvents, welding fumes, truck fumes, etc. Consequences – Employee/ contractor illness.	Negative Medium	Negative Low
Causes – Drilling, piling, generators, air compressors. Consequences – Adverse impact on hearing of workers. Possible nuisance factor in near-by areas.	Negative Medium	Negative Low
Causes – Heat during the day. Cold in winter. Consequence – Heat stroke. Hypothermia.	Negative Low	Negative Low
Causes – Large projects bring many contractor workers into a small, isolated community. Consequences – Lack of sufficient accommodation, entertainment, etc. Increase in alcohol abuse, violence.	Negative Low	Negative Low
Causes – Lifting heavy equipment. Awkward angles during construction. Consequences – Back and other injuries.	Negative Low	Negative Low
Causes – Involvement in an external fire. Fire involving fuels used in construction vehicles or vehicles themselves (e.g., tyre fire). Fire due to uncontrolled welding or other hot-work Consequences – Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire.	Negative Medium	Negative Low
No credible causes	N/A	
Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants. Consequences – Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms, etc.	Negative Medium	Negative Low
Causes – Construction moving equipment, heavy loaded, elevated loads, working at heights Consequences – Injury or possibly fatality. Damage to equipment. Delays in starting the project, financial losses	Negative High	Negative Low
Causes – Use of electrical machines, generators, etc. Hot dry area static generation is highly likely. Lightning strike. Consequences – Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	Negative Medium	Negative Low
Causes – Dust from construction and generally hot dry area. Consequences – Adverse impact on employee health.	Negative Low	Negative Low
Causes – Diesel for equipment, paints and solvents. Transformer oil spills. Sewage and kitchen/mess area wastewater. Consequences – Environmental damage, particularly to the surface and underground water in the area.	Negative Low	Negative Low
Causes – Mess area and other solid waste. Consequences – Environmental damage.	Negative Low	Negative Low
Causes – Water usage not controlled. Battery equipment damaged. Consequences – Delays.	Negative Low	Negative Low
Causes – Bright surfaces reflecting light. Tall structures in a flat area. Consequences – Irritation.	Negative Medium	Negative Low
Causes – Defective technology. Extreme project delays. Consequences – Financial loss	Negative Medium	Negative Low
Causes – On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences	Negative Medium	Negative Low

Impact	Pre-mitigation	Post-mitigation
– Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.		
Causes – Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse. Inadequate emergency response to small event leads to escalation. Consequences – Injuries turn to fatalities, small losses become extended down time.	Negative Medium	Negative Low
Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences – Unknown hazards manifest due to using “cheaper supplier or less developed technology”.	Negative Medium	Negative Low

Operational

Impact	Pre-mitigation	Post-mitigation
Impacts to Biophysical Systems		
Terrestrial and Aquatic /Wetland		
Washing of panels could contribute to the erosion and sedimentation of neighbouring habitats	Negative Low	Negative Low
Operation of solar PV facility, the reflective surfaces and operational light pollution may cause disorientation affecting the behaviour and distribution of fauna	Negative Low	Negative Low
Activities related to the maintenance of the solar PV facility can cause the spread and establishment of AIP	Negative Medium	Negative Low
Heavy machinery can result in spillages of harmful substances and potential contamination of soil with hydrocarbons	Negative Low	Negative Low
Geotechnical		
Increased erosion due to alteration of natural drainage	Negative Low	Negative Low
Agricultural – compliance statement – none identified		
Avifaunal		
Displacement of priority species due to habitat transformation associated with the presence of the PV plants and associated infrastructure	Negative High	Negative Medium
Mortality of priority species due to collisions with the solar panels.	Negative Low	Negative Low
Entanglement/entrapment of birds in the perimeter fence.	Negative Medium	Negative Low
Electrocution of priority species on the 33 kV power line network and in the on-site substations	Negative Medium	Negative Low
Mortality due to collisions with the overhead sections of the internal 33 kV cables.	Negative Medium	Negative Low
Traffic Impact		
Slight increase of vehicle trips due to permanent staff traveling to site, periodically (bi-annual) trips to site for transport of water and irregular maintenance trips	Negative Low	Negative Low
Impacts to Socio-Economic Component		
Socio-economic		
Rhino		
Expenditure associated with the operations of the proposed development will impact the production of the local economy.	Positive Medium	Positive Medium
Temporary increase in country’s GDP due to operational expenditure	Positive Medium	Positive Medium

Impact	Pre-mitigation	Post-mitigation
The operation of the proposed development will positively impact the community and beyond by creating a number of job opportunities.	Positive Medium	Positive Medium
Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	Positive Medium	Positive Medium
The investment in the facility will generate revenue for the government during the construction period through a combination of personal income tax, VAT, companies' tax, etc.	Positive Medium	Positive Medium
The landowners will receive monthly/ annual compensation for the solar panels situated on their farms, this will help to increase the landowner's revenue to ensure sustainability on the farms.	Positive Medium	Positive Medium
The additional electricity that will be generated will increase electricity supply in the country.	Positive High	Positive High
Negative impact on sense of place (noise and visual) for farmers where solar panels and associated infrastructure will be located.	Negative Medium	Negative Medium
Loss of agricultural space	Negative Medium	Negative Medium
Sunnyside		
Expenditure associated with the operations of the proposed development will impact the production of the local economy.	Positive Medium	Positive Medium
Temporary increase in country's GDP due to operational expenditure	Positive Medium	Positive Medium
The operation of the proposed development will positively impact the community and beyond by creating a number of job opportunities.	Positive Medium	Positive Medium
Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	Positive Medium	Positive Medium
The investment in the facility will generate revenue for the government during the construction period through a combination of personal income tax, VAT, companies' tax, etc.	Positive Medium	Positive Medium
The landowners will receive monthly/ annual compensation for the solar panels situated on their farms, this will help to increase the landowner's revenue to ensure sustainability on the farms.	Positive Medium	Positive Medium
The additional electricity that will be generated will increase electricity supply in the country.	Positive High	Positive High
Negative impact on sense of place (noise and visual) for farmers where solar panels and associated infrastructure will be located.	Negative Low	Negative Low
Loss of agricultural space.	Negative Medium	Negative Low
Heritage		
Rhino and Sunnyside		
Operational activities that taken place near to archaeological resources may result in their destruction	Negative Low	Negative Low
Operational activities that take place near to palaeontological resources may result in their destruction	Negative Medium	Negative Low
Visual		
Rhino		
The development of this PV array may be perceived as conflicting with the current undeveloped, largely deserted inhospitable agricultural landscape. The proposed SEF is anticipated to interrupt and/or degrade views, affecting the sense of place and presenting as a visual intrusion across the landscape.	Negative Medium	Negative Low
The installation of lighting on the site perimeter and / or around the BESS is anticipated to generate nightglow which currently does not emanate from the natural, undeveloped site. The introduction of	Negative Low	Negative Low

Impact	Pre-mitigation	Post-mitigation
lighting on the site will alter the sense of place and visual quality to surrounding receptors.		
Sunnyside		
The development of this PV array may be perceived as conflicting with the current undeveloped, largely deserted inhospitable agricultural landscape. The proposed SEF is anticipated to interrupt and/or degrade views, affecting the sense of place and presenting as a visual intrusion across the landscape.	Negative Medium	Negative Low
The glare analysis indicated that no glare will be experienced at the Ops modelled, however a short duration of glare will be experienced along the gravel road route.	Negative Low	Negative Low
The installation of lighting on the site perimeter and / or around the BESS is anticipated to generate nightglow which currently does not emanate from the natural, undeveloped site. The introduction of lighting on the site will alter the sense of place and visual quality to surrounding receptors.	Negative Low	Negative Low
Risk		
SSLB Energy Storage Systems		
Causes – Operation and maintenance materials, spare parts, paints, solvents, welding fumes, transformers oils, lubricating oils and greases, etc. Consequences – Occupational illness.	Negative Medium	Negative Low
Causes – Compromised battery compartments vapours accumulate in the containers, solids/ liquids on surfaces. Maintenance of battery components, corrosive and mildly toxic liquid on surfaces. Consequences – Dermatitis, skin /eye/lung irritation.	Negative Medium	Negative Low
Causes – Moving parts inside containers, buildings, pumps, compressors, cooling systems, etc. Consequences – Adverse impact on hearing of workers. Nuisance factor at near -by residences or other activities.	Negative Medium	Negative Low
Causes – Heat during the day. Batteries generate heat within enclosed building/ containers. Cold in winter. Night work requires lighting. Consequences – Heat stroke. Hypothermia.	Negative Low	Negative Low
Causes – Isolated workstation and monotonous repetitive work. Consequences – Low performance, system productivity suffers.	Negative Low	Negative Low
Causes – Lifting heavy equipment. Awkward angles during maintenance, stretching reaching to high level and bending to low level. Working at height if equipment located on top of roofs or elevated electrical equipment (e.g., pylons). Consequences – Back	Negative Medium	Negative Low
Causes – Involvement in an external fire, e.g., veld fire, maintenance vehicle fire, electrical systems fire. Manufacturing defects or damage to battery leading to shorting and heating. High humidity condensation of water or ingress of water or flooding leading to shorting. Dust accumulation on electrical parts leading to overheating. Excessive electrical loads – surges Operator abuse BMS failure or software failure. Incorrect extinguishing medium, escalate the fire. Consequences – Contaminated run off. Radiation burns unlikely to be severe as no highly flammable materials on site. Damaged equipment. Fire spreads to other units or offsite if grass/vegetation not controlled. Data indicates an event frequency of 0.001 per installation and with 750 units this would mean an event once 2 years, i.e., a high probability event.	Negative High	Negative Low
Causes – PCS, i.e., DC to AC, cooling failure electrical fire. Consequences – Fire starts in PCS or another section or room and spreads to battery area.	Negative High	Negative Low

Impact	Pre-mitigation	Post-mitigation
Cause 1 – Transformer shorting/ overheating/ explosion. Cause 2 – Flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces, static. Lithium Cobalt Oxide generates O_2 during decomposition – escalation. Consequences – Potential fatalities amongst first responders. Damage to container or other nearby items, e.g., other container.	Negative Medium	Negative Low
Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants. Consequences – Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms, etc.	Negative Low	Negative Low
Causes – Damaged batteries components, leak electrolyte, are completely broken exposing hazardous chemicals. Hazardous fumes released on thermal run away see fire above. Consequences – Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns for large exposure. In the case of toxic fumes, serious lung damage.	Negative Medium	Negative Low
Causes – Moving equipment, pumps, heavy equipment at elevation, nip points, working at heights. Traffic accidents. Earthquake/ tremor. Consequences – Injury. Fatality in unlikely worst case, e.g., traffic accidents or fall from heights. Damage to equipment, spills, environment pollution	Negative Medium	Negative Low
Causes – Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences – Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	Negative Medium	Negative Low
Not expected on a normal basis. Refrigerant may be an asphyxiant if accidentally released indoors it can accumulate and displace oxygen.	Negative Low	Negative Low
Causes – Cooling water blow-down. Laboratory waste (if included in the design). Maintenance waste, e.g., oils. Spills from batteries, coolant system, diesel trucks, transformers. Parked vehicles – oil drips. Fire water runoff control. Kitchen waste and sewage. Refrigerant release. Consequences – Pollution if not contained. Excessive disposal costs if emissions not limited.	Negative Low	Negative Low
Causes – Mess area and other solid waste. Disposal of solid-state batteries. Consequences – Environmental damage.	Negative Low	Negative Low
Causes – Similar to construction phase. Disposal of batteries or components. Disposal of containers. Water usage not controlled. Consequences – Delays. Excessive costs and disposal of large volumes of hazardous waste.	Negative Low	Negative Low
Causes – Bright surfaces reflecting light. Tall structures in a flat area. Consequences – Irritation.	Negative Low	Negative Low
Causes – Defective technology. Extreme project delays. Consequences – Financial loss	Negative Medium	Negative Low
Causes – On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences – Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.	Negative Medium	Negative Low
Causes – Cyber security attacks aimed at the National Electricity Grid. Consequences – Ransom of the National Electricity Grid.	Negative Medium	Negative Low
Causes – Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse. Inadequate emergency response to small event leads to escalation. Consequences – Injuries turn to fatalities, small losses become extended down time.	Negative Medium	Negative Low

Impact	Pre-mitigation	Post-mitigation
Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences – Unknown hazards manifest due to using “cheaper supplier or less developed technology”.	Negative Medium	Negative Low
VRFB Energy Storage Systems		
Causes – Operation and maintenance materials, spare parts, paints, solvents, welding fumes, transformers oils, lubricating oils and greases, etc. Consequences – Occupational illness.	Negative Medium	Negative Low
Causes – Compromised battery compartments vapours accumulate in the containers, solids/ liquids on surfaces. Maintenance of battery components, corrosive and mildly toxic liquid on surfaces. Consequences – Dermatitis, skin /eye /lung irritation.	Negative Medium	Negative Low
Causes – Moving parts inside containers, buildings, pumps, compressors, cooling systems, etc. Consequences – Adverse impact on hearing of workers. Nuisance factor at near -by residences or other activities.	Negative Medium	Negative Low
Causes – Heat during the day. Batteries generate heat within enclosed building/ containers. Cold in winter. Night work requires lighting. Consequences – Heat stroke. Hypothermia.	Negative Low	Negative Low
Causes – Isolated workstation and monotonous repetitive work. Consequences – Low performance, system productivity suffers.	Negative Low	Negative Low
Causes – Lifting heavy equipment. Awkward angles during maintenance, stretching reaching to high level and bending to low level. Working ta height if equipment located on top of electrolyte tanks, roofs or elevated electrical equipment (e.g., pylons). Consequences – Back and other injuries.	Negative Medium	Negative Low
Causes – Involvement in an external fire, e.g., veld fire, maintenance vehicle fire, electrical systems fire. Manufacturing defects or damage to battery leading to shorting and heating. High humidity condensation of water or ingress of water or flooding leading to shorting. Dust accumulation on electrical parts leading to overheating. Excessive electrical loads – surges Operator abuse BMS failure or software failure. Incorrect extinguishing medium, escalate the fire. Consequences – Contaminated run off. Radiation burns. No affected bystanders. Damaged equipment. Fire spreads to other units or offsite if grass/ vegetation not controlled.	Negative Medium	Negative Low
Causes – PCS – DC to AC cooling failure electrical fire. Consequences – Fire starts in PCS or another section or room and spreads to battery area.	Negative Medium	Negative Low
Transformer shorting/ overheating/ explosion. Consequences – Potential fatalities, e.g., amongst first responders. Damage to nearby equipment.	Negative Medium	Negative Low
Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants. Consequences – Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms, etc.	Negative Low	Negative Low
Causes – Damaged batteries components, leak electrolyte, are completely broken exposing hazardous chemicals. Consequences – Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns for large exposure.	Negative Medium	Negative Low
Causes – Moving equipment, pumps, heavy equipment at elevation, nip points, working at heights. Traffic accidents. Earthquake / tremor. Consequences – Injury. Fatality in unlikely worst case, e.g., traffic	Negative Medium	Negative Low

Impact	Pre-mitigation	Post-mitigation
accidents or fall from heights. Damage to equipment, spills, environment pollution		
Causes – Use of electrical machines, generators, etc. Hot dry area static generation is highly likely. Lightning strike. Consequences – Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	Negative Medium	Negative Low
Not expected on a normal basis. Refrigerant may be an asphyxiant if accidentally released indoors it can accumulate and displace oxygen.	Negative Low	Negative Low
Causes – Cooling water blow-down. Laboratory waste (if included in the design). Maintenance waste, e.g., oils. Spills from batteries, coolant system, diesel trucks, transformers. Parked vehicles – oil drips. Fire water runoff control. Kitchen waste and sewage. Refrigerant release. VRFB electrolyte purging. Consequences – Pollution if not contained. Excessive disposal costs if emissions not limited.	Negative Low	Negative Low
Causes – Mess area and other solid waste. Disposal of battery components. Consequences – Environmental damage.	Negative Low	Negative Low
Causes – Similar to construction phase. Disposal of batteries or components. Disposal of containers. Water usage not controlled. Excessive purging of deteriorated or contaminated electrolyte. Consequences – Delays. Excessive costs and disposal of large volumes of hazardous waste.	Negative Low	Negative Low
Causes – Bright surfaces reflecting light. Tall structures in a flat area. Consequences – Irritation.	Negative Medium	Negative Low
Causes – Defective technology. Extreme project delays. Consequences – Financial loss	Negative Medium	Negative Low
Causes – On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences – Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.	Negative Medium	Negative Low
Causes – Cyber security attacks aimed at the National Electricity Grid. Consequences – Ransom of the National Electricity Grid.	Negative Medium	Negative Low
Causes – Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse. Inadequate emergency response to small event leads to escalation. Consequences – Injuries turn to fatalities, small losses become extended down time.	Negative Medium	Negative Low
Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences – Unknown hazards manifest due to using “cheaper supplier or less developed technology”.	Negative Medium	Negative Low

Decommissioning

Impact	Pre-mitigation	Post-mitigation
Impacts to Biophysical Systems		
Terrestrial Ecology and Aquatic /Wetland -Non-Identified		
Geotechnical		
Ground disturbance during access road construction, foundation earthworks, platform earthworks	Negative Low	Negative Low
Increased erosion due to vegetation clearing, alteration of natural drainage	Negative Low	Negative Low

Impact	Pre-mitigation	Post-mitigation
Agricultural Compliance Statement– none identified		
Avifaunal		
Displacement of priority species due to disturbance associated with decommissioning of the PV facilities and associated infrastructure.	Negative Medium	Negative Low
Traffic Impact		
Temporary increase in traffic due to construction vehicle trips on the external road network/ increase in noise and dust pollution levels during construction period / possible damage to road surface of access routes	Negative Medium	Negative Low
Impacts to Socio-Economic Component		
Social		
Rhino		
Expenditure associated with the decommissioning of the proposed development will impact the production of the local economy.	Positive Medium	Positive Medium
Temporary increase in country's GDP due to capital expenditure during the decommissioning period.	Positive Medium	Positive Medium
The decommissioning of the proposed development will positively impact the community and beyond by creating a number of job opportunities (albeit temporary).	Positive Medium	Positive Medium
Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	Positive Medium	Positive Medium
After decommissioning, the land can be restored and repurposed for other uses, potentially increasing its economic value for activities like agriculture, real estate development, or recreation.	Positive Medium	Positive Medium
SEFs contribute to local tax revenues. Decommissioning can lead to a reduction in tax income for municipalities and regions, impacting their ability to fund public services.	Negative Medium	Negative Medium
Decommissioning can be expensive, and the financial responsibility often falls on the facility owner or local government. These costs can strain budgets and resources.	Negative Medium	Negative Medium
Decommissioning means the loss of renewable energy production, which can affect the availability of energy resources in the region.	Negative High	Negative Medium
Effective waste management during the decommissioning phase of a solar farm is crucial for minimizing environmental impact, ensuring safe disposal of materials, and complying with regulations; however, it is costly due to specialized handling requirements and proper disposal methods.	Negative Medium	Positive Medium
Should the facility be decommissioned, jobs would be lost.	Negative Low	Negative Low
Sunnyside		
Expenditure associated with the decommissioning of the proposed development will impact the production of the local economy.	Positive Medium	Positive Medium
Temporary increase in country's GDP due to capital expenditure during the decommissioning period	Positive Medium	Positive Medium
The decommissioning of the proposed development will positively impact the community and beyond by creating a number of job opportunities (albeit temporary).	Positive Medium	Positive Medium
Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	Positive Medium	Positive Medium

Impact	Pre-mitigation	Post-mitigation
After decommissioning, the land can be restored and repurposed for other uses, potentially increasing its economic value for activities like agriculture, real estate development, or recreation.	Positive Medium	Positive Medium
SEFs contribute to local tax revenues. Decommissioning can lead to a reduction in tax income for municipalities and regions, impacting their ability to fund public services.	Negative Medium	Negative Medium
Decommissioning can be expensive, and the financial responsibility often falls on the facility owner or local government. These costs can strain budgets and resources.	Negative Medium	Negative Medium
Decommissioning means the loss of renewable energy production, which can affect the availability of energy resources in the region.	Negative High	Negative Medium
Effective waste management during the decommissioning phase of a solar farm is crucial for minimizing environmental impact, ensuring safe disposal of materials, and complying with regulations; however, it is costly due to specialized handling requirements and proper disposal methods.	Negative Medium	Positive Medium
Should the facility be decommissioned, jobs would be lost.	Negative Low	Negative Low
Heritage		
Rhino and Sunnyside		
Decommissioning activities that take place near to archaeological resources may result in their destruction	Negative Low	Negative Low
Decommissioning activities that take place near to palaeontological resources may result in their destruction	Negative Low	Negative Low
Visual		
Rhino		
Dust generated during decommissioning activities will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the site, during the decommissioning period.	Negative Medium	Negative Low
Sunnyside		
Dust generated during decommissioning activities will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the site, during the decommissioning period.	Negative Medium	Negative Low
Risk		
SSLB Energy Storage Systems		
Similar to the construction and operational phases – no new hazards.	N/A	
Causes – Batteries / equipment reached end of life and may leak. Consequences – Environment damage from heavy metal ions.	Negative Medium	Negative Low
Disposal of hazardous “waste” is rife with difficulties and numerous regulations that need to be complied with.	Negative Medium	Negative Low
VRFB Energy Storage Systems		
Similar to the construction and operational phases – no new hazards.	N/A	
Causes – Batteries/ electrolyte/ equipment reached end of life and may leak. Consequences – Environment damage from heavy metal ions.	Negative Medium	Negative Low
Disposal of hazardous “waste” is rife with difficulties and numerous regulations that need to be complied with.	Negative Medium	Negative Low

Cumulative

Impact	Pre-mitigation	Post-mitigation
Impacts to Biophysical Systems		
Terrestrial Ecology		
Transformation and presence of the facility will contribute to cumulative habitat loss and impacts on broad-scale ecological processes such as fragmentation.	Negative Medium	Negative Low
Agricultural – compliance statement – none identified		
Avifaunal- None identified		
Traffic Impact		
Further traffic impact due to increased traffic by other RE project being developed during the same time	Negative High	Negative Medium
Impacts to Socio-Economic Component		
Socio-economic		
Expenditure associated with the construction of the projects will have an impact on the production of the local economy.	Positive High	Positive High
Temporary increase in country's GDP due to capital expenditure	Positive High	Positive High
The construction of the Projects will positively impact the community and beyond by creating a number of job opportunities (albeit temporary).	Positive High	Positive High
An impact on the demographics of the area as a result of in-migration in response to job opportunities will occur.	Negative Medium	Negative Medium
The high number of facilities will have an impact on the geographical look of the local area, impacting potential local services and accommodation facilities.	Negative Medium	Negative Medium
Heritage		
Rhino & Sunnyside		
Cumulative destruction of significant archaeological heritage	Negative Low	Negative Low
Cumulative destruction of significant palaeontological heritage	Negative Low	Negative Low
Visual		
The site and surrounds are rural in character, there is a high concentration of approved renewable energy projects and associated grid infrastructure located around the project sites. While none of these facilities appear to be operational, as more of are constructed, the visual landscape is expected to be significantly transformed detracting from the visual quality of the region. As SEFs and WEFs proliferate, impacts will accumulate towards an unknowable threshold.	Negative Medium	Negative Low

SPECIALIST STUDIES

The following specialist studies have been undertaken for the project and their main findings and recommendations are included below:

Specialist Study	Findings and Recommendations
Aquatic / Freshwater	The Compliance Statement notes that the site's indicates that the aquatic ecological footprint will have a localised and minimal impact, preserving the

Specialist Study	Findings and Recommendations
	sensitive surroundings and water bodies associated with the broader project. The Platdoring River exhibits medium ecological sensitivity, and the L11F catchment has a low ecological importance sensitivity, with few sensitive aquatic elements near the study area. Despite being recognised as a vital ESA River system, the Platdoring River's low priority status is justified by continuous dry conditions and a persistent zero flow status. The aquatic compliance statement aims to minimise and mitigate potential impacts, with the overall effect on aquatic features deemed negligible despite ESA1 classification. Should the project progress, engagement with the DWS for the necessary water use authorisation application processes, such as a GA or WUL, will be required. The report recommends that the low importance and sensitivity of wetlands, rivers, and drainage lines (aquatic features) be considered by the DWS in deciding whether a GA or WUL is necessary in terms of Section 21 of the NWA.
Terrestrial Biodiversity including Animal and Plant Species	The desktop study revealed that very few species of conservational importance are found within the quarter degree grid cells encompassing the project area. However, of these species, none were recorded during site investigations nor are they expected to occur in areas directly related to the proposed project sites (with the exception perhaps of *Chersobius boulengeri*). CBAs are located north and west of the Rhino SEF site along the seasonal watercourse, Platdoring river. The small area of the CBA, which infringes the site to the west, was confirmed not to be of sensitive nature with the main drainage line in the center of the CBA being the driving feature from which the CBA has been delineated. This CBA will not be affected by the development as it infringes a mere 20 m into the site. The northern CBAs will also remain unaffected. It is also noteworthy that due to the low levels of transformation in the area, the irreplaceability of these CBAs is likely low. All major and minor drainage lines within the Rhino and Sunnyside solar PV areas are mapped as functional natural or near-natural ESAs. The ESAs are generally small and represent buffered areas around drainage features. This includes minor washes, the drainage areas largely devoid of riparian vegetation. It is unlikely that development would be able to avoid all ESAs and some habitat loss is inevitable. The minor drainage features in particular do not represent broad-scale ecological corridors and are unlikely to impact ecological functionality should development occur. Development will likely impinge on ESAs, however, these minor drainage lines are not particularly sensitive and the impacts would likely be low. The sites in question have been impacted by past and present anthropogenic activities, predominantly sheep farming, and can no longer be classified as pristine environments. This is evidenced from the grazing pressure and the presence of invasive species within the site. • Should development infringe on the 500 m regulated area surrounding any NFEPA identified wetland areas, or any specialist delineated wetlands, the applicant will need to approach the DWS and consider the relevant application processes for either a GA or a WUL. • It is recommended that highly sensitive areas be avoided for development as far as possible. Existing road infrastructure should be prioritised for use to minimise new road development.

Specialist Study	Findings and Recommendations
	• Road infrastructure crossing drainage lines must be free-draining, non-erosive in nature and bank stability must be maintained. The appropriate application process for Water Use must be followed. • Maintenance and monitoring plans should be compiled and be approved by the relevant regulatory authorities. These should relate to requirements of water use licencing, alien invasive control, and NEMA, specifically presences of SCCs and all mortalities of faunal species that occur on site. • While the presence of Black-footed Cats has been confirmed through previous assessments or direct sightings in the area under consideration, it was not found on site during the project assessment. This species is transient in nature and will avoid the area during construction. No direct impacts are expected. Nevertheless, should this species or any other SCC (faunal and floral) be identified on site during construction, this should be brought to the attention of the authors of this report to assisit with the management thereof. • It is recommended that the mitigatory measures as mentioned in Section 7 of the Terrestrial report be implemented and included in the EMPr and Authorisation application.
Agricultural	The site is classified as low to medium agricultural sensitivity by the National Web-Based Environmental Screening Tool promulgated in terms of Regulation 16(1)(b)(v) of the EIA Regulations, enacted under the NEMA. This has been confirmed by this assessment, because of the agricultural production potential and current agricultural land use. The arid climate is the limiting factor for land capability, regardless of the soil and terrain capability, although shallow, rocky soils are an additional limitation. Moisture availability is very limiting to any kind of agricultural production, including grazing and is completely insufficient for rain-fed crop production. The climate constraints mean that the site has low agricultural potential, and its agricultural use is limited to grazing only. The assessed development will not result in any loss of viable, arable land and therefore poses minimal threat to agricultural production potential.
Avifauna	A review of the data from the SABAP2 determined that a total of 183 bird species could potentially occur within the broader area where the PAOI is located (the PAOI includes the land parcels of both Rhino PV and Sunnyside PV). Of the 183 species, 75 are classified as priority species for solar developments. Of the 75 solar priority species, 24 were recorded during the on-site surveys (SSV site visit and pre-construction monitoring surveys), and 44 solar priority species have a medium to high likelihood of occurring regularly in the project area. The proposed mitigation measures as detailed in Sections 8 and 9 of the Avifaunal report and the EMPr must be strictly implemented.
Socio-Economic	The net positive impacts associated with the construction of the proposed development are expected to outweigh the net negative effects. The development is also envisaged to have a positive stimulus on the local economy and employment creation, leading to the economy's diversification and a small reduction in the unemployment rate. The proposed Rhino PV and Sunnyside PV facilities should therefore be considered for development. It should, however, be acknowledged that the negative impacts would be largely borne by the nearby farms and households residing on them, whilst the positive impacts will be distributed throughout both the local and national economies. Due to this imbalance, it is recommended that the mitigation measures suggested, be strictly adhered to. Application of these mitigation measures will ensure that the negative impacts on the nearby farms and

Specialist Study	Findings and Recommendations
	businesses are minimised and that the distribution of the potential benefits of the project are more balanced. It is important to value the landowners concerns and thus advised that further communication towards the landowners will be vital for the project.
Geotechnical	The assessment area is underlain by rock units of Adelaide Subgroup of the Beaufort Group and intrusive dolerite. The bedrock geology is covered by transported silts, sands and gravels, as well as well-developed calcrete. Some geotechnical constraints have been identified, primarily shallow and outcropping bedrock and calcrete which may cause excavation difficulties, and existing drainage channels with concentrated water flow. These conditions and associated constraints may be mitigated via standard engineering design and construction measures. The assessment Rhenosterkop Solar PV Facility area may be divided into two (2 No.) ZONEs (I and II) where similar geotechnical conditions are anticipated. ZONE I is defined by shallow occurring bedrock covered by thin, loose transported material and varying degrees of cemented calcrete. ZONE II can be characterised by relativity thicker alluvial deposits, identifiable by erosion paths, rills, and continuous drainage features. Intrusive investigation may reveal additional facets once variations in the subsoil profile become apparent. • The recommended mitigation measures must be implemented. • Further intrusive geotechnical investigations should be undertaken to confirm the engineering recommendations provided in this report.
Archaeological, Cultural Heritage and Palaeontological	The site forms part of a low significance cultural landscape representative of the Central Plateau of the Great Karoo possessing heritage value for historical, aesthetic, architectural, social and scientific reasons. The site possesses some landscape elements contributing to a composite cultural landscape, however, this particular area is already dominated by existing infrastructure. The addition of the proposed PV facility is therefore unlikely to negatively impact on any significant cultural landscape elements within this immediate context, or the broader context. The proposed development is located sufficiently far from the N1 scenic route, existing railway infrastructure and the Rhenosterkop farmstead that the anticipated impact to the heritage significance of these resources is considered to be negligible. Although the broader area has archaeological significance in terms of the sensitive dolerite outcrops in the area and associated rock art sites, no archaeological resources of significance were identified within the area proposed for the Rhino SEF. No further mitigation is recommended. A number of ruins of farm structures were identified within the development footprint for the Sunnyside SEF. These ruins are associated with the historic farming practices in this area and as such, have been determined to have contextual cultural value. These resources are Graded IIIC. A no development buffer of 50 m is recommended around these sites. Due to the age of these ruins, and their historic nature, excavations that take place in close proximity to these ruins are more likely to negatively impact associated buried archaeological heritage. It is recommended that this area be avoided by development activities. No observations of palaeontological significance were noted within the area proposed for development. However, the geology underlying the development area remains sensitive for impacts to significant palaeontological heritage.

Specialist Study	Findings and Recommendations
	Based on the outcomes of the report, it is not anticipated that the proposed development will negatively impact on significant heritage resources on condition that: • The buffers recommended are implemented. • The HWC Chance Fossil Finds Procedure is implemented for the duration of construction activities. • The recommendations of the VIA are implemented. • Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g., remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.
Risk (BESS)	• In order to highlight the maximum differences between the possible technology types, this study is based on the assumption that redox flow batteries (typically vanadium based chemistry) could be installed within a building using bulk tanks, while SSBs (typically lithium based chemistry) would be installed in shipping containers that have hundreds of individual batteries combined into packs. Redox flow batteries can be installed in containers where the individual quantities of electrolyte involved would be smaller, although the hazards are the same just smaller in magnitude. • There will always be residual risks but with the recommended preventative and mitigative measures these could be considered suitably low and therefore broadly acceptable.
Transport	• Feasible accessibility was assessed considering sight lines, access spacing requirements and road safety aspects and are discussed in this report. It is recommended to ensure that the access points are kept clear of vegetation and any other obstructions to ensure sight lines are kept. • In general, NMT is a dominant mode of transportation in rural areas, with private cars and minibus/taxis being the second-most used mode of transport, followed by buses. Currently, there are no known future planned public transport facilities in the vicinity of the site. However, generally the appointed contractor of a renewable energy project will provide either shuttle busses or accommodation on site for workers during the construction phase. • The highest trip generator for the proposed projects is expected during the construction phase. The actual construction stage peak hour trips are dependent on the construction period, construction programming, material availability, component delivery, abnormal load permitting, etc. The decommissioning phase is expected to generate similar trips as the construction phase. The recommended mitigation measures must be adhered to.
Visual/ Landscape	The sites are generally flat with elevated areas to the north-west and east of the Rhino SEF site and to the north of the Sunnyside SEF site. Further to the west and north-west of the sites, prominent mountain ranges are visible in the background. To the south-east and south of the sites fewer ridges exist, and isolated koppies and wide flat plains, typical of the Karoo, are more common.

Specialist Study	Findings and Recommendations
	Ephemeral watercourses drain the relatively higher altitudes. The Platdoring River traverses the Remainder of Farm Rhenosterkop 155. The vegetation on the sites include dwarf spiny shrubland, few low growing trees, drought-resistant grasses cover and thicket. The area around the project is predominantly characterised by grazing lands (natural vegetation), with supporting infrastructure (roads, powerlines and a railway line [Rhino SEF]). A mining permit has been issued for a dolerite quarry about 2.5 km to the east of the Rhino SEF. The sites are located 27 to 30 km from the nearest town of Beaufort West. The Karoo National Park is located about 30 km to the east of the sites. The visual quality of the area can be experienced through long closed views across plains of low growing vegetation and prominences and ridgelines defining the horizon and occasional pockets of development such as farmsteads and small towns, such as Beaufort West. The visual quality of the sites is consistent with the visual quality of the region: natural, visually untransformed environment that can be experienced by receptors as barren and harsh due to the desolate nature of the landscape. Both sites are used for sheep grazing. Both Rhino and Sunnyside SEF range from not visible to marginally visible from various viewpoints around the SEF sites. As such, the visibility of these SEF sites is considered low. PV arrays will introduce a large, uniform anthropogenic artefact into the landscape discordant with scale, texture and current land use around the SEF sites. The discordant nature of the SEF will result in the SEF being experienced as a visual intrusion in the landscape. As such, the project is considered to have low integrity with the surrounding landscape. Glare modelling was conducted for the proposed PV arrays. Notable findings of the modelling are as follows: • No glare emanating from Rhino SEF will be experienced by receptors; and • Motorists will experience short durations of yellow category glare from Sunnyside SEF while travelling on the gravel road. Less than 2.5 hours of yellow category glare will be experienced per year along the gravel road. • The recommended mitigation measures must be implemented.

BASIC ASSESSMENT PROCESS

The following steps were undertaken as part of the BA process:

- Site investigations by the EAP and specialists.
- SSVs by the EAP and specialists.
- The preliminary layout was investigated in order to avoid or minimise negative impacts and maximise potential benefits.
- An Impact Assessment was undertaken for the potential impacts associated with the proposed project.
- Environmental impact statements regarding the potential significance of residual impacts, taking into account proposed mitigation measures were provided in this BAR and EMPr.
- An EMPr covering construction and decommissioning phases of the proposed development were prepared. The EMPr's included input from specialists and incorporates recommendations for

mitigation and monitoring.

The following specialist studies have been undertaken for the project and the significant environmental aspects investigated:

- Desktop Geotechnical Assessment;
- Agricultural Compliance Statement;
- Aquatic/ Wetland Compliance Statement;
- Terrestrial Biodiversity (including Animal and Plant Species) Assessment;
- Avifaunal Assessment;
- Socio-Economic Assessment;
- Cultural Heritage, Archaeological and Palaeontological Assessment;
- Landscape/ Visual Assessment;
- Risk Assessment; and
- Transportation Assessment.

The findings of the specialist studies have been included in **Section 8** of this Final BAR. Therefore, the Final BAR includes conclusive findings of the specialists.

The associated Impact Assessment tables are included in **Section 16** of this Final BAR. The specialist studies identified opportunities and constraints associated with the sites and the proposed development.

SiVEST has consulted with the DFFE as follows:

- Pre-Application Meeting.
- Regulation 11, of the EIA Regulations, Application for a combined EA (BA) application process for the Rhino and Sunnyside SEF. The combined application was approved on **26 September 2023**.
- Submission of EA application form to obtain EA reference number.
- The Draft BAR was made available for comment to I&APs, key stakeholders and the authorizing authority including the general local public.
- After the Draft BAR was made available for comment in the public domain, comments were incorporated into a CRR and Final BAR.
- The Final BAR is submitted to the DFFE for review and decision-making.
- Notify I&APs and key stakeholders of the decision on the EA (BA) application.
- Further consultation with authorities occurred whenever necessary.

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BASIC ASSESSMENT PROCESS FOR THE SOLAR PHOTOVOLTAIC FACILITY, "RHINO PV" ON REMAINDER OF FARM RHENOSTERKOP 155 AND "SUNNYSIDE PV" ON FARM 400, BEAUFORT WEST

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FINAL BASIC ASSESSMENT REPORT

1. INTRODUCTION AND BACKGROUND

K2022578692 South Africa (Pty) Ltd is proposing to develop a solar photovoltaic (PV) facility and associated infrastructure on the Remainder of Farm Rhenosterkop 155 ("Rhino PV") and Farm 400 ("Sunnyside PV"), situated approximately 27 to 30 kilometres (km) to the east and north-east of Beaufort West in the Western Cape Province (refer to **Figure 1-1**). The sites fall within the Beaufort West Local Municipality and Central Karoo District Municipality.

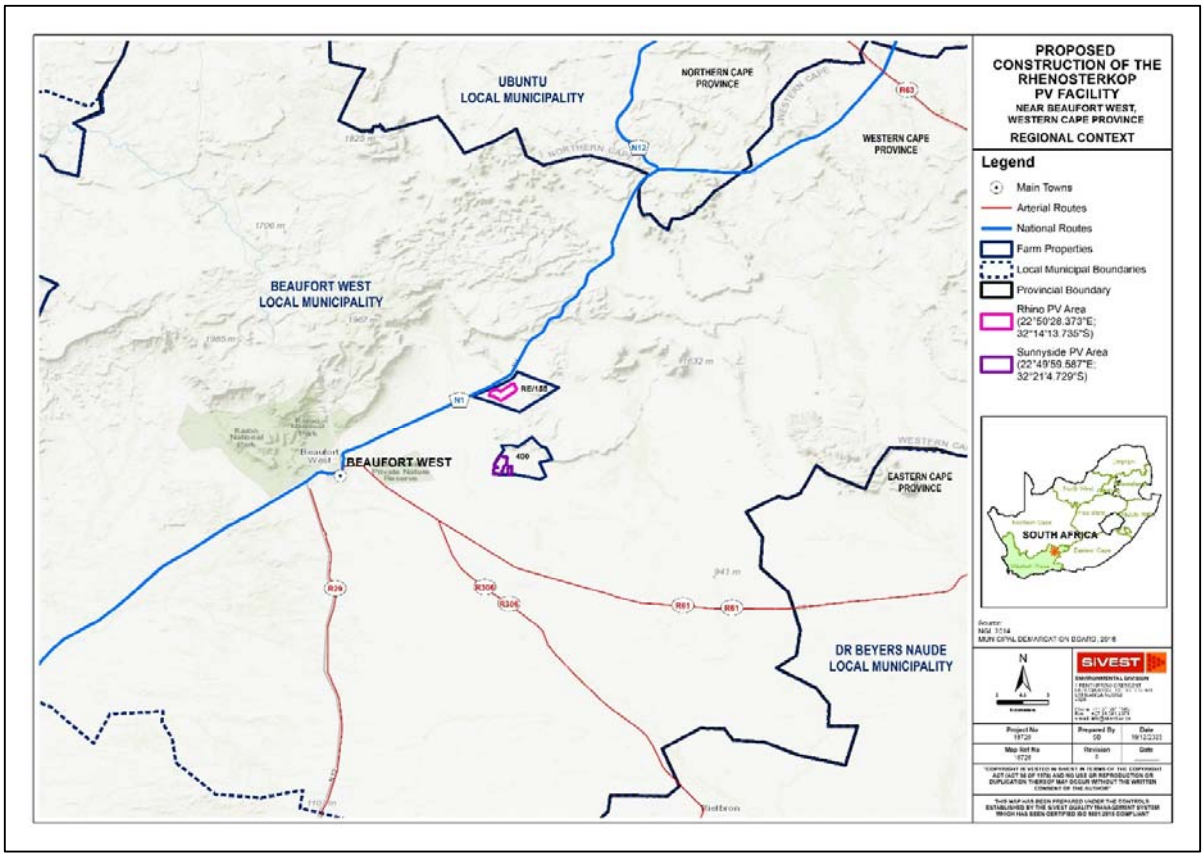

Figure 1-1: Regional context of the Rhino and Sunnyside PV Areas

The proposed project is envisaged to generate an output of up to 500 megawatts (MW) alternating current (AC) energy, the project is being developed either to supply the national grid under the Renewable Energy

Independent Power Producer Procurement Programme (REIPPPP) or similar procurement programme under the Integrated Resource Plan (IRP).

The electrical grid energy connection infrastructure associated with this project is being done separately by the applicant. This Basic Assessment (BA) only covers the proposed Solar Energy Facility (SEF).

SiVEST SA (Pty) Ltd's (SiVEST) Environmental Division has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the required Environmental Assessment (EA) application process in terms of the Environmental Impact Assessment Regulations, 2014 as amended (EIA Regulations), promulgated under Chapter 5 of the National Environmental Management Act, 1998 (Act 107 of 1998), as amended (NEMA) for the proposed development and associated infrastructure. The proposed SEF and associated infrastructure are situated within a Renewable Energy Development Zone (REDZ), namely Zone 11 Beaufort West, that has been formally gazetted in South Africa as per Government Notice (GN) No. 114 of 2018 and 144 of 2021 enacted under of Section 24(3) of the NEMA, for the purpose of development of solar and wind energy generation facilities. Thus, a BA process in terms of the EIA Regulations, is being undertaken. The **national Department of Forestry Fisheries and the Environment (DFFE) Reference Number is 14/12/16/3/3/1/2921**.

A Regulation 11, of the EIA Regulations, Application for a combined EA (BA) application process for the Rhino and Sunnyside SEF was lodged to the DFFE and approved on 26 September 2023.

1.1 Overview of the Basic Assessment Process

The NEMA promotes the use of the BA process to ensure integrated environmental management. The purpose of a BA is, therefore, to provide the Competent Authority (CA) with sufficient information to make an informed decision on whether an activity should proceed or not, and to assist with selecting an option that will provide the most benefit and cause the least impact. The BA process should identify activities which may have a detrimental effect on the environment, and which would, therefore, require EA prior to commencement.

As this project requires an EA in terms of the EIA Regulations, all the process steps including the Environmental Management Programme (EMPr) must be prepared in terms of the EIA Regulations.

1.1.1 Objectives and Overview of the Basic Assessment Process

The BA process involves establishing the existing environmental baseline of the site proposed for development, considering the type of development and its potential impacts, and determining what potential impacts should be assessed and how. The process includes a comprehensive study that assesses the sensitivities identified by the various specialists as well as the identified impacts of the proposed development. The main objective of the BA process, through consultation, is to assess the significance of the identified potential impacts that may occur as a result of the proposed development, provide mitigation measures and management recommendations to reduce the significant impacts, compile an EMPr to guide the construction phase to ensure correct monitoring procedures are followed, and to undertake a Public Participation Process (PPP).

Accordingly, the EAP compiled a Draft Basic Assessment (BAR) and EMPr which was made available for public and stakeholder comment for a period of 30 days as part of the PPP. All comments received in response to the Draft BAR are considered and responded to, and are incorporated into the Final BAR and final draft of the EMPr. The EMPr is not final until it has been amended with the conditions of an EA and other authorisations or licences, where relevant. The Final BAR is submitted to the CA for review and decision-

making.

1.1.2 Public Participation Process

Public and stakeholder participation is a fundamental component of the BA process. The inclusion of the views of Interested and Affected Parties (I&APs) aids in ensuring that the BA process is open, transparent and robust, and that the decision-making process is equitable and fair. This in turn guides informed choice and better environmental outcomes. It further presents a valuable source of information on key impacts, potential mitigation measures and the identification and selection of feasible alternatives. This process allows the EAP to identify key stakeholders and I&APs, as well as to identify any fatal flaws, at the onset of a project. The Draft BAR was made available to I&APs as well as Organs of State for a period of 30 days, thereafter, all comments were captured and responded to in a Comments and Responses Report (CRR) which is submitted to the DFFE along with this Final BAR for review and decision-making.

1.2 Content Requirements of a Basic Assessment Report

The content requirements of a BAR as provided for as per Appendix 1 of the EIA Regulations, as well as details of which section of this report fulfils these requirements are shown in **Table 1-1**.

Table 1-1: Content requirements of a BAR

Content Requirements	Applicable Section
(a) details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae (CV);	4 and Appendix 1
(b) the location of the activity, including- (i) the 21-digit Surveyor General (SG) code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	5
(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 is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	5 and Appendix 3
(d) a description of the scope of the proposed activity, including- (i) all listed and specified activities triggered; (ii) a description of the activities to be undertaken, including associated structures and infrastructure;	6
(e) a description of the policy and legislative context within which the development is proposed including: (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	10
(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 location;	12
(g) a motivation for the preferred site, activity and technology alternative;	13
(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 alternatives considered;	14, 15, 16, 20 and Appendix 7

Content Requirements	Applicable Section
(ii) details of the PPP undertaken in terms of Regulation 41 of the EIA Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by I&APs, 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 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) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and (xi) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	
(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: (i) a description of all environmental issues and risks that were identified during the EIA process; 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;	16 and Appendix 7
(j) an assessment of each identified potentially significant impact and risk, including: (i) cumulative impacts; (ii) the nature, significance and consequences 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; and (vii) the degree to which the impact and risk can be mitigated;	16 and Appendix 7
(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to the EIA Regulations and an indication as to how these findings and recommendations have been included in the FEIAR;	16 and Appendix 7
(l) an environmental impact statement which contains: (i) a summary of the key findings of the environmental impact assessment (EIA): (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	18

Content Requirements	Applicable Section
(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	
(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;	16, 17 and 19
(n) 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 15
(o) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	22
(p) 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;	23
(q) where the proposed activity does not include operational aspects, the period for which the EA is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	23
(r) 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 I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by I&APs;	24 and Appendix 1
(s) where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	N/A
(t) any specific information required by the CA; and	N/A
(u) any other matters required in terms of Section 24(4)(a) and (b) of the NEMA.	N/A
(2) Where a GN gazetted by the Minister provides for the BA process to be followed, the requirements as indicated in such notice will apply.	Appendix 8

2. PROJECT TITLE

Proposed solar photovoltaic facility, “Rhino PV” on Remainder of Farm Rhenosterkop 155 and “Sunnyside PV” on Farm 400, Beaufort West.

3. DETAILS OF APPLICANT

3.1 Name and contact details of the Applicant

Table 3-1: Name and contact details of the applicant

Name of Applicant	K2022578692 South Africa (Pty) Ltd
Physical Address	Unit 15, Canal Edge 2, Tyger Waterfront, Bellville, Cape Town
Postal Address	Same as physical
Postal Code	7530
Applicant Contact Person	Dirk Muller
Telephone	079 367 2593
Email	dirk@agv-za.co.za

4. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTIONER AND SPECIALISTS

4.1 Name and contact details of the Environmental Consultant

Table 4-1 provides the name and contact details of the Environmental Consultants who prepared this report:

Table 4-1: Name and contact details of the Environmental Consultant who prepared the report

Name of EAP	SiVEST SA (Pty) Ltd
Physical Address	16 Chester Road, Rondebosch, Cape Town
Postal Address	Same as physical
Postal Code	7701
Telephone	021 689 2733
EAP Contact Person	Zikhona Wana
Email	ZikhonaW@sivest.com

4.2 Names and expertise of the Environmental Assessment Practitioner

Table 4-2 provides the names, qualifications and registrations of the EAPs who prepared this report.

Table 4-2: Names and details of the expertise of the EAPs involved in the preparation of this report

Name EAP representative	Educational Qualifications	Professional Registrations/ Affiliations	Experience (years)
Natalie Pullen	MSc Environmental Biotechnology	*Reg. EAP*[1] with EAPASA[2], Reg. No. 2018/132	20
Luvanya Naidoo	BSc (Hons) Environmental Monitoring and Modelling	*Reg. EAP* with EAPASA Registration No. 2019/1404 *Pr.Sci.Nat*[3] with SACNASP[4] Registration No. 126107	14
Zikhona Wana	BTech Environmental Sciences	*Reg. EAP* with EAPASA, Registration No. 2019/555 *Pr.Sci.Nat* with SACNASP, Registration No. 119417	10

CV's of SiVEST personnel and the EAP declaration are attached in **Appendix 1.**

4.3 Names and expertise of the Specialists

Table *4-3* below provides the names of the specialists involved in the project:

[1] Registered Environmental Assessment Practitioner
[2] Environmental Assessment Practitioners Association of South Africa
[3] Professional Natural Scientist
[4] South African Council for Natural Scientific Professions

Table 4-3: Names of specialists involved in the project

Company/ Name	Name of representative of the specialist	Specialist	Educational Qualifications	Experience (years)
SRK Consulting (Pty) Ltd	Kelly Armstrong	Landscape/ Visual Assessment	BSocSc (Hons) in Environmental and Geographical Studies	5
CTS Heritage (Pty) Ltd	Jenna Lavin	Cultural Heritage, Archaeological, and Palaeontological Assessment	MSc. Archaeology And Palaeoenvironments Professional Archaeologist with ASAPA[5] Accredited Professional Heritage Specialist with APHP[6]	8
Johann Lanz	Johann Lanz	Agriculture Compliance Statement (Desktop)	MSc. Environmental Geochemistry *Pr.Sci.Nat.* (Soil Science) with SACNASP, Reg. No. 400268	24
AfriAvian (Pty) Ltd	Albert Froneman	Avifaunal Assessment	MSc. Conservation Biology *Pr.Sci.Nat.* (Zoological Science) with SACNAP, Reg. No. 400177	25
M2 Environmental Connections (Pty) Ltd	Hanjo Fourie	Aquatic Biodiversity (including Wetland) Compliance Statement	BSc. Environmental Management *Cert.Sci.Nat.* (Aquatic Science) with SACNASP, Reg No. 125420	11
PeraGaGE Consulting (Pty) Ltd	Duan Swart	Geotechnical Assessment (Desktop)	MSc Engineering Geology *Pr.Sci.Nat.* (Geological Science) with SACNASP, Reg. No. 137543	6
Urban-Econ Development Economists (Pty) Ltd	Pierre van Jaarsveld	Socio-Economic Assessment	B.TRP (Honours) Regional and Town Planning	17
M2 Environmental Connections (Pty) Ltd	Reuhl Lombard	Terrestrial Biodiversity (including Animal and Plant Species)	MSc Zoology *Pr.Sci.Nat* (Environmental Science) with SACNASP, Reg. No. 128735	7
iSHECON (Pty) Ltd	Debbie Mitchell	Risk Assessment (BESS)	MSc Process Safety & Loss Prevention	25
iWink (Pty) Ltd	Iris Wink	Transport Assessment	MSc Civil Engineering *Pr.Eng* with ECSA[7], Reg No. 20110156	20

[5] Association of Southern African Professional Archaeologists
[6] Association of Professional Heritage Practitioners
[7] Engineering Council of South Africa

5. LOCATION OF THE ACTIVITY

5.1 21 Digit SG Codes and Property Information

The details and visualisation of the affected properties are included in **Table *5-1*** and **Figure 5-1** below.

Table 5-1: 21 Digit Surveyor General Code and Property Information

Proposed Site	Property name	21-digit SG code	Extent
Rhino PV	Remainder of farm Rhenosterkop 155	C00900000000015500000	4 247 ha, only 563 ha available for development
Sunnyside PV	Farm 400	C00900000000040000000	4 035 ha, only 525.2 ha available for development

5.2 Co-ordinates of the Site

The centre point co-ordinates for the proposed sites are as follows:

- Rhino PV: 32’14'9.”54"S; 22°50’26”E
- Sunnyside PV: 22°49’59.587”S; 32°21’4.729”E

The geographical positioning systems (GPS) co-ordinates of the site and associated infrastructure have been included in **Table 5-2** and **Table *5-3***.

Table 5-2: GPS co-ordinates for the proposed Rhino PV

Corner/ Point	South	East
SEF Site		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°14’1.007”S	22°49’3.273”E
2	32°13’47.007”S	22°49’40.72”E
3	32°13’59.832”S	22°50’5.062”E
4	32°13’15.598”S	22°51’10.757”E
5	32°13’17.692”S	22°51’21.75”E
6	32°13’25.282”S	22°51’23.059”E
7	32°13’33.476”S	22°51’28.535”E
8	32°13’39.728”S	22°51’34.885”E
9	32°13’43.733”S	22°51’37.132”E
10	32°13’58.995”S	22°51’27.932”E
11	32°14’52.917”S	22°50’3.975”E
12	32°14’23.362”S	22°48’59.96”E
Coordinates at Centre Point (DD MM SS.sss)		
13	32°14'9.254"S	22°50'26"E
On-site Substation		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°14'50.452"S	22°50'1.733"E
2	32°14'48.614"S	22°50'4.797"E
3	32°14'50.953"S	22°50'6.941"E
4	32°14'52.847"S	22°50'4.017"E
Coordinates at Centre Point (DD MM SS.sss)		
5	32°14'50.814"S	22°50'4.49"E
Operation and Maintenance Building		

Corner/ Point	South	East
Coordinates at Corner Points (DD MM SS.sss)		
1	32°14'1.212"S	22°49'3.247"E
2	32°13'59.235"S	22°49'8.232"E
3	32°14'1.658"S	22°49'7.898"E
4	32°14'3.551"S	22°49'2.912"E
Coordinates at Centre Point (DD MM SS.sss)		
5	32°14'1.435"S	22°49'5.307"E
BESS		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°14'47.369"S	22°50'4.145"E
2	32°14'40.595"S	22°50'14.809"E
3	32°14'43.982"S	22°50'17.882"E
4	32°14'50.819"S	22°50'7.031"E
Coordinates at Centre Point (DD MM SS.sss)		
5	32°14'46.115"S	22°50'10.543"E
Site Laydown Area 1		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°14'49.445"S	22°50'0.414"E
2	32°14'47.308"S	22°50'3.72"E
3	32°14'48.41"S	22°50'4.665"E
4	32°14'50.479"S	22°50'1.359"E
Coordinates At Centre Point (DD MM SS.sss)		
5	32°14'49.018"S	22°50'2.551"E
Site Laydown Area 2		
Coordinates At Corner Points (DD MM SS.sss)		
1	32°13'17.447"S	22°51'11.019"E
2	32°13'16.448"S	22°51'16.208"E
3	32°13'16.741"S	22°51'17.812"E
4	32°13'17.034"S	22°51'17.95"E
5	32°13'18.74"S	22°51'17.794"E
6	32°13'18.844"S	22°51'9.933"E
Coordinates At Centre Point (DD MM SS.sss)		
7	32°13'17.896"S	22°51'13.898"E
Site Access Road		
Coordinates (DD MM SS.sss)		
Start	32°12'41.222"S	22°50'24.815"E
Middle	32°12'43.792"S	22°51'24.434"E
End	32°13'17.371"S	22°51'11.071"E
Internal Road Network		
Coordinates (DD MM SS.sss)		
Start	32°13'19.084"S	22°51'16.211"E
Middle	32°14'10.652"S	22°50'21.731"E
End	32°14'23.464"S	22°49'2.421"E

Table 5-3: GPS co-ordinates for the proposed Sunnyside PV

Corner/ Point	South	East
SEF Site		
Coordinates at Corner Points (DD MM SS.sss)		
West		
1	32°20'11.293"S	22°50'1.781"E
2	32°20'18.21"S	22°50'20.804"E

Corner/ Point	South	East
3	32°20'16.481"S	22°50'29.45"E
4	32°20'21.02"S	22°50'41.771"E
5	32°20'21.885"S	22°50'42.852"E
6	32°20'30.748"S	22°50'40.042"E
7	32°20'35.936"S	22°50'40.042"E
8	32°20'46.095"S	22°50'37.448"E
9	32°20'59.065"S	22°50'39.826"E
10	32°21'4.037"S	22°50'37.448"E
11	32°21'3.388"S	22°50'35.503"E
12	32°21'8.36"S	22°50'22.533"E
13	32°21'39.271"S	22°50'10.644"E
14	32°21'55.051"S	22°50'6.104"E
15	32°21'52.025"S	22°49'22.656"E
16	32°20'54.958"S	22°49'31.951"E
East		
1	32°21'7.063"S	22°50'52.796"E
2	32°21'9.873"S	22°51'7.927"E
3	32°21'56.565"S	22°51'5.117"E
4	32°21'57.213"S	22°50'46.743"E
5	32°21'24.16"S	22°50'44.743"E
6	32°21'16.488"S	22°50'49.94"E
Coordinates at Centre Point (DD MM SS.sss)		
West		
17	32°21'4.037"S	22°49'58.971"E
East		
7	32°21'33.315"S	22°50'56.283"E
On-site Substation		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°20'8.683"S	22°50'9.006"E
2	32°20'9.961"S	22°50'12.308"E
3	32°20'12.731"S	22°50'10.859"E
4	32°20'11.474"S	22°50'7.535"E
Coordinates at Centre Point (DD MM SS.sss)		
5	32°20'10.643"S	22°50'9.879"E
Operation and Maintenance Building		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°20'7.042"S	22°50'4.616"E
2	32°20'8.661"S	22°50'8.856"E
3	32°20'11.474"S	22°50'7.365"E
4	32°20'9.684"S	22°50'2.783"E
Coordinates at Centre Point (DD MM SS.sss)		
5	32°20'9.151"S	22°50'5.916"E
BESS		
Coordinates at Corner Points (DD MM SS.sss)		
1	32°20'9.961"S	22°50'12.5"E
2	32°20'16.098"S	22°50'28.843"E
3	32°20'18.293"S	22°50'20.874"E
4	32°20'14.244"S	22°50'10.284"E
Coordinates at Centre Point (DD MM SS.sss)		
5	32°20'14.628"S	22°50'17.998"E
Site Laydown Area 1		

Corner/ Point	South	East
Coordinates at Corner Points (DD MM SS.sss)		
1	32°20'9.977"S	22°50'2.778"E
2	32°20'12.908"S	22°50'10.807"E
3	32°20'14.183"S	22°50'10.074"E
4	32°20'11.092"S	22°50'2.109"E
Coordinates At Centre Point (DD MM SS.sss)		
5	32°20'11.793"S	22°50'5.996"E
Access Road		
Coordinates (DD MM SS.sss)		
West		
Start	32°19'37.751"S	22°50'22.916"E
Middle	32°19'53.17"S	22°50'11.781"E
End	32°20'8.589"S	22°50'3.214"E
East		
Start	32°21'6.41"S	22°50'28.27"E
Middle	32°20'58.272"S	22°50'45.831"E
End	32°21'8.337"S	22°50'52.898"E
Internal Road Network		
Coordinates (DD MM SS.sss)		
West		
Start	32°20'11.463"S	22°50'1.86"E
Middle	32°20'59.771"S	22°49'59.788"E
End	32°21'54.224"S	22°50'3.729"E
East		
Start	32°21'7.481"S	22°50'52.683"E
Middle	32°21'33.061"S	22°50'55.467"E
End	32°21'54.975"S	22°51'5.162"E

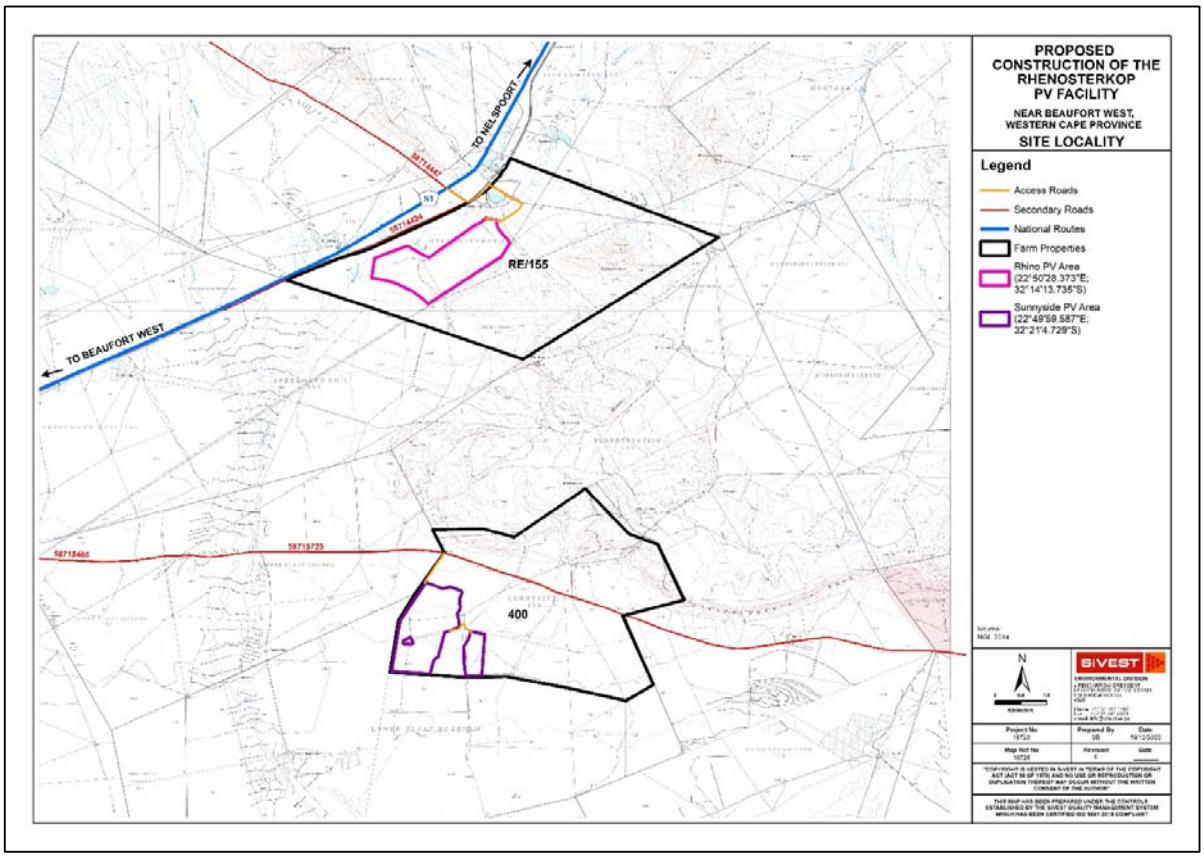

Figure 5-1: Locality of the proposed development sites

All maps associated with the sites are attached in **Appendix 2.**

6. ACTIVITY INFORMATION

6.1 Project Description

K2022578692 South Africa (Pty) Ltd intends to develop a solar PV facility and associated infrastructure approximately 20 km east and north-east of Beaufort West. The solar facility will have a generating capacity of up to 500 MW AC. The combined total development footprint of the project site will be approximately 1 080,15 hectares (ha), with Rhino at about 561.17 and Sunnyside 518.98 ha, including supporting infrastructure save for the electrical grid infrastructure.

6.1.1 SEF and associated Infrastructure

The Rhino and Sunnyside Layouts are reflected in **Figure 6-1** and **Figure 6-2** and attached in **Appendix 3**. Photographs of the site are included in **Appendix 4**. The solar PV panels and all other project infrastructure will be placed strategically within the developable area based on environmental constraints.

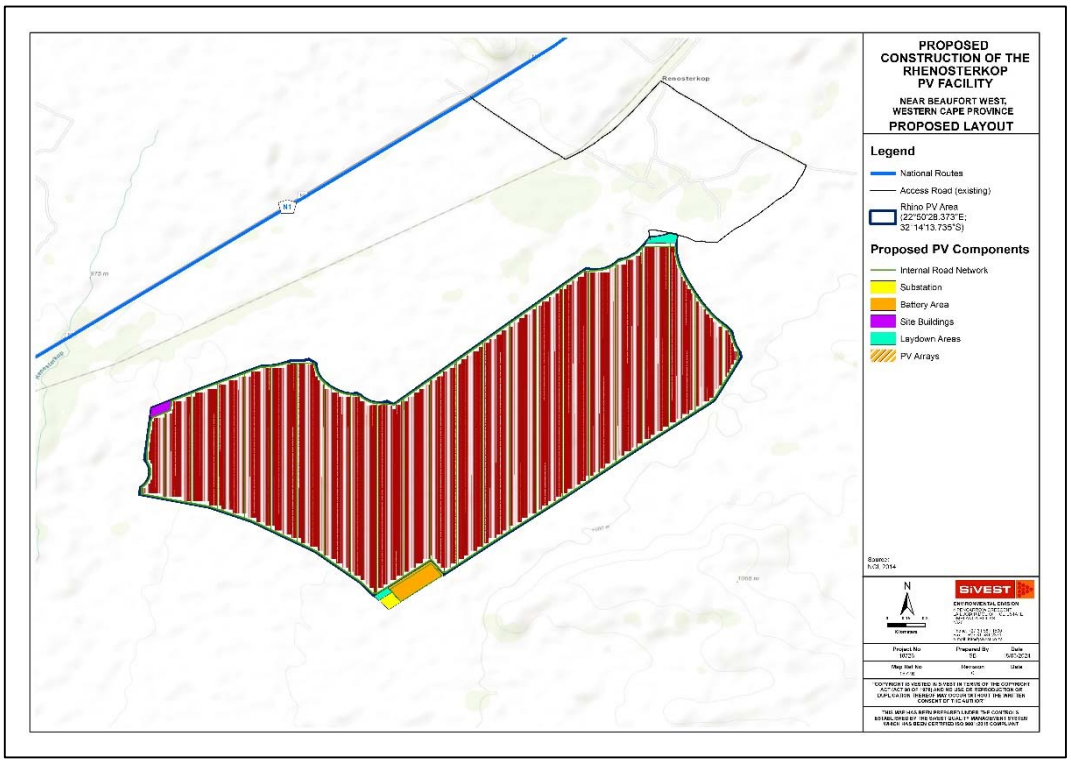

Figure 6-1: Rhino Layout showing location of solar PV panels (i.e., buildable area) and infrastructure

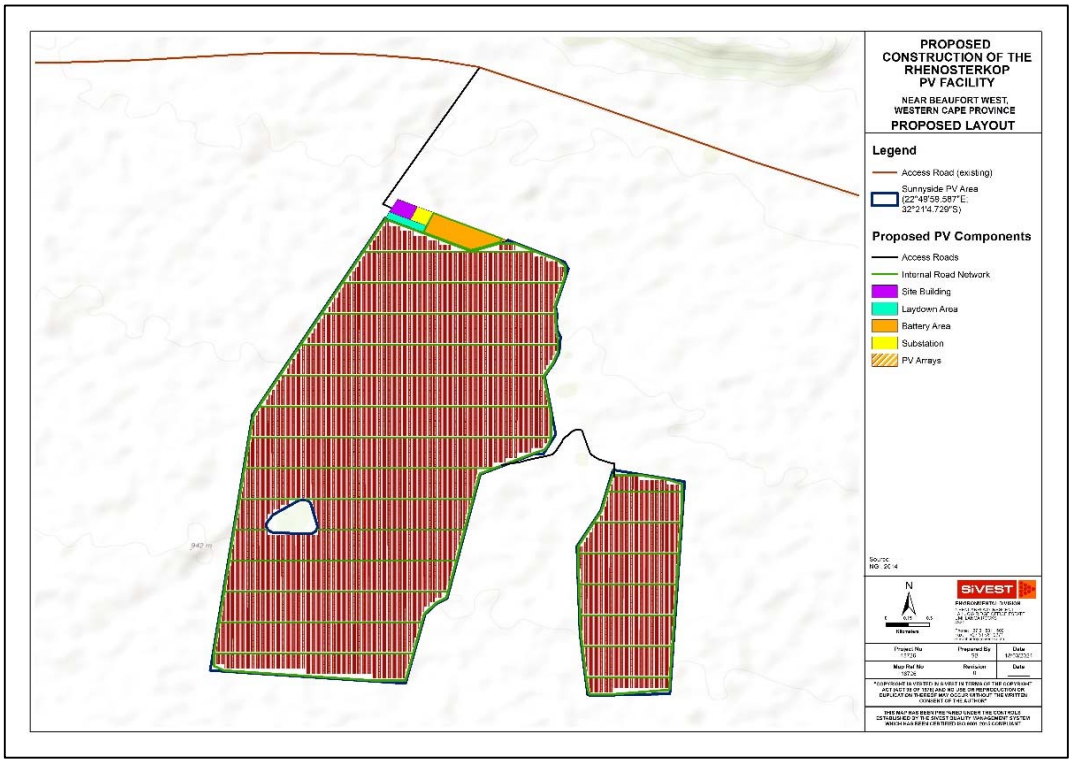

Figure 6-2: Sunnyside layout showing location of solar PV panels (buildable area) and infrastructure

6.1.2 Main Components of a Solar PV Facility

The term PV describes a solid-state electronic cell that produces direct current (DC) electrical energy from the radiant energy of the sun through a process known as the PV Effect. This refers to light energy placing electrons into a higher state of energy to create electricity. Each PV cell is made of silicon (i.e., semiconductors), which is positively and negatively charged on either side, with electrical conductors attached to both sides to form a circuit. This circuit captures the released electrons in the form of an DC.

It is anticipated that the proposed Solar PV energy facility will include PV fields (arrays) comprising multiple PV panels. Solar PV panels are usually arranged in rows consisting of a number of PV modules. Refer to **Figure 6-3** for the typical components of a solar panel.

The solar arrays are usually connected in strings, which are in turn connected to inverters. Sections of the PV array will be wired to inverters. The inverter is a pulse-width mode inverter that converts DC electricity to AC electricity at grid frequency. DC power from the panels will be converted into AC power in the inverters and the voltage will be typically stepped up to a medium voltage (MV) in the transformers. MV cabling will link the solar PV facility to the grid connection infrastructure (33/132 kV on-site substation). The MV cables will be run underground (wherever technically feasible) in the facility before being fed to the on-site and/or collector substation, where the voltage will typically be stepped up.

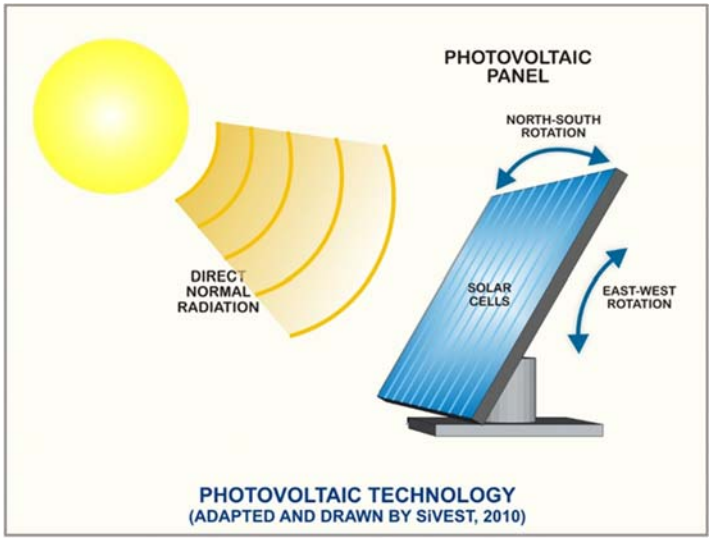

Figure 6-3: Typical components of a solar PV panel

The solar PV electricity generation process is illustrated in **Figure 6-4**.

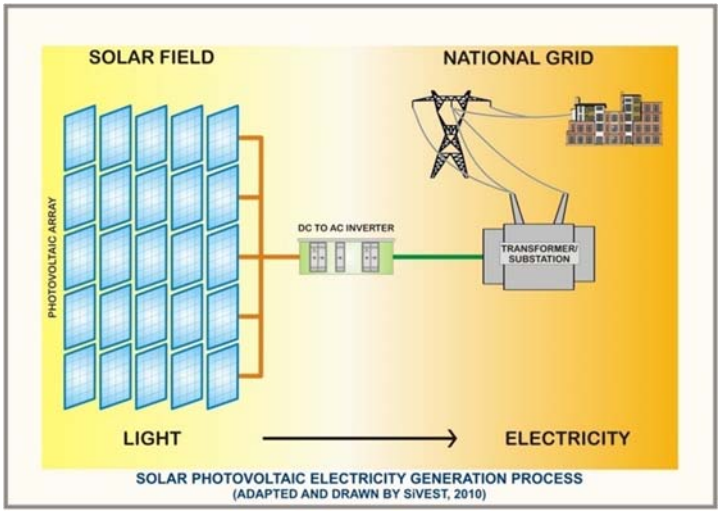

Figure 6-4: Solar PV electricity generation process

The main components of the proposed project are described below, it should be noted that the information applies to each site unless stated otherwise.

6.1.2.1 Solar PV Arrays

The proposed solar PV facility will include PV fields (arrays) comprising multiple PV panels. The PV Panel Array is proposed to produce up to 500 MW AC, the facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Monofacial or Bifacial solar panels will be considered as the preferred solar PV panel type. However, the specific technology types will only be determined following Engineering, Procurement and Construction (EPC) Procurement. Each PV module will be approximately 1 to 1.3 metres (m) wide by 2 to 2.4 m height and mounted on supporting structures above ground. Sections of the PV array will be wired to inverters.

6.1.2.2 Inverters

Inverter technology will either be string-type and mounted on or next to the PV structures, or central-type and mounted in containers on concrete foundations.

6.1.2.3 On-site Substations

The proposed Rhino and Sunnyside SEF development will include the construction of one new 33 kV/132 kV on-site substation each. The substation will occupy an area of approximately 1 ha with a height of 21 m. DC power from the modules will be converted into AC power in the inverters and the voltage will be stepped up to MV in the inverter transformers. MV cabling will link the various PV arrays to the on-site substation. These cables will be laid underground wherever technically feasible. Various transformers will be located within the PV area, these will combine the power from multiple inverters and step up the supply voltage from 800 volts (V) to 33 kV. The expected capacity of these transformers is in the range of 2.5 megavolt ampere each.

6.1.2.4 BESS

The Battery Energy Storage System (BESS) is envisaged to occupy an area of 5 to 5.8 ha. The final BESS capacity is subject input by Department of Mineral Resources and Energy (DMRE), National Energy Regulator of South Africa (NERSA) and Eskom Holdings SOC Limited (Eskom) regarding the dispatchability and

ancillary services to be provided by the hybrid Solar PV and BESS facility. This may range between 77 MW/ 308 megawatt hour (MWh), in line with the latest Energy Storage Independent Power Producer Procurement Programme (ESIPPPP) bidding round 2, and 240 MW/ 960 MWh, in line with 4 hours of rated capacity. These stated capacities are also subject to the charging, discharging and augmentation regime established during the subsequent design phases of the project.

6.1.2.5 Electrical Reticulation Network

An internal electrical reticulation network will be required and will be laid approximately 2 to 4 m underground, as far as practically possible.

Electrical supply during the construction phase will be provided by means of generators. On completion of the construction phase, the operational phase will draw power from the facility.

6.1.2.6 Water

Existing boreholes will be tested. If there are no existing potential boreholes, new boreholes will be required. Water will be stored on site using jojo tanks storing borehole or municipal water. The necessary approvals from the Department of Water and Sanitation (DWS) will be applied for separately (should this be required).

6.1.2.7 Roads

Access to the proposed facility will be via existing roads. The Rhino site can be accessed from the N1, 30 km outside Beaufort-West, between Beaufort West and Three Sisters. This will lead to a Transnet Holdings SOC Limited (Transnet) service road used by the local population for access to farms and smallholdings. The site will be located immediately to the right at the T-junction of the road that connects the service road and the N1. Access to the Sunnyside solar PV site is gained approximately 3.2 km outside Beaufort-West on R61 and onto Hopewell Road in an easterly direction. After 24.1 km, the right leads onto Farm 400. Existing access gravel roads with a width of 6 m to 8 m (+/-15%) will be used within the solar PV facility, new internal gravel roads of approximately 4 m wide may, however, will be constructed where necessary. The Rhino and Sunnyside solar PV facility will have roads of approximately 36.26 km and 44.26 km, respectively.

6.1.2.8 Fence and Security

For health, safety and security reasons, the facility will be fenced off from the host and surrounding farms. The project will have permanent security on site for 24 hours per day, 7 days a week. A triple wire fence, electrical fencing of various length (Rhino solar PV at 11 076 m, Sunnyside solar PV west at 11 408.45 m and east at 3 959 m) and 3 m maximum height will be installed.

6.1.2.9 Supporting Infrastructure

The following auxiliary buildings with basic services including water and electricity will be required on the site:

- 1 ha construction camps, per site, will be utilised in each site. These will then become the operational site camp offices, workshop areas, operation and maintenance (O&M) buildings, permanent parking area, storage area or office;
- Laydown Areas (envisaged at 2 ha), two on Rhino and one on Sunnyside SEF site.

6.1.3 Technical Detail Summary

A summary of the project technical detail is provided in the table below.

Table 6-1: Technical Detail Summary of Solar PV Facility

Component	Description/ Dimensions on Rhino site	Description/ Dimensions on Sunnyside site
Location of site (centre point)	32°14'9.254"S; 22°50'26"E	22°49'59.587"S; 32°21'4.729"E
Application site area	Remainder of farm Rhenosterkop 155: 4 247 ha, only 563 ha available for development	Farm 400: 4 035 ha, only 525.2 ha available for development
Solar PV development area	533.94 ha	494.93 ha
SG codes	Remainder of farm Rhenosterkop 155: C09900000000015500000	Farm 400: C09900000000040000000
Export capacity	Up to 250 MW	Up to 250 MW
PV Panels	Mono- or bifacial panels will be used, not thin film Panel width and height (to be confirmed during detailed design phase) Expected panel dimensions: Width: 1 – 1.3 m Height: 2 – 2.4 m	Mono- or bifacial panels will be used, not thin film Panel width and height (to be confirmed during detailed design phase) Expected panel dimensions: Width: 1 – 1.3 m Height: 2 – 2.4 m
On-site Substation	One 132 kV 21 m height 1 ha Substation will step up voltage from 33 to 132 kV Various transformers will be located within the PV area. These will combine the power from multiple inverters and step up the supply voltage from 800 V to 33 kV. The expected capacity of these transformers are in the range of 2.5 megavolt ampere each Note that the voltage levels are estimates and subject to confirmation/change during the detail design phase of the project	One 132 kV 21 m height 1 ha Substation will step up voltage from 33 to 132 kV Various transformers will be located within the PV area. These will combine the power from multiple inverters and step up the supply voltage from 800 V to 33 kV. The expected capacity of these transformers are in the range of 2.5 megavolt ampere each Note that the voltage levels are estimates and subject to confirmation/change during the detail design phase of the project
BESS	5 to 5.8 ha The final BESS capacity is subject input by DMRE, NERSA and Eskom regarding the dispatchability and ancillary services to be provided by the hybrid Solar PV and BESS facility. This may range between 77 MW/ 308 MWh, in line with the latest ESIPPPP bidding round 2, and 240 MW/ 960 MWh, in line with 4 hours of rated capacity. These stated capacities are also subject to the charging, discharging and augmentation regime established during the subsequent design phases of the project.	5 to 5.8 ha The final BESS capacity is subject input by DMRE, NERSA and Eskom regarding the dispatchability and ancillary services to be provided by the hybrid Solar PV and BESS facility. This may range between 77 MW/ 308 MWh, in line with the latest ESIPPPP bidding round 2, and 240 MW/ 960 MWh, in line with 4 hours of rated capacity. These stated capacities are also subject to the charging, discharging and augmentation regime established during the subsequent design phases of the project.
Proximity to grid connection	The facility is planned to connect to a new Main Transmission Substation (MTS) which will be established near the project site. The new MTS will tie in via loop-in-loop-out connection to the existing Droërivier/Hydra 400 kV lines.	The facility is planned to connect to a new MTS which will be established near the project site. The new MTS will tie in via loop-in-loop-out connection to the existing Droërivier/Hydra 400 kV lines. Alternatively, the project can tie into

Component	Description/ Dimensions on Rhino site	Description/ Dimensions on Sunnyside site
	Alternatively, the project can tie into the existing Droërivier MTS via a 132 kV connection. It should be noted that this does not form part of this application	the existing Droërivier MTS via a 132 kV connection. It should be noted that this does not form part of this application
O&M buildings	The 1 ha construction camps will become the operational site camp offices, workshop areas, O&M building, permanent parking area, storage area	The 1 ha construction camps will become the operational site camp offices, workshop areas, O&M building, permanent parking area, storage area
Access roads	6 – 8 m access roads +/-15% 4 m internal roads	6 – 8 m access roads +/-15% 4 m internal roads
Site Access	Turn southward off from N1, 30 km outside Beaufort-West, between Beaufort-West and Three Sisters. This will lead to a Transnet service road used by the local population for access to farms and smallholdings. The site will be located immediately to the right at the T-junction of the road that connects the service road and the N1	Approximately 3.2 km outside Beaufort-West on the R61, turn onto the Hopewell Road in an Eastern direction. After 24.1 km, turn right onto Farm 400 through the gate to the farm. This will be the main access point to the site
Construction camp	One 1 ha temporary containers	One 1 ha temporary containers
Temporary construction laydown/ staging area	2 ha within the development area – laydown (x 2)	2 ha within the development area – laydown (x 1)
Fence/ security	Triple wire fence, electrical fencing: Maximum height 3 m Length – 11 076 m	Triple wire fence, electrical fencing: Maximum height 3 m Length – Sunnyside PV west at 11 408.45 m and east 3 959 m
Boreholes and storage tanks (if applicable), per site	Existing boreholes will be tested. If no potential boreholes (existing), new boreholes will be required. Water will be stored on site using jojo tanks storing borehole or municipal water.	Existing boreholes will be tested. If no potential boreholes (existing), new boreholes will be required. Water will be stored on site using jojo tanks storing borehole or municipal water.

6.2 NEMA Listed Activities

The EIA Regulations, promulgated under Section 24(5) of the NEMA and published in GN No. R. 326, lists activities which may not commence without EA from the CA. The proposed project comprises activities identified in terms of GN No. R. 327, 325 and 324 (Listing Notice 1, 2 and 3 respectively), activities which must, therefore, follow a Scoping and Environmental Impact Assessment Reporting process. However, due to the sites being situated with REDZ 11 Beaufort West, the assessment to be followed in a BA. The triggered, listed activities are depicted in **Table 6-2**:

Table 6-2: Listed activities in terms of EIA Regulations applicable to the proposed project

Activity No.:	Relevant Listed Activity as set out in of the EIA Regulations	Describe the portion of the proposed project to which the applicable Listed Activity relates	
		Rhino	Sunnyside
Listing Notice 1			
11.(i)	The development of facilities or infrastructure for the transmission and distribution of electricity: (i) outside	The developer proposes to install 33 kV MV	The developer proposes to install 33 kV MV

Activity No.:	Relevant Listed Activity as set out in of the EIA Regulations	Describe the portion of the proposed project to which the applicable Listed Activity relates	
		Rhino	Sunnyside
	urban areas or industrial complexes with a capacity of more than 33 but less than 275 kV; or…	underground cables and 132 kV on-site substation.	underground cables and 132 kV on-site substation.
12.(ii)(a)(c)	The development of:…(ii) infrastructure or structures with a physical footprint of 100 square metres (m^2) or more; where such development occurs: (a) within a watercourse;…(c) if no development setback exists, within 32 m of a watercourse, measured from the edge of a watercourse…	Drainage lines were delineated within and outside the site, the development will include developing over drainage lines.	Wetland and drainage lines were delineated within and outside the sites, the development will encroach wetlands and include developing over drainage lines.
19.	The infilling or depositing of any material of more than 10 cubic metres (m^3) into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 m^3 from a watercourse…	Drainage lines were delineated within and outside the site, some drainage lines are envisaged to be infilled.	Drainage lines and wetlands were delineated within and outside the sites, the development will either encroach the wetlands and some drainage lines are envisaged to be infilled on both sites.
24.(ii)	The development of a road:…(ii) with a reserve wider than 13.5 m, or where no reserve exists where the road is wider than eight metres…	Access roads (upgrading) of 6 m to 8 m +/-15% are planned as part of the Rhino and Sunnyside solar PV facility.	Access roads (upgrading) of 6 m to 8 m +/-15% are planned as part of the Rhino and Sunnyside solar PV facility.
28.(ii)	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:…(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 ha…	The proposed site is currently used and zoned for agricultural purposes, i.e., grazing. The proposed development will result in an area of agricultural land greater than 1 000 ha being transformed to industrial/ commercial use.	The proposed sites are currently used and zoned for agricultural purposes, i.e., grazing. The proposed development will result in an area of agricultural land greater than 1 000 ha being transformed to industrial/ commercial use.
48.i.(a)(c)	The expansion of (i) infrastructure or structures where the physical footprint is expanded by 100 m^2 or more…where such expansion occurs (a) within a watercourse;…or (c) if no development setback exists, within 32 m of a watercourse, measured from the edge of a watercourse…	The proposed development will entail the expansion (upgrading) of roads by approximately 186 000 m^2 within drainage lines.	The proposed development will entail the expansion (upgrading) of roads by approximately 150 000 m^2 within drainage lines and 32 m from the edge of wetlands.
56.(ii)	The widening of a road by more than six metres, or the lengthening of a road by more than 1 kilometre:…(ii) where no reserve exists, where the existing road is wider than eight metres...	Internal and access roads (upgrade) of 4 m and 6 m to 8 m +/-15%, respectively, are planned as part of the SEF (36.26 km).	Internal and access roads (upgrade) of 4 m and 6 m to 8 m +/-15%, respectively, are planned as part of the SEF (44.26 km).
Listing Notice 3			
4.i.ii.(aa)	The development of a road wider than 4 m with a reserve less than 13.5 m. **i. Western Cape** ii. Areas outside urban	Parts of the proposed site were delineated as “Grassy Shrubland” and “Arid Karoo	Parts of the proposed site were delineated as “Grassy Shrubland” and “Arid Karoo

Activity No.:	Relevant Listed Activity as set out in of the EIA Regulations	Describe the portion of the proposed project to which the applicable Listed Activity relates	
		Rhino	Sunnyside
	areas; (aa) Areas containing indigenous vegetation…	Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". Access and internal roads (upgrading) of 6 to 8 m +/-15% and 4 min width, respectively, are planned where indigenous vegetation exists on site.	Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". Access and internal roads (upgrading) of 6 to 8 m +/-15% and 4 min width, respectively, are planned where indigenous vegetation exists on the sites.
12.i.ii.	The clearance of an area of 300 m^2 or more of indigenous vegetation… **i. Western Cape** ii. Within critical biodiversity areas (CBAs) identified in bioregional plans;	Parts of the proposed site were delineated as "Grassy Shrubland" and "Arid Karoo Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". The site measures approximately 561.17 ha and therefore approximately 5 000 000 m^2 of this vegetation will be cleared in preparation for the development. The site encroaches a CBAs with no CBAs situated inside the site.	
14.(ii)(a)(c)i. i.(ff)	The development of…(ii) infrastructure or structures with a physical footprint of 10 m^2 or more; where such Development occurs: (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 m of a watercourse, measured from the edge of a watercourse… **i. Western Cape** i. Outside urban areas:… (ff) CBAs or ecosystem service areas as identified in systematic biodiversity plans adopted by the CA or in bioregional plans…	The infrastructure development on site which encroaches a CBAs, is 5 611 700 m^2 and some will be situated within and in 32 m of wetlands. The site is situated 30 km outside of Beaufort West.	
18.(i)(ii)(aa)	The widening of a road by more than four metres, or the lengthening of a road by more than one kilometre. **(i) Western Cape** (i) Areas zoned for use as public open space or equivalent zoning; (ii) All areas outside urban areas: (aa) Areas containing indigenous vegetation…	Parts of the proposed site were delineated as "Grassy Shrubland" and "Arid Karoo Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". Access roads (upgrading) of 6 to 8 m +/-15% are planned as part of the SEF (36.26 km). The	Parts of the proposed site were delineated as "Grassy Shrubland" and "Arid Karoo Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". Access roads (upgrading) of 6 to 8 m +/-15% are planned as part of the SEF (44.26 km) solar

Activity No.:	Relevant Listed Activity as set out in of the EIA Regulations	Describe the portion of the proposed project to which the applicable Listed Activity relates	
		Rhino	Sunnyside
		site is situated 30 km outside of Beaufort West.	PV facility. The sites are situated 27 km outside of Beaufort West.
23.(ii)(a)(i)(i)(ff)	The expansion of:…(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs: (a) within a watercourse; **(i) Western Cape** (i) Outside urban areas: (ff) CBAs or ecosystem service areas as identified in systematic biodiversity plans adopted by the CA or in bioregional plans;	Parts of the proposed site were delineated as "Grassy Shrubland" and "Arid Karoo Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". Drainage lines were also delineated on or in close proximity to site. The site encroaches a CBAs. Expansion (186 000 m^2) of existing internal roads is planned to occur within or close to these resources. The site is situated 30 km outside of Beaufort West.	
Listing Notice 2			
1.	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 MW or more…	The proposed development will entail the construction of a SEF where the respective electricity output will be up to 500 MW. In addition, the proposed SEF development will be located outside urban areas.	The proposed development will entail the construction of a SEF where the respective electricity output will be up to 500 MW. In addition, the proposed SEF development will be located outside urban areas.
15.	The clearance of an area of 20 ha or more of indigenous vegetation…	Parts of the proposed site were delineated as "Grassy Shrubland" and "Arid Karoo Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". The site measures approximately 533.94 ha and therefore indigenous vegetation of approximately 533.94 ha of vegetation will be cleared in preparation for the development.	Parts of the proposed site were delineated as "Grassy Shrubland" and "Arid Karoo Shrubland" with some designated "Calcrete Ridge" and "Degraded Sandveld". The site measures approximately 494.93 ha and therefore indigenous vegetation of approximately 494.93 ha of vegetation will be cleared in preparation for the development.

7. NATIONAL WEB-BASED ENVIRONMENTAL SCREENING TOOL

The National Web-based Environmental Screening Tool (Screening Tool) is a geographically based web-enabled application which allows a proponent intending to submit an application for EA, in terms of the EIA

Regulations, to screen their proposed site for any environmental sensitivity.

As per GN No. 320 and 1150 of 2020 before the Specialist Assessment is undertaken, as identified by the Screening Tool, it is the responsibility of the EAP and specialists to undertake SSVs to ascertain the sensitivities and determine the level of assessment.

According to the Screening Report, attached in **Appendix 8**, the themes described in **Table 7-1** and ***Table 7-2*** are applicable to the proposed development. The table also includes Site Sensitivity Verification (SSV) by both the EAPs and specialists, as a consequence of the SSV the Compliance Statements and Specialist Assessments were undertaken.

Table 7-1: DFFE Screening Tool Environmental Sensitivity for Rhino PV

Screening Report Theme	Screening Report Sensitivity	EAPs/ Specialist Sensitivity	EAP/ Specialist SSV
Agriculture	Medium	Low to Medium	An Agriculture SSV was undertaken by Johann Lanz (**Appendix 6**). According to the SSV, the Screening Tool classifies the fenced area as ranging from low to medium agricultural sensitivity. None of the land is classified as cropland and the rating of agricultural sensitivity is, therefore, purely a function of classified land capability. The classified land capability of the site ranges from 5 to 8. This assessment verifies that the site is not within crop boundaries. It disputes the classified land capability of >7, based on an assessment that the site is unsuitable for viable rain-fed crop production, predominantly because of climate limitations but also because of soil limitations. The appropriate land capability of land that is unsuitable for viable rain-fed crop production is ≤7 because the relationship between land capability and agricultural production potential is such that a land capability of >7 should denote land that is suitable for viable rain-fed crop production. This assessment, therefore, confirms the low to medium sensitivity rating by the Screening Tool but disputes a land capability of 8. This assessment rates the entire proposed site as being of low to medium agricultural sensitivity with a maximum land capability of 7.
Animal Species	High	Medium	A Terrestrial Biodiversity SSV, which included Animal and Plant Species, was undertaken by M2 Environmental Connections (Pty) Ltd (Appendix 6). According to the SSV, there are no species of conservation concern (SCC) or red-list species occurring within several medium sensitivity plant species reported in the Screening Tool. None of the medium sensitivity nor red-listed species were recorded during the site assessment. The sites had low plant biodiversity, as expected with the comparative low species diversity and endemism of the Nama-Karoo. No sensitive species identified by the Screening Tool as potentially being at the site were found and, therefore, the site as a whole was determined to be of low plant sensitivity overall. According to the specialist, the animal theme is characterised as medium sensitivity.

Screening Report Theme	Screening Report Sensitivity	EAPs/ Specialist Sensitivity	EAP/ Specialist SSV
Aquatic Biodiversity	Very High	Low	An Aquatic SSV was undertaken by M2 Environmental Connections (Pty) Ltd (**Appendix 6**). According to the SSV, the site in question was identified as having "very high sensitivities" following the Screening Tool Report generation with the project area falling within an ESA1: Aquatic region as well as having a very high (Rivers_Z) classification. Although the River system is classified as a very sensitive feature it is classified as a River Con Z: which indicates that the Tributary condition modelled as not intact, according to natural land cover. The (NBA 2018) also further classifies the River system as non-free flowing. No NFEPA Wetlands were identified on-site with a small Unchanneled Valley Bottom Wetland being the only wetland system in close proximity to the study area. 90% of the project area falls under a "Low Sensitivity" while non-perennial drainage lines are featured as having "Very High Sensitivity".
Archaeological and Cultural Heritage	Low	Medium	An Archaeological and Cultural Heritage SSV was undertaken by CTS Heritage (Pty) Ltd (**Appendix 6**). According to the SSV, while no archaeological resources of significance were identified within the area proposed for the development of the Rhino PV facility, some were identified in close proximity to the development area, but outside its borders.
Avian	Low	High	An Avifaunal SSV was undertaken by AfriAvian (Pty) Ltd (**Appendix 6**). According to the SSV, the Rhino PV and immediate environment is classified as **Medium** and **High** sensitivity for terrestrial animals under to the Terrestrial Animal Species Theme (as per the DFFE screening tool). The High classification is linked to the potential occurrence of Ludwig's Bustard (Globally and Regionally Endangered), Verreaux's Eagle (Regionally Vulnerable), Southern Black Korhaan (Globally and Regionally Vulnerable), Martial Eagle (Globally and Regionally Endangered) and Lanner Falcon (Regionally Vulnerable). The project area of impact PAOI contains confirmed habitat for SCC as defined in the GN No. 1150 of 2020. The occurrence of SCC was confirmed during the SSV site visits (26–29 September 2022) with observations of Martial Eagle, Verreaux's Eagle, Blue Crane (Globally Vulnerable and Regionally Near Threatened), Karoo Korhaan (Regionally Near threatened), Ludwig's Bustard and Secretarybird (Globally and Regionally Endangered) recorded, and during the pre-construction monitoring surveys of August 2023 and November 2023 with observations of Karoo Korhaan, Kori Bustard (Globally and Regionally Near Threatened), and Southern Black Korhaan were recorded (Globally and Regionally Vulnerable). Based on the available SABAP2 data and the on-site surveys, the classification of **Medium and/or High** sensitivity for avifauna in the DFFE Screening Tool is supported for the site. **It is suggested that a High Sensitivity rating is appropriate (for the Rhino SEF)**.

Screening Report Theme	Screening Report Sensitivity	EAPs/ Specialist Sensitivity	EAP/ Specialist SSV
Civil Aviation (Solar PV)	Low	Low	The entire site has a low sensitivity in terms of the defence theme. No further assessment required.
Defence	Low	Low	The entire site has a low sensitivity in terms of the defence theme. No further assessment required.
Landscape (Solar)	Very High	Medium	The Landscape/ Visual SSV was undertaken by SRK Consulting (Pty) Ltd (**Appendix 6**). According to the SSV, there are existing corpses of trees that line the SEF property and the N1 national road providing screening for the project to receptors located to the north and north-west of the site, where the majority of the receptors are located. As such, the visibility of the site is considered be low.
Palaeontology	Very High	Low	A Palaeontological SSV was undertaken by CTS Heritage (Pty) Ltd (**Appendix 6**). According to the SSV, no highly significant palaeontological resources were identified within the development footprint, and the geology underlying the development area is not very sensitive for impacts to significant fossils. As per the findings of the assessment, and its supporting documentation, the outcome of the sensitivity verification disputes the results of the Screening Tool for Palaeontology and should be considered to be low.
Plant Species	Medium	Low	A Terrestrial Biodiversity SSV, which included Animal and Plant Species, was undertaken by M2 Environmental Connections (Pty) Ltd (**Appendix 6**). Very few plant species have been recorded in the QDG which encompasses the project site (3222BB), with only 115 species recorded. The neighbouring QDGs (3222BB, 3222BC), which consist of similar habitat, were included for a more comprehensive species list of potentially occurring species. Thus, a total 526 plant species have been recorded in the area encompassing and neighbouring the project area as a whole, of which no species had statuses higher than Near Threatened. The Screening Tool however identified four species to be investigated. The plant theme is confirmed as Low sensitivity.
RFI (Radio Frequency Interference)	Medium	Low	The Screening Report describes areas falling within 1 km of a telecommunication facility or between 30 and 60 km from a Weather Radar installation and within the radar's line of sight as medium sensitivity. It is unlikely that the proposed development will interfere with the telecommunication and weather radar installations given in nature, SEF. The sensitivity has therefore been assigned low and no further assessment is required. The relevant departments will be consulted with during the PPP to confirm requirements (if any).

Screening Report Theme	Screening Report Sensitivity	EAPs/ Specialist Sensitivity	EAP/ Specialist SSV
Terrestrial Biodiversity	Very High	Medium	A Terrestrial Biodiversity SSV, which included Animal and Plant Species, was undertaken by M2 Environmental Connections (Pty) Ltd (**Appendix 6**). According to the SSV, based on the information gathered from online databases, as well as a ground truthing site visit conducted on the 10 – 12 October 2023, it is the opinion of the specialists that the habitat found on the sites could potentially house SCCs and as such is overall of medium sensitivity for Terrestrial Biodiversity.

Table 7-2: DFFE Screening Tool Environmental Sensitivity for Sunnyside Site (West and East)

Screening Report Theme	Screening Report Sensitivity		EAPs/ Specialist Sensitivity	EAP/ Specialist SSV
	Sunnyside Site West	Sunnyside Site East		
Agriculture	Medium	Medium	Low to Medium	An Agriculture SSV was undertaken by Johann Lanz (**Appendix 6**). The Screening Tool classifies the fenced area as ranging from low to medium agricultural sensitivity. None of the land is classified as cropland and the rating of agricultural sensitivity is, therefore, purely a function of classified land capability. The classified land capability of the site ranges from 4 to 8. This assessment verifies that the site is not within crop boundaries. It disputes the classified land capability of >7, based on an assessment that the site is unsuitable for viable rain-fed crop production, predominantly because of climate limitations but also because of soil limitations. The appropriate land capability of land that is unsuitable for viable rain-fed crop production is ≤7 because the relationship between land capability and agricultural production potential is such that a land capability of >7 should denote land that is suitable for viable rain-fed crop production. This assessment, therefore, confirms the low to medium sensitivity rating by the Screening Tool but disputes a land capability of 8. This assessment rates the entire proposed site as being of low to medium agricultural sensitivity with a maximum land capability of 7.
Animal Species	High	High	Medium.	A Terrestrial Biodiversity SSV, which included Animal and Plant Species, was undertaken by M2 Environmental Connections (Pty) Ltd (**Appendix 6**). According to the SSV, there are no SCC or red-list species occurring within several medium sensitivity plant species reported in the Screening Tool. None of the medium sensitivity nor red-listed species were recorded during the site assessment. According to the specialist, the animal theme is characterised as medium sensitivity.

Screening Report Theme	Screening Report Sensitivity		EAPs/ Specialist Sensitivity	EAP/ Specialist SSV
	Sunnyside Site West	Sunnyside Site East		
Aquatic Biodiversity	Very High	Low	Low	An Aquatic SSV was undertaken by M2 Environmental Connections (Pty) Ltd (**Appendix 6**). According to the SSV, the site in question was identified as having “very high and low sensitivities” following the Screening Tool Report generation, with the project area falling within an ESA1. No NFEPA Wetlands were identified on-site. A wetland, not earmarked for development, was identified on site with other wetlands identified outside. 90% of the project area is categorised as "Low Sensitivity”.
Archaeological and Cultural Heritage	Low	Low	Medium	An Archaeological and Cultural Heritage SSV was undertaken by CTS Heritage (Pty) Ltd (**Appendix 6**). According to the SSV, while no archaeological resources of significance were identified within the area proposed for the development of the Rhino PV facility, some were identified in close proximity to the development area, but outside its borders. According to the specialist the results of the screening tool for archaeology and cultural heritage are disputed and should be considered to be medium.
Avian	Low	Low	High	An Avifaunal SSV was undertaken by AfriAvian (Pty) Ltd (**Appendix 6**). According to the SSV, the Sunnyside PV and immediate environment is classified as **Medium** and **High** sensitivity for terrestrial animals under to the Terrestrial Animal Species Theme (as per the DFFE Screening Tool). The High classification is linked to the potential occurrence of Ludwig’s Bustard (Globally and Regionally Endangered), Verreaux’s Eagle (Regionally Vulnerable), Southern Black Korhaan (Globally and Regionally Vulnerable), Martial Eagle (Globally and Regionally Endangered) and Lanner Falcon (Regionally Vulnerable). The occurrence of SCC was confirmed during the SSV site visits (26–29 September 2022) with observations of Martial Eagle, Verreaux’s Eagle, Blue Crane (Globally Vulnerable and Regionally Near Threatened), Karoo Korhaan (Regionally Near threatened), Ludwig’s Bustard and Secretarybird (Globally and Regionally Endangered) recorded, and during the pre-construction monitoring surveys of August 2023 and November 2023 with observations of Karoo Korhaan, Kori Bustard (Globally and Regionally Near Threatened), and Southern Black Korhaan were recorded (Globally and Regionally Vulnerable). Based on the available SABAP2 data and the on-site surveys, the classification of **Medium and/or High**

Screening Report Theme	Screening Report Sensitivity		EAPs/ Specialist Sensitivity	EAP/ Specialist SSV
	Sunnyside Site West	Sunnyside Site East		
				sensitivity for avifauna in the DFFE Screening Tool is supported for the site including the smaller land parcel that forms part of Sunnyside SEF. **It is suggested that a High Sensitivity rating is appropriate (for the Sunnyside SEF).**
Civil Aviation (Solar PV)	Low	Low	Low	The entire site has a low sensitivity in terms of the defence theme. No further assessment required.
Defence	Low	Low	Low	The entire site has a low sensitivity in terms of the defence theme. No further assessment required.
Landscape (Solar)	Medium	N/A	Medium	The Landscape/ Visual SSV was undertaken by SRK Consulting (Pty) (**Appendix 6**). The SEF is located at least 1 km from the gravel farm road to the north of the site. Limited vegetation exists directly surrounding the proposed site, therefore, there is limited screening of the site, particularly from the gravel farm road traversing the property to the north of the SEF. The visibility of the site is considered to be moderate.
Palaeontology	Very High	Low	Low	A Palaeontological SSV was undertaken by CTS Heritage (Pty) Ltd (**Appendix 6**). According to the SSV, no highly significant palaeontological resources were identified within the development footprint, and the geology underlying the development area is not very sensitive for impacts to significant fossils. As per the findings of the assessment, and its supporting documentation, the outcome of the sensitivity verification disputes the results of the Screening Tool for Palaeontology and should be considered to be low.
Plant Species	Medium	Medium	Low	A Terrestrial Biodiversity SSV, which included Animal and Plant Species, was undertaken by M2 Environmental Connections (Pty) Ltd (Appendix 6). Very few plant species have been recorded in the QDG which encompasses the project site (3222BB), with only 115 species recorded. The neighbouring QDGs (3222BB, 3222BC), which consist of similar habitat, were included for a more comprehensive species list of potentially occurring species. Thus, a total 526 plant species have been recorded in the area encompassing and neighbouring the project area as a whole, of which no species had statuses higher than Near Threatened. The Screening Tool, however, identified four species to be investigated. The plant theme is confirmed as Low sensitivity.
RFI (Radio Frequency Interference)	Low	Low	Low	The Screening Report describes areas falling within 1 km of a telecommunication facility or between 30 and 60 km from a Weather Radar installation and within the radar's line of sight as medium sensitivity.

Screening Report Theme	Screening Report Sensitivity		EAPs/ Specialist Sensitivity	EAP/ Specialist SSV
	Sunnyside Site West	Sunnyside Site East		
				It is unlikely that the proposed development will interfere with the telecommunication and weather radar installations given in nature, SEF. The sensitivity has therefore been assigned low and no further assessment is required. The relevant departments will be consulted with during the PPP to confirm requirements (if any).
Terrestrial Biodiversity	Very High	Low	Medium	A Terrestrial Biodiversity SSV, which included Animal and Plant Species, was undertaken by M2 Environmental Connections (Pty) Ltd (**Appendix 6**). According to the SSV, based on the information gathered from online databases, as well as a ground truthing site visit conducted on the 10 – 12 October 2023, it is the opinion of the specialists that the habitat found on the sites could potentially house SCCs and as such is overall of medium sensitivity for Terrestrial Biodiversity.

8. DESCRIPTION OF THE BIOPHYSICAL AND PHYSICAL ENVIRONMENT

8.1 Geographical

The proposed site is situated approximately 27 km to 30 km east and north-east of the town of Beaufort West in the Beaufort West Local Municipality, which falls within the central Karoo District Municipality in the Western Cape Province (refer to **Figure 1-1** and **Figure 5-1**).

8.2 Land Use/ Cover

According to the South African National Land Cover dataset (GeoTerra Image, 2018), the proposed Rhino solar PV site assessment area is characterized, equally, by shrubland and barren land while the Sunnyside solar PV site is majorly barren (refer to **Figure 8-1**). Immediately outside the sites the landuses/ land cover comprises shrub and barren land with patches of grassland, cultivated land and water bodies. Throughout the general study area, the land appears to be fallow shrubland, hence livestock farming is the dominant agricultural activity, although livestock densities appear to be relatively low.

Farm properties in the broader study area tend to be relatively large resulting in a low density of rural settlement. Built form is largely characterised by scattered farmsteads and ancillary farm buildings, gravel access roads, telephone lines, existing electrical lines, fences and the remnants of disused workers' dwellings. Other human influence is visible in the area in the form of roads, rail and electricity infrastructure. This includes the N1 and other secondary roads. The tall steel structures of the towers of the powerlines are visible in the landscape.

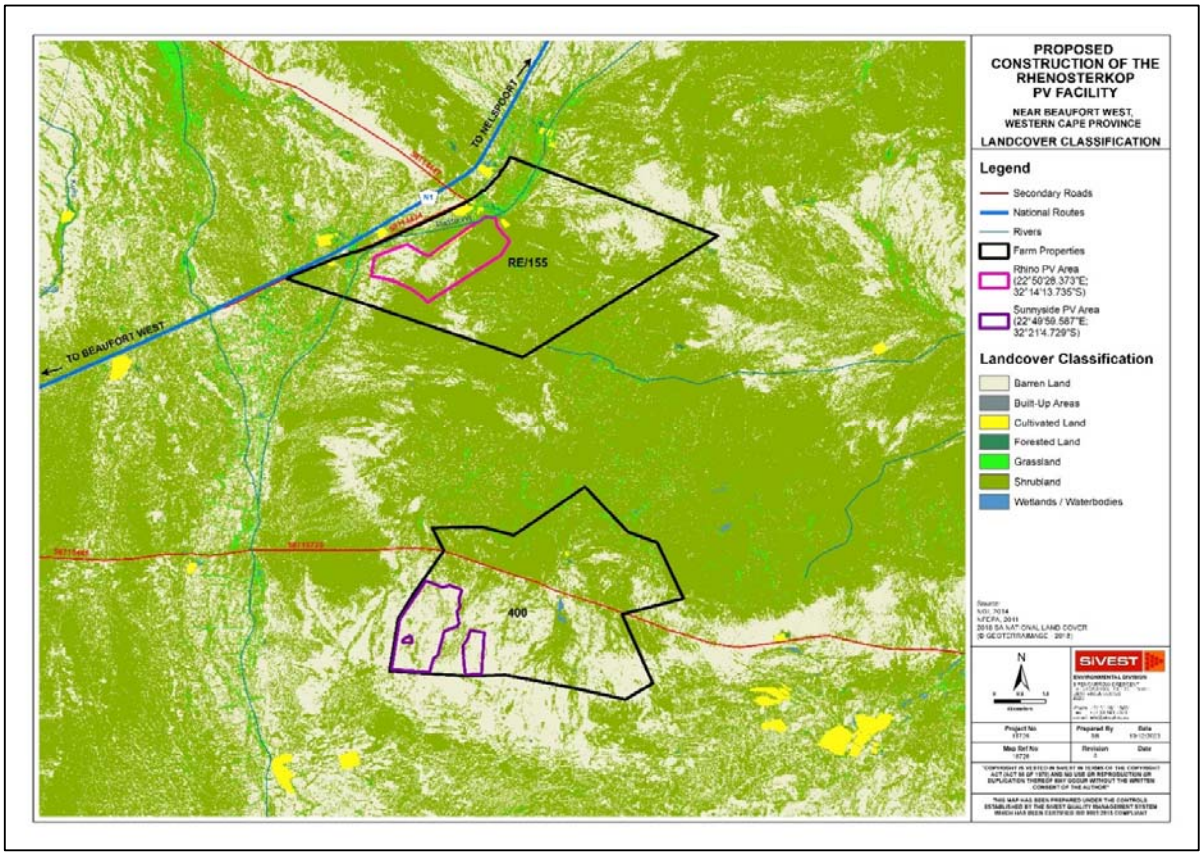

Figure 8-1: Land Cover Classification

8.3 Climate

The area surrounding Beaufort West is considered to have a local steppe climate with little rainfall throughout the year. The area can be classified as cold semi-arid climate (BSk) according to the Köppen- Geiger climate classification. The average annual rainfall is 392 mm with the average maximum and minimum temperatures of 24°C and 11.1°C, respectively. The temperature in summer a is hot, maximum 31.7°C, with cold winter nights, minimum 4.4°C.

Regarding solar radiation levels, South Africa overall experiences an average daily range of 4.5 to 6.5 kilowatt-hour per square meter (kWh/m^2). In Beaufort West specifically, the region receives an average of around 3496 hours of sunshine annually.

8.4 Topography and Drainage

The Rhino solar PV development area is characterised being flat with a very gentle slope to the west at a gradient of less than 2 %. The site drainage is expected to occur as sheetwash and throughflow towards the east into the Renosterspruit before flowing into the Platdoring River heading south. The site exists in a maximum and minimum elevation of 1 000 and 960 metres above mean sea level (mamsl), respectively. The topographical map is presented in **Figure 8-2** and the expected drainage direction with 20 m contours is shown in **Figure 8-3**.

The Sunnyside solar PV development area is sloping towards the south at gradients approximately equal to 2%. The site area is flat to slightly undulating. The site drainage is expected to occur as sheetwash and throughflow towards the south into the Platdoring River heading south. The site exists in a maximum and minimum elevation of 940 and 890 mamsl, respectively. The topographical map is presented in **Figure 8-4** and the expected drainage direction with 20 m contours is shown in **Figure 8-5**.

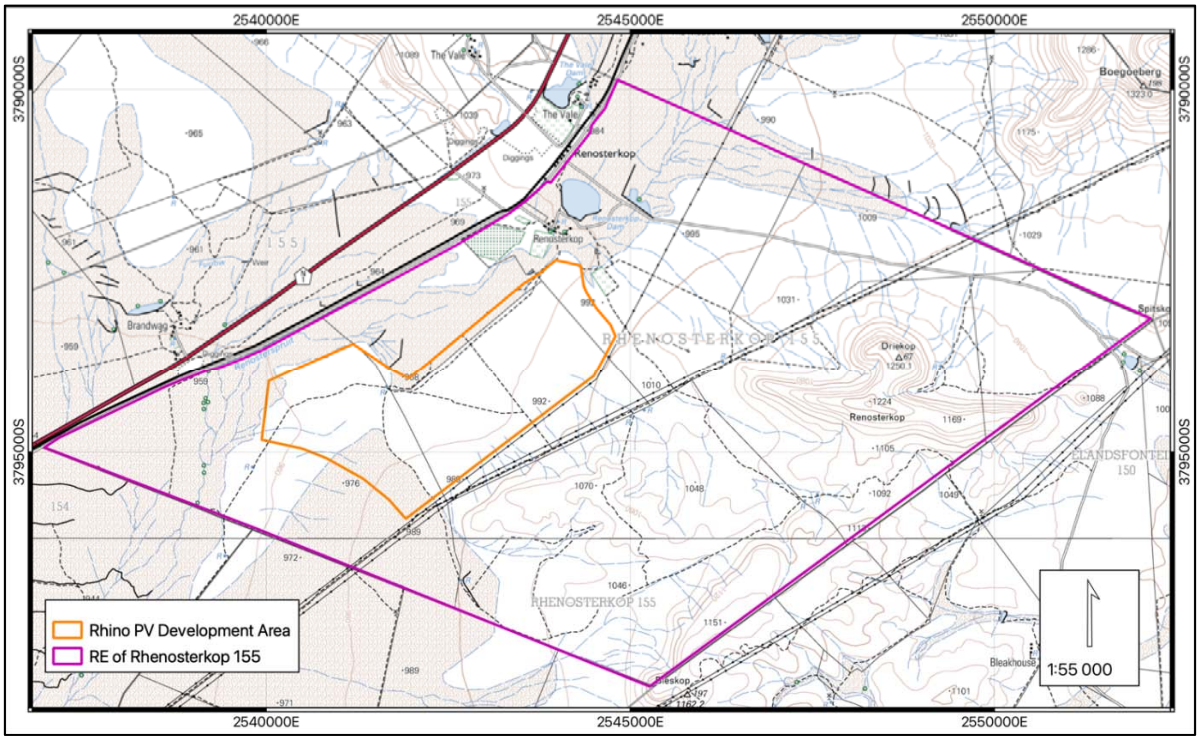

Figure 8-2: Topography of the proposed Rhino solar PV site

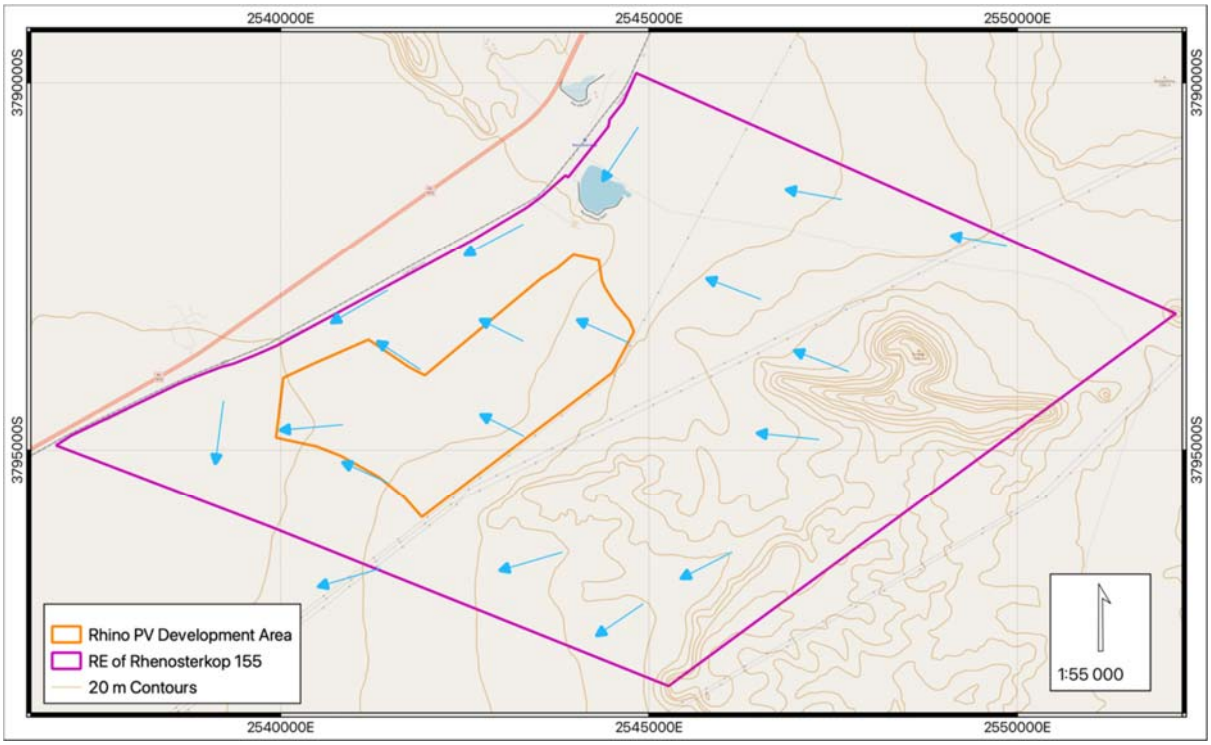

Figure 8-3: Drainage features and 20 m contours associated with the Rhino solar PV site

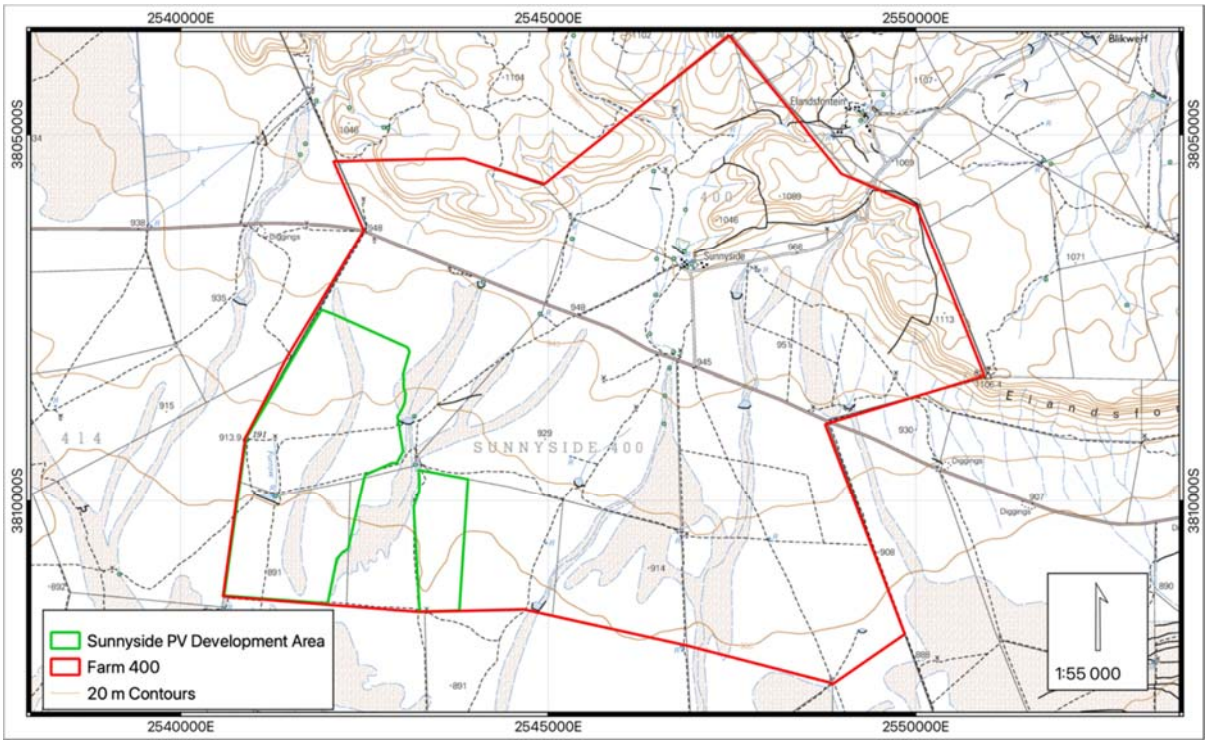

Figure 8-4: Topography of the proposed Sunnyside solar PV site

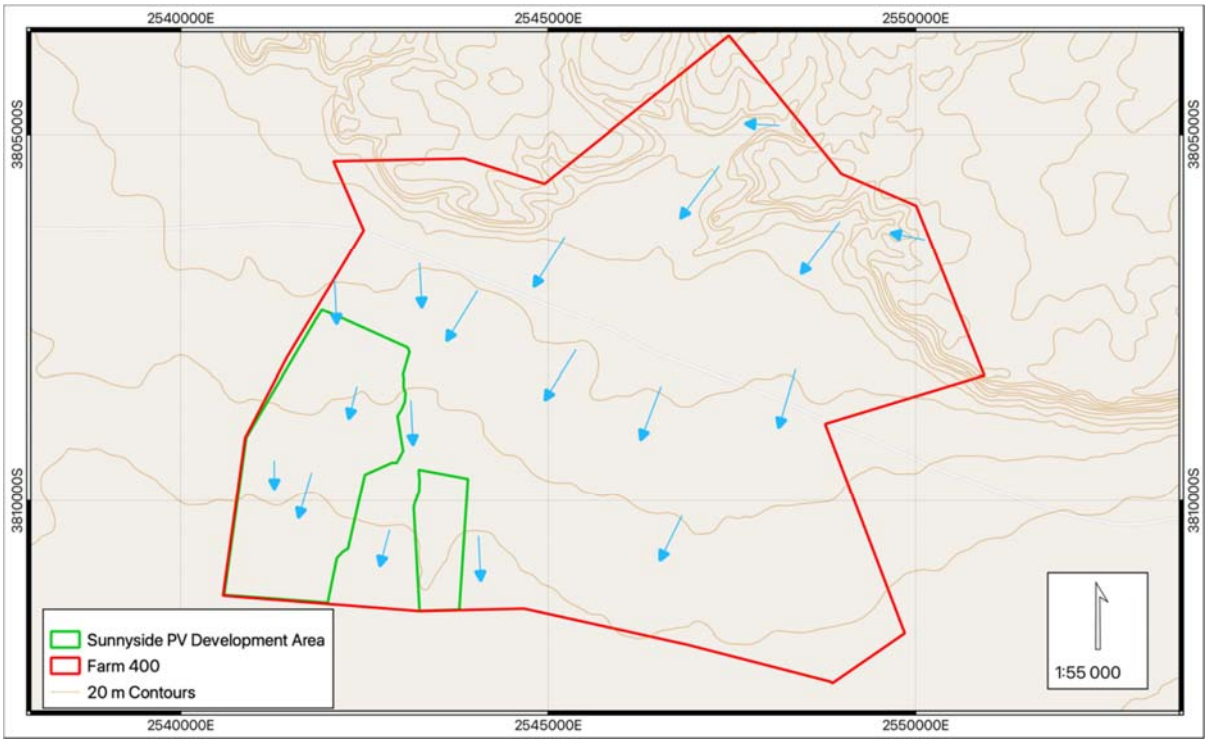

Figure 8-5: Drainage features and 20 m contours associated with the Rhino solar PV site

8.5 Geology

A Desktop Geotechnical Assessment was undertaken by PeraGage Consulting (Pty) Ltd (report dated February 2024, attached in **Appendix 6D**).

8.5.1 Baseline Assessment

According to the report, both sites are underlain by Permian-aged alternating bluish-grey, greenish grey or greyish red mudrocks and grey, very fine to medium-grained lithofeldspathic sandstone of the Teekloof and Abrahamskraal Formations that form the Adelaide Subgroup of the Beaufort Group found in the Karoo Supergroup. The Formations boundaries are linked to specific sandstone-rich marker units. A number of greenish chert bands, existing from a few centimetres to two metres thick, and pink tuff beds have been recorded to exist in the Abrahamskraal Formation. Calcareous nodules and concretions occur in mudstones throughout the Beaufort Group.

Adelaide Subgroup is highly faulted with numerous anticline and syncline formations, as well as a few faults, striking generally in an east-west direction. The rock units of the Beaufort Group in the vicinity of the site dip towards the north and south, due to numerous anticline and synclines, varying between dip angles of 10° and 40°. The site geology is presented in **Figure 8-6**.

The Adelaide Subgroup underlies the low-lying areas in this region. Much of this geological unit is covered by transported soils due to the erosion occurring along the Great Escarpment. Due to the sporadic rainfall and high evaporation rates, the area is conducive for formation of calcrete at shallow depths. It is expected the sites will be underlain by varying degrees of cemented, nodular to hardpan calcretes. Where calcrete has not formed, the covering surface soils are expected to comprises unconsolidated, loose, gravels and silts to sands

and may be relatively thick (approximately 800 mm).

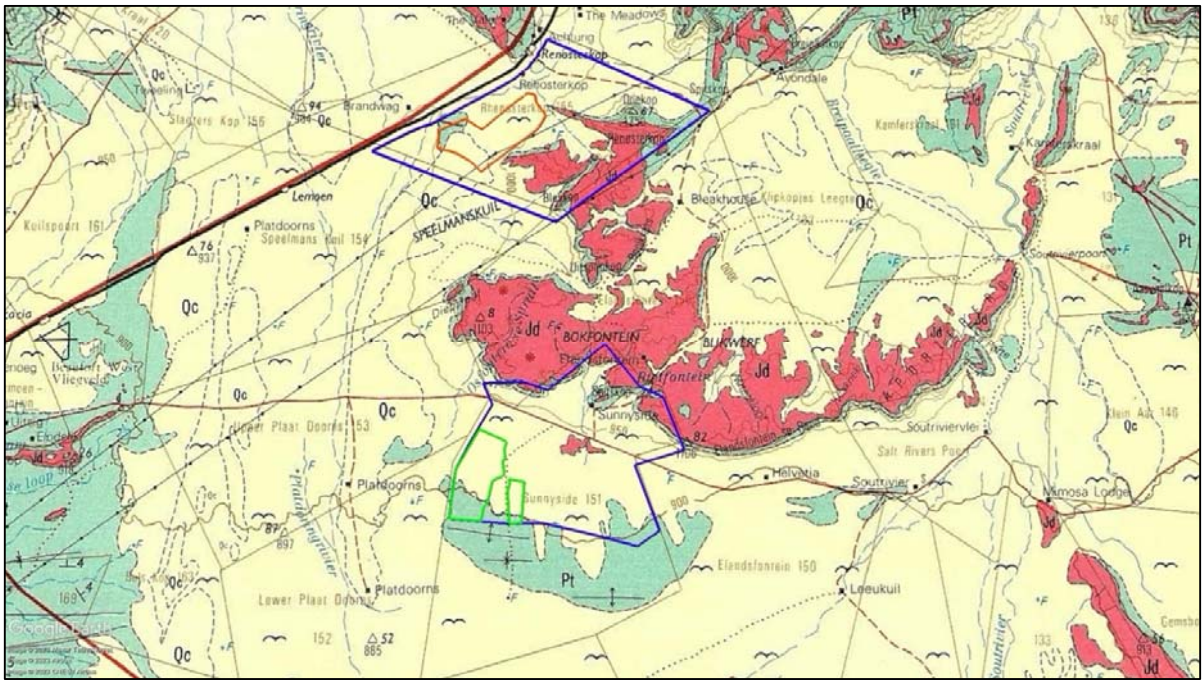

Figure 8-6: Regional geology of the sites

The Beaufort Group was intensely intruded by dolerite dykes and sills during the Jurassic Era. These zones now present in the high-lying koppies and plateaus around Beaufort West. None of the PV developmental areas are seemingly underlain by dolerite.

8.5.1.1 Seismicity

According to the Seismic Hazard Map of South Africa (SANS 10160-4, 2017), the peak ground acceleration is approximately 0.1 g for the site. The peak ground acceleration may be described as the maximum acceleration of the ground shaking during an earthquake, which has a 10% probability of being exceeded in a 50-year period.

8.5.1.2 Engineering Geology

A large portion of the SEF areas are expected to comprise shallow occurring bedrock covered by transport horizons. The interlayered nature of the bedrock, coupled with the presence of faults, folds and other geological structures, may result in complex and variable geotechnical conditions, even beneath individual foundation footprints. It is possible for less competent shale to be encountered below more competent sandstone layers and for zones of preferential weathering to occur within un-weathered surrounding rock. The transported soils will be variable but generally be silty sand to gravelly sand at varying thicknesses.

The southern to middle portion of Rhino PV has seemingly an east to west striking dolerite intrusion which is expected to have weathered to gravels lying onto of competent dolerite bedrock.

Most of the rills and gullies at the site surface will comprise transported soils of loose, silty gravelly sand, becoming sandier within local drainage features, and occasionally underlain by a very weakly to strongly

cemented calcrete horizon. The alluvial material in this area may exhibit collapsible fabric.

Soils with a collapsible structure have an open-voided texture with individual grains being separated or weakly bonded by bridging material such as clay, iron oxides, calcium, or other bridges. While these soils have a high to moderate strength and can withstand fairly large loads under low soil moisture conditions, an increasing moisture content can weaken the bridging materials. Increasing the soil moisture content under load can cause a decrease in the soil volume, resulting in large settlements with no increase in the applied stress. This can lead to sudden settlements beneath foundations and structures.

The formation of duripan (in the form of a variable calcrete horizon ranging from nodules to hardpan calcrete) is expected to occur locally in parts of the site, which is characteristic of the Namaqualand soils. Calcrete is a pedogenic material and its properties are largely determined by the degree of cementation and the nature of the parent material. Lateral and vertical variations often occur over short distances and the soil strength and consistency usually deteriorate with depth (hardpan calcrete may not be laterally continuous and weaker materials may occur beneath the hardpan calcrete layer/s). As such, it is dangerous to found heavy structures on calcrete layers unless these are of adequate thickness and/or the underlying materials have sufficient strength to support the foundation loads.

According to satellite imagery, north sites have seemingly existing infrastructure, namely kraals, wind pumps, dams and trenches. These will need to be mapped during the detailed geotechnical investigation as these areas may need additional earthworks to prepare the site for the development.

8.5.2 Site Sensitivities

Based on the desktop Geotechnical Study **(Appendix 6D),** the entire assessment areas may be divided into three (2 No.) ZONEs: I, and II. Intrusive investigation may reveal additional facets once variations in the subsoil profile become apparent. The anticipated geotechnical constraints and mitigation measures are summarised in **Table 8-1**. The zonation for the Rhino and Sunnyside PV developmental areas are presented in **Figure 8-7** and **Figure 8-8**, respectively.

Table 8-1: Summary of the Geotechnical Conditions/ Constraints

Zone	Ground Conditions	Geotechnical Conditions/ Constraints	Impacts on Engineering Design and Construction
I	Shallow bedrock covered by thin transported and calcrete material	• Shallow bedrock • Thin soil cover • Transported soils comprising sands, silts and gravels • Intermediate to hard excavation conditions with depth • Overlain by transported soils of variable thickness in some areas (in gullies and rills)	• Shallow bedrock • Thin soil cover • Intermediate to hard excavation conditions with depth • Overlain by alluvial soils of variable thickness in some areas (in gullies and rills) • Generally good founding conditions for structures at shallow depths • Minor earth works required at founding level • Conventional shallow foundations suitable • Conventional subgrade preparation for roads • Variable excavation conditions • Intermediate to hard excavation conditions for pole planting / trenching / earthworks
II	Alluvium	• Loose sandy soils • Potentially collapsible soils	• Deeper spread footings (found below alluvial sands)

Zone	Ground Conditions	Geotechnical Conditions/ Constraints	Impacts on Engineering Design and Construction
		• Moderate soil cover • Moderate bedrock depth • Increased erosion potential • Deep erosion gullies and rills	• Soft excavation conditions becoming intermediate with depth • Unstable trench sidewalls shoring/battering required • Erodible soils • Surface drainage measures required to minimise risk of flooding and erosion

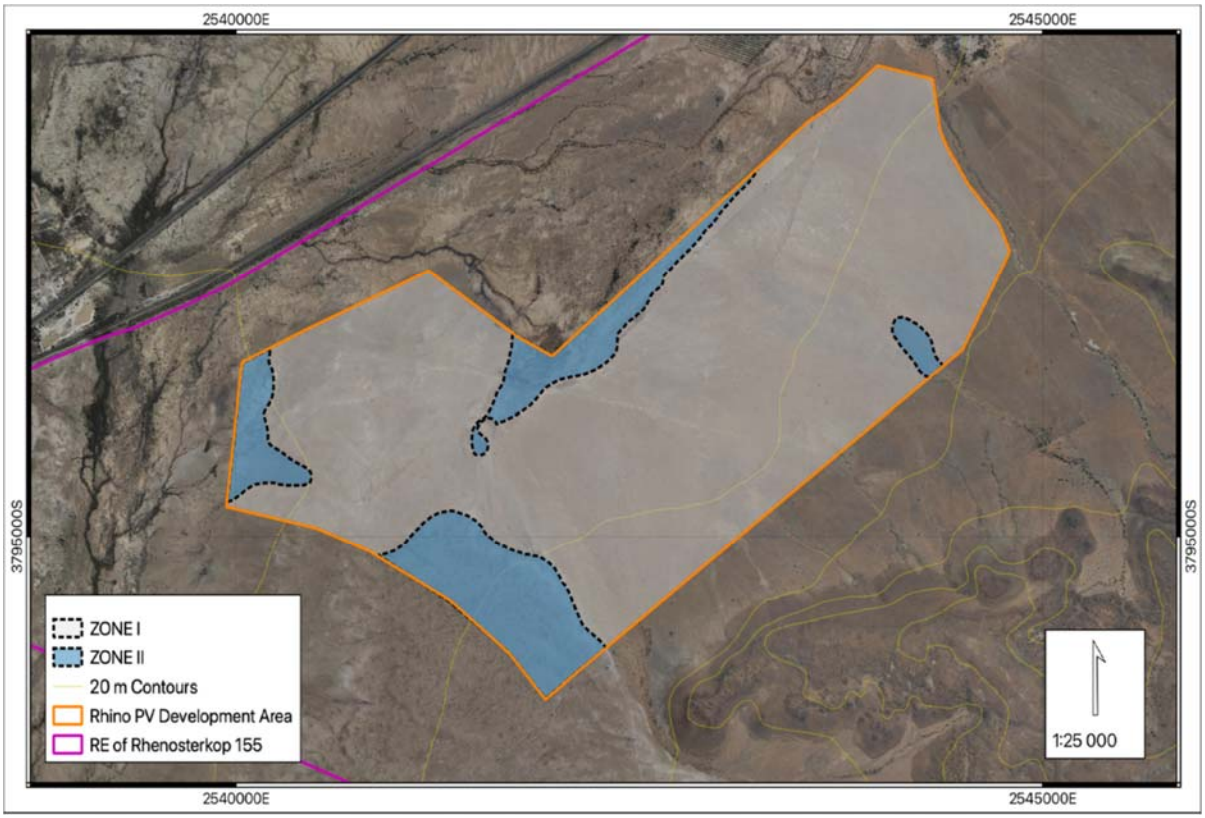

Figure 8-7: Geotechnical desktop zonation for the Rhino solar PV area

The proposed SEF is mainly underlain by FACET I area which is expected to provide good founding conditions and minimal earthworks before construction, therefore reducing the potential environmental impact (**Geotechnical Study (Appendix 6D)**). However, zones of the SEFs are seemingly underlain by thicker sandy, possibly alluvial material, which is susceptible to erosion when disturbed or exposed to channelled water flow. According to the Geotechnical Study (**Appendix 6D**), it is recommended that any substation and offices be planned to be built within FACET I.

From a geotechnical viewpoint, the assessment area is considered suitable for the development of the proposed SEF, including the associated infrastructure, provided that standard engineering design and construction measures are implemented to mitigate the identified geotechnical constraints.

The topography of the site is generally flat with localised areas of steep slopes. The flat areas will require

minor earthworks depending on the final layout design. Access routes should be carefully planned to avoid any steep areas and drainage channels. Most of the site is expected to be characterised by outcropping or very shallow bedrock. This will provide good founding for the PV modules.

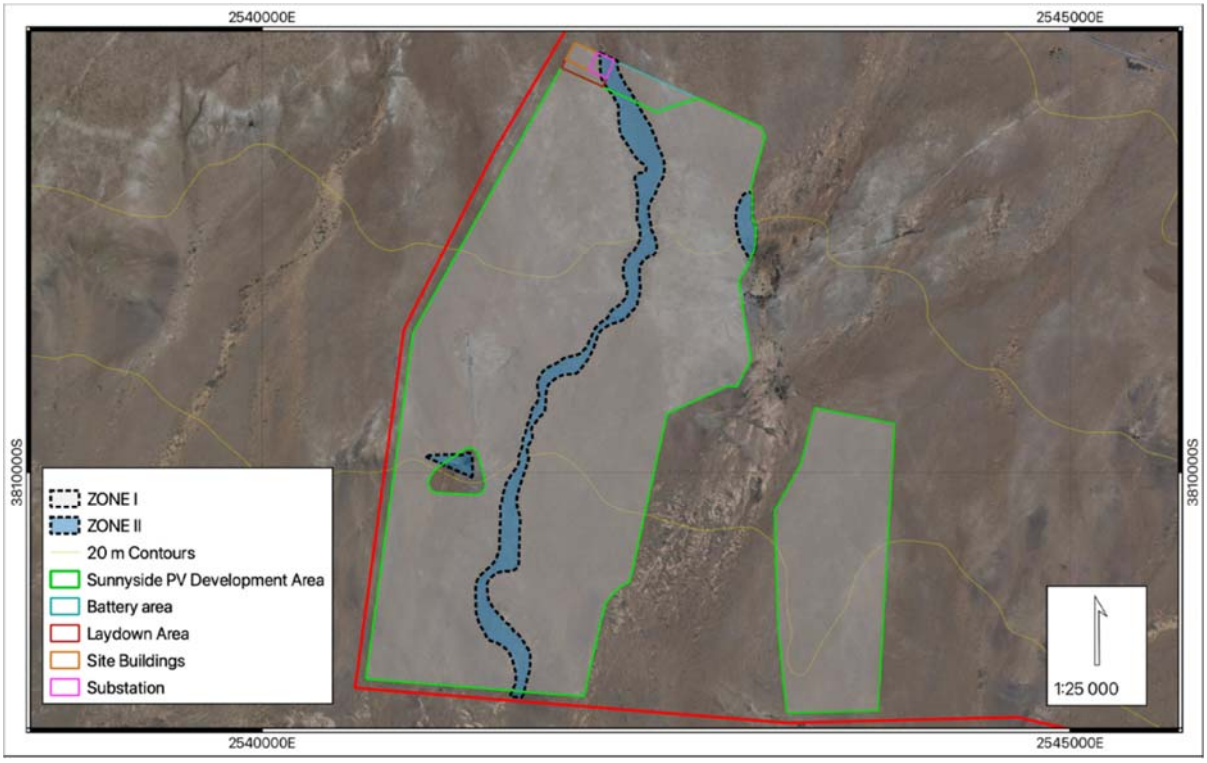

Figure 8-8: Geotechnical desktop zonation for the Sunnyside solar PV area

The majority of soils (when not in large drainage channels) do not render the site particularly susceptible to soil erosion, though mitigation measures need to be implemented, particularly within the steeper sections of the site and lower-lying, drainage channels of the site where concentrated surface flow is anticipated after heavy rainfall events.

Vital infrastructure at Sunnyside and Rhino PV developments, such as the substation and battery area, footprints are located within the FACET II area. This area is susceptible to flooding during and immediately after heavy rains. It is advised erosion berms and divergence drains are placed upstream of the site to limit the amount of water flow through these areas.

Appropriate engineering design of access roads, particularly drainage and erosion control measures, are critical to limit the impact of the development on the geological and geotechnical environment.

Detailed geotechnical materials investigations should be undertaken to assess the suitability of the in-situ materials and the need for processing (e.g., crushing, stabilisation, etc.).

8.5.3 Summary and Conclusion

No fatal flaws or ‘no-go’ areas have been identified that would render any assessment areas unsuitable from a geological and geotechnical perspective.

The geological impact of the Rhenosterkop Solar PV Facility will be caused by the construction of access roads, earthworks required for the construction of working platforms, and excavations as well as trenching for underground cables. Bulk earthworks, where required, for the construction of access roads and working platforms on or adjacent the steeper sections and within or adjacent streams, may cause a more significant impact. These are to be avoided in the layout design where possible.

The impact of the substation and powerlines on the geological environment is limited to topsoil stripping, excavations for plinth foundations, trenching, the construction of access roads and associated light infrastructure. Additional impacts would be caused by the opening of borrow pits that may be undertaken to obtain construction materials.

The proposed layout being put forward for authorisation has been deemed acceptable by the specialist. According to the specialist,

Further intrusive geotechnical investigations must be undertaken to confirm the engineering recommendations provided in the specialist report.

8.6 Agriculture and Soils

An Agricultural Compliance Statement was undertaken by Johann Lanz (dated January 2024, attached in **Appendix 6A)**.

8.6.1 Baseline Assessment

The purpose of this section of an agricultural assessment report is to present the baseline information that controls the agricultural production potential of the site so that an assessment of that potential can be made. Agricultural production potential, and particularly cropping potential is one of three factors that determines the significance of the agricultural impact, together with size of footprint and duration of impact (see Section 9).

8.6.1.1 Rhino

The arid climate (mean annual rainfall of 215 mm and evaporation of 1428 mm) is the limiting factor for land capability, regardless of the soil and terrain capability, although shallow, rocky soils are an additional limitation. Moisture availability is very limiting to any kind of agricultural production, including grazing and is completely insufficient for rain-fed crop production. The climate constraints mean that the site has low agricultural potential, and its agricultural use is limited to grazing only.

8.6.1.2 Sunnyside

The arid climate (mean annual rainfall of 212 mm and evaporation of 1462 mm) is the limiting factor for land capability, regardless of the soil and terrain capability, although shallow, rocky soils are an additional limitation. Moisture availability is very limiting to any kind of agricultural production, including grazing and is completely insufficient for rain-fed crop production. The climate constraints mean that the site has low agricultural potential, and its agricultural use is limited to grazing only.

The land has a long-term grazing capacity of 30 ha per large stock unit. Because climate is the limiting factor that controls production potential, it is the only aspect of the agro-ecosystem description that is required for assessing the agricultural impact of this development. All other agricultural potential parameters become irrelevant under the dominant limitation of aridity.

The site falls outside an area that is classified as a Protected Agricultural Area. A Protected Agricultural Area is a demarcated area in which the climate, terrain, and soil are generally conducive for agricultural production and which, historically, has made important contributions to the production of the various crops that are grown across South Africa. Within Protected Agricultural Areas, the protection, particularly of arable land, is considered a priority for the protection of food security in South Africa, but the protection of land outside of these areas is generally not considered a food security priority.

8.6.2 Compliance with the allowable development limits

The agricultural protocol stipulates allowable development limits for renewable energy developments of > 20 MW. Allowable development limits refer to the area of a particular agricultural sensitivity category that can be directly impacted (i.e. taken up by the physical footprint) by a renewable energy development. The agricultural footprint is defined in the protocol as the area that is directly occupied by all infrastructures, including roads, hard standing areas, buildings, substations etc., that are associated with the renewable energy facility during its operational phase, and that result in the exclusion of that land from potential cultivation or grazing. It excludes all areas that were already occupied by roads and other infrastructure prior to the establishment of the energy facility but includes the surface area required for expanding existing infrastructure (e.g. widening existing roads). It excludes the corridor underneath overhead power lines but includes the pylon footprints. It therefore represents the total land that is actually excluded from agricultural use as a result of the renewable energy facility (the agricultural footprint).

For a SEF, the footprint is considered to be the total area inside the security fence of the facility.

The allowable development limit on land of medium agricultural sensitivity with a land capability of < 8, as this site has been verified to be, is 2.5 ha per MW. This would allow a proposed facility with a total generating capacity of 250 MW to occupy an agricultural footprint of 250 X 2.5 = 625 ha. The facility fenced area as shown in Figures 2 and 3 is 543 ha. It is therefore confirmed that the facility is in line with the allowable development limits contained in the agricultural protocol.

8.6.3 Summary and Conclusion

The overall conclusion of this assessment is that the proposed development is acceptable because it can provide benefits to agriculture but leads to no loss of potential cropland and therefore minimal loss of future agricultural production potential.

An agricultural impact is a change to the future agricultural production potential of land. In this case, the facility fenced area is considered to be below the threshold for needing to be conserved as agricultural production land because of the limitations on its cropping potential. The production potential of the land is limited to only being suitable as grazing land, and there is no particular scarcity of such land in the country, in contrast to arable land, which is very scarce. The use of this land for non-agricultural purposes will cause minimal loss of agricultural production potential in terms of national food security.

Furthermore, the land occupied by PV panels can be used for the dual purposes of solar power generation and agricultural food production by way of sheep grazing. This has potential benefits for both activities and means that the land is not lost to agricultural production. At the farm level, the development will provide a positive economic impact. This is likely to increase financial security and cash flow and improve farming operations and productivity on other parts of the farms through increased investment into farming.

Due to the facts that the solar facility will not occupy scarce, viable cropland, that it can still be used to graze

sheep, and that its negative impact is offset by economic benefits to farming, the overall negative agricultural impact of the development (loss of future agricultural production potential) is assessed here as being of low significance and as acceptable.

Its acceptability is further substantiated by the following points:

- The proposed development is within a REDZ, which is an area that has specifically been designated within South Africa for the prioritisation of renewable energy development. The designation of the REDZ has taken into account the country's need to balance renewable energy development against the conservation of land required for agricultural production and national food security.
- The proposed development will also have the wider societal benefits of generating additional income and employment in the local economy.
- In addition, the proposed development will contribute to the country's urgent need for energy generation, particularly renewable energy that has much lower environmental and agricultural impact than existing, coal powered energy generation.
- All renewable energy development in South Africa decreases the need for coal power and thereby contributes to reducing the large agricultural impact that open cast coal mining has on highly productive agricultural land throughout the coal mining areas of the country. Furthermore, a reduction in coal power saves water resources and therefore potentially makes more water available for irrigated agriculture.

From an agricultural impact point of view, it is recommended that the proposed development be approved. The conclusion of this assessment on the acceptability of the proposed development and the recommendation for its approval is not subject to any conditions.

8.7 Aquatic/ Freshwater Assessment

An Aquatic Compliance Statement was undertaken by M2 Environmental Connections (Pty) Ltd (dated November 2023, attached in **Appendix 6B**).

8.7.1 Baseline Assessment

According to the report the sites are situated within the Nama Karoo Biome, within the Lower Karoo Bioregion. The Lower Karoo Bioregion is the lowest-altitude bioregion within the biome, receiving minimal rainfall (mean annual precipitation of 203 mm per annum) and frost.

The Rhino PV site fringes on the Southern Karoo Riviere vegetation, classified as Inland Azonal Vegetation. The Southern Karoo Riviere vegetation (also least threatened) is found on the northern boundary of the sites along the Platdoring River, which it intersects to the southwest of the project site. This vegetation type is located on the outer reaches of the riparian areas of the Platdoring River which slightly intersects with the site boundary.

The project area falls within the "L" (L1) Drainage Region within the Mzimvubu-Tsitsikamma WMA. The quaternary catchment area, L11F, falls within a Class C Moderately Modified category, while the Best Attainable Ecological Class is also set at a Class C. The Platdoring River (River Order 1) borders the north eastern corner of the property area. This River system is classified as a non-perennial tributary system with limited flow throughout the year. Considering the low seasonal rainfall occurring within the surrounding areas, the surface water within this river system and its associated drainage lines are very limited in quantity. Additionally, there are no observed impacts or developments, apart from the N1 Highway within close proximity to the property area. Additionally, Rhino PV Facility is also planning on filling in 2 of these drainage

lines which is not expected to have any impacts on the aquatic ecosystems due to their fragmented/impacted current status.

The geomorphological Zone for the Platdoring River associated with the project is considered as an Upper Foothill. The NFEPA River Condition for the L11F catchment falls under a CDEFZ classification which indicates that this catchment has no associated FEPA associated with it and contains no protected species. The Platdoring River and associate drainage lines more specifically are classified as a River Condition Z. This classification indicates that the Platdoring River and its drainage lines are not intact according to natural land cover, meaning the features deviate from its natural state possibly due to human activities or alterations in land cover causing a non-pristine condition. The National Biodiversity Assessment, (2018) also further classifies the river system as a non-free flowing aquatic system. Please refer to Figure 6-1 for an indication of waterbodies and drainage lines relevant to the site.

The aquatic ecological footprint of the Rhino PV site will have a low impact with impacts expected to be very localised and will not infringe on the surrounding sensitive areas nor the water bodies associated with the greater project area. Therefore, the specific conservation value of the site itself is very low.

The EIS of the Platdoring River is considered to be Medium while the L11F catchment has a Low EIS, with very minimal sensitive aquatic features identified in close proximity to the study area. The area is also listed as least concerned as far as threatened aquatic sub catchments are concerned. Although the Platdoring River is considered as an important ESA River system, the dry conditions with continual zero flow status justifies this river as a low priority status. **Figure 8-9** present the aquatic features relevant to the Rhino PV site.

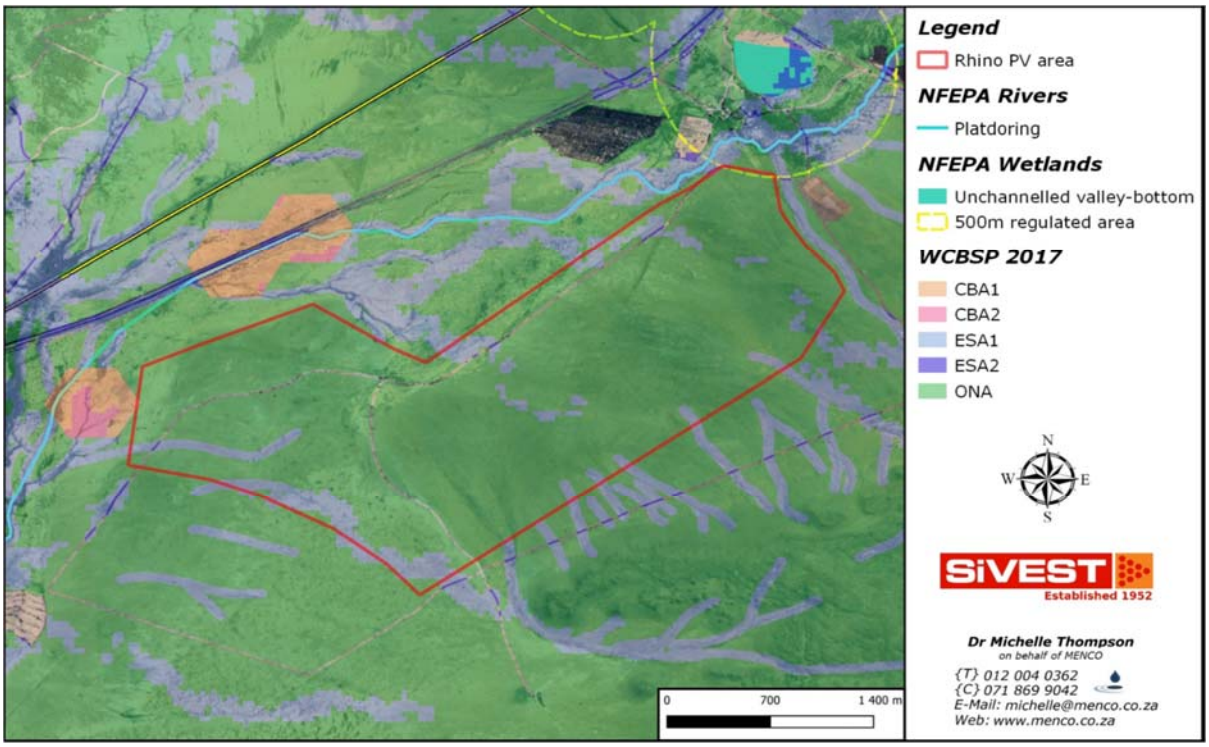

Figure 8-9: Desktop aquatic sensitivity associated with the Rhino solar PV area

According to the report and **Figure 8-10**, the four intermittent drainage lines can be categorised as two primary lines with two smaller branches originating from the one on the western side of the project boundary. This

implies that the one minor drainage lines within the site boundary may be regarded as practically non-existent. One of these drainage lines is depicted in **Figure 8-11**. However, the ESA1 is fragmented and lacks a prominent aquatic feature. The on-site drainage lines are identified as ESA1 areas, and the outer eastern border of the site includes a small ESA2 area (Artificial Dam), but it is considered a feature of low sensitivity in aquatic scientific terms. Approximately 450 m of this (500 m wetland buffer) intersects the site boundary.

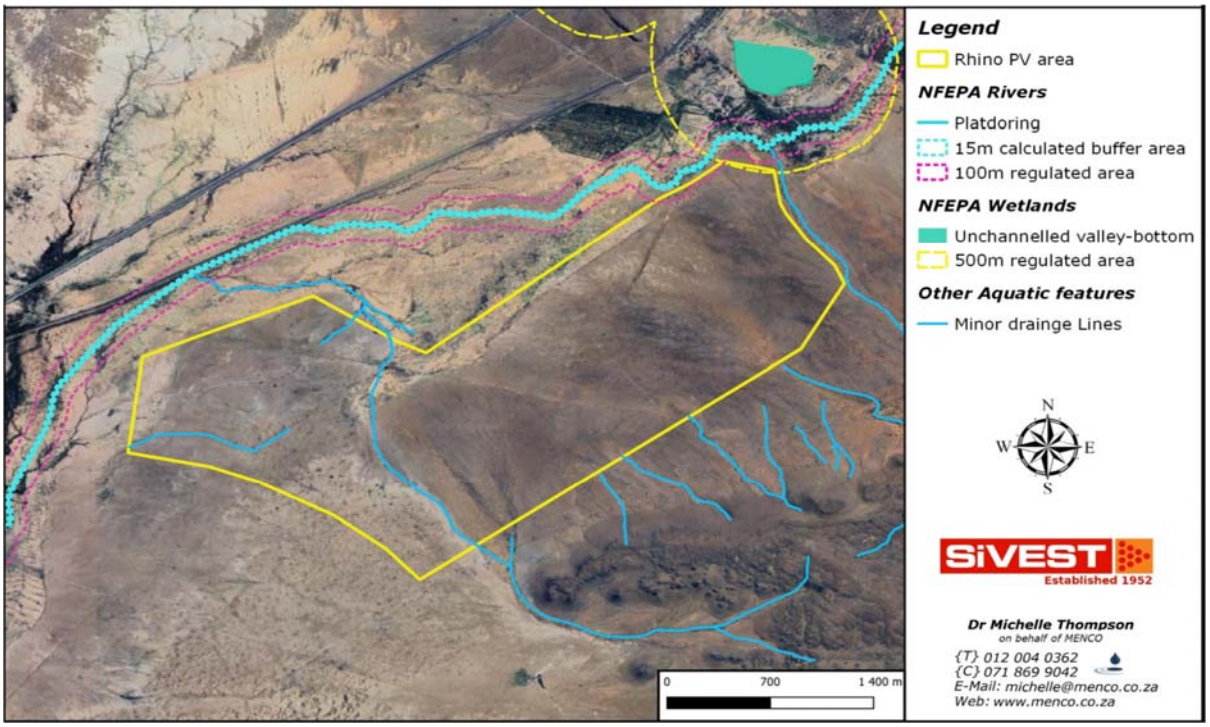

Figure 8-10: Field aquatic sensitivity associated with the Rhino solar PV area

In reviewing SANBI's (NFEPA), it was determined that a singular NFEPA feature exists within the confines of the project area. This feature is initially identified as an Un-channelled Valley-bottom Wetland; however, upon closer examination during the site visit, it was determined to be an Artificial Dam. The 500 m wetland buffer in this case will have no relevance to the artificial dam as ground proofing concluded that there was no wetland habitat and vegetation remaining. This particular feature holds very little water in the rainy season and quickly dries up. It is not a natural feature and there is no wetland associated vegetation on site.

Regarding this specific NFEPA wetland feature, it intrudes a distance of 350 m into the site, as illustrated in **Figure 8-12**. Importantly, it is essential to highlight that this encroachment is not anticipated to have any adverse effects on the wetland, which is classified as an artificial dam.

The ESA areas as identified by the WCBSP (2017) and NFEPA are classified as “Artificial Waterbodies”. No other NFEPA Wetlands were identified on-site with the small Un-channelled Valley Bottom Wetlands (Artificial Dams) being the only wetland systems with in close proximity to the study area.

As previously mentioned, the majority (90%) of the western project site falls within areas as defined as “Other Natural Areas”. While the proposed PV plant necessitates development over these “ONAs”, it is recommended to ensure an approach that prioritises responsible environmental stewardship by the developer.

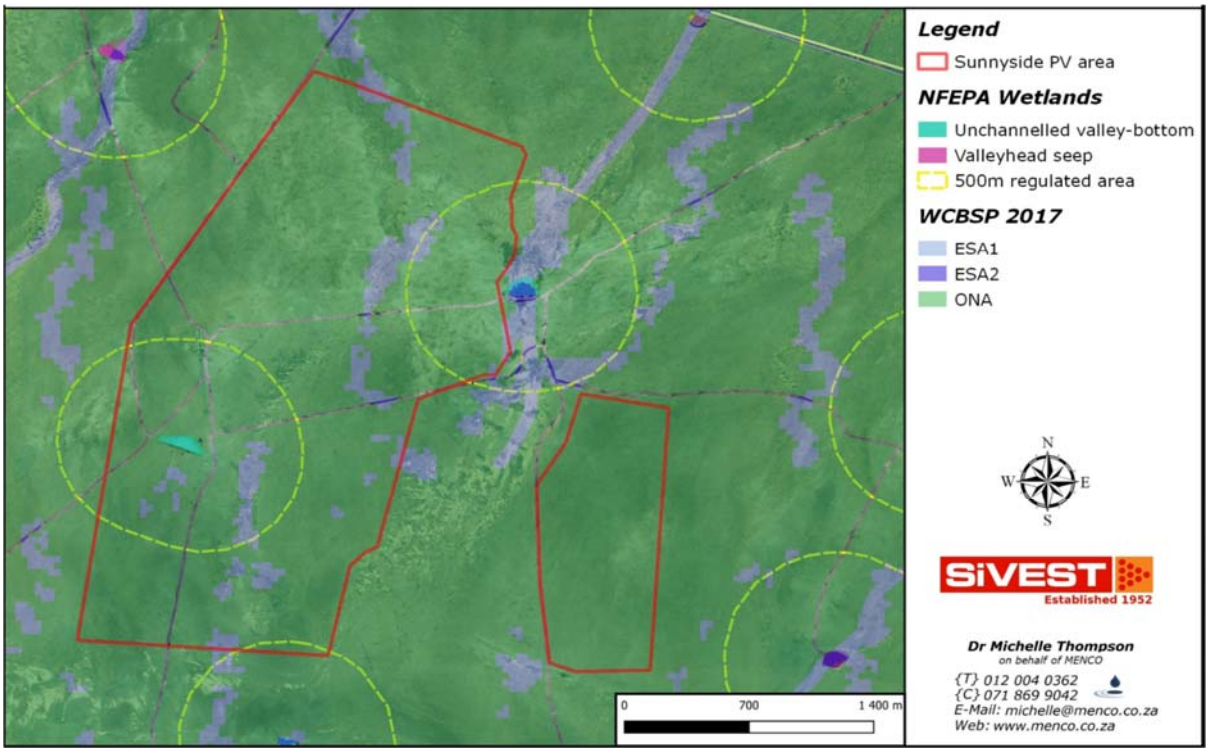

Figure 8-11: Desktop aquatic sensitivity associated with the Sunnyside solar PV site

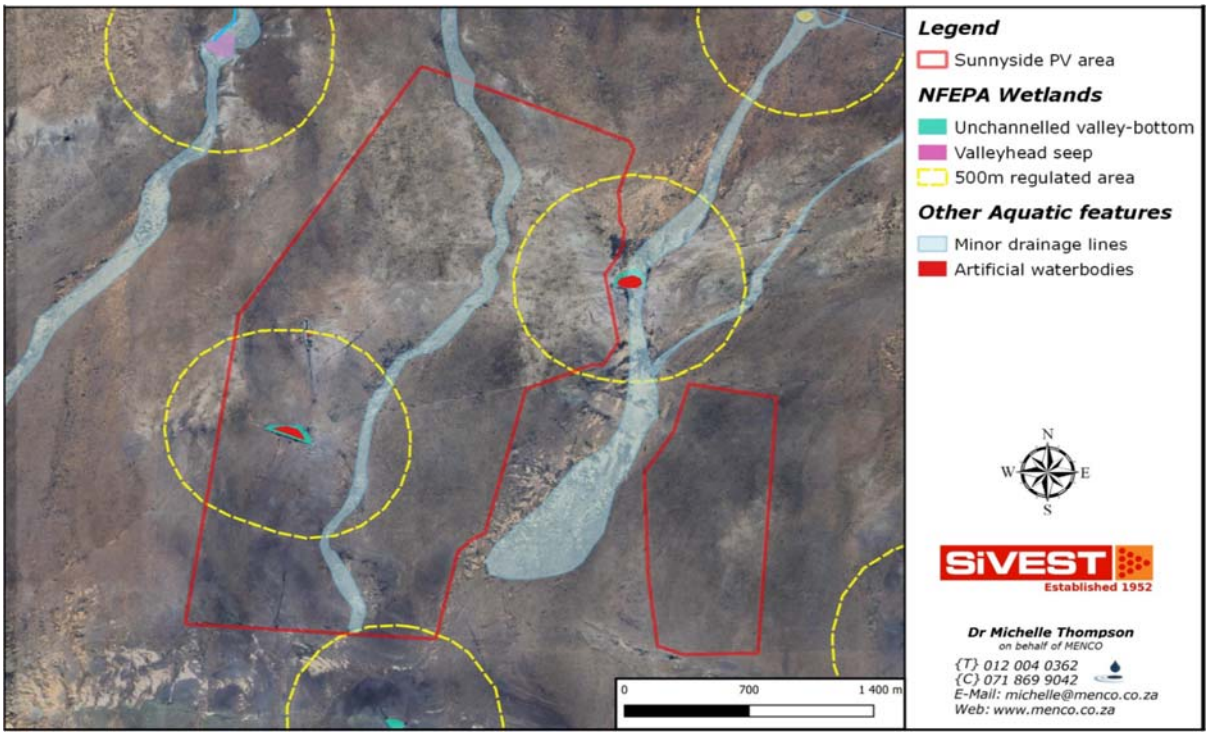

Figure 8-12: Field aquatic sensitivity associated with the Sunnyside solar PV site

This aquatic compliance statement has been conducted to minimise and mitigate potential aquatic ecological effects on these areas. It is concluded that although classified as ESA1 areas the overall impacts on the aquatic features will be insignificant and that all features relevant to the project area will remain unaffected.

8.7.2 Site Sensitivities

The localised nature of the construction and PV facility will not impact the functionality of the identified ESA1. It is suggested to introduce mitigation strategies to prevent any potential impacts within this freshwater ecosystem, thereby preventing any aggravation of its degradation. Given the minimal project area impact and low environmental sensitivity, a 15 m buffer suffices around the Platdoring River zones for the Rhino PV Facility. As the PV facility lies beyond these designated buffers, there is no imperative need for the inclusion of aquatic scientific buffers on the drainage channels. However, it is still advisable that all development activities be confined outside of these designated areas.

As for the Sunnyside PV Facility, there is no imperative need for the inclusion of aquatic scientific buffers. However, as mentioned it remains advisable that all development activities are carried out in terms of best practice while still adhering to the Aquatic Biodiversity guidelines to ensure minimal impact on the aquatic features.

8.7.3 Summary and Conclusion

According to the report, the proposed project has been designed to have minimal impact on the aquatic ecosystem and has taken all necessary measures to prevent harm to aquatic biodiversity. Based on the results of the desktop review and the site verification, the sensitivity of aquatic biodiversity is regarded as Low.

The development of the Rhino PV facility will have a very small to no impact on freshwater biodiversity should the management actions be taken into consideration during the construction phase. Some impact is expected as a result of the proposed SEFs as a result of the infilling of drainage lines within the development areas. The potential impacts are considered to be of very low to low impact with implementation of the mitigation measures. No aquatic impacts are expected to occur during the operational phase however it is the recommendation from the specialists that the applicant remains committed to ongoing monitoring and evaluation of the Rhino PV project to ensure that the Rhino PV Facility continue to meet its environmental commitments and minimise the impact on the aquatic ecosystem. It is further encouraged that the Rhino PV facility maintain open lines of communication with stakeholders and authorities to ensure that they are informed of any changes or developments in the project.

The development of the Sunnyside PV facility will not impact on any freshwater biodiversity should the management actions be taken into consideration during the construction phase. Similar to the Rhino PV facility some impacts is expected as a result of the proposed SEFs as a result of the infilling of drainage lines within the development areas with impacts considered to be very low.

8.8 Terrestrial Biodiversity

A Terrestrial Biodiversity, including Animal and Plant Species, Assessment was undertaken by M2 Environmental Connections (Pty) Ltd (report dated February 2024, attached in **Appendix 6H**).

8.8.1 Baseline Assessment

8.8.1.1 Critical Biodiversity Areas

On a desktop level, CBAs are located north and west of the Rhino site along the seasonal watercourse, Platdoring River (refer to **Figure 8-13**). The small CBA which infringes to the west of this site was confirmed not to be of sensitive nature with the main drainage line, in the centre of the CBA, being the driving feature from which the CBA has been delineated. The CBA will not be affected by the development as it infringes a mere 20 m into the site. The northern CBA will also remain unaffected. It is also noteworthy that due to the low levels of transformation in the area, the irreplaceability of the CBA is likely low.

There is no CBA relevant to the Sunnyside site, refer to **Figure 8-14**.

8.8.2 Ecological Support Areas

All major and minor drainage lines within the Rhino and Sunnyside PV areas are mapped as functional natural or near-natural ESA (**Figure 8-13** and **Figure 8-14**). The ESAs are generally small and represent buffered areas around drainage features. This includes minor washes, the drainage areas largely devoid of riparian vegetation. It is unlikely that the development, both Rhino and Sunnyside, would be able to avoid all ESAs and some habitat loss is inevitable. The minor drainage features, in particular, do not represent broad-scale ecological corridors and are unlikely to impact ecological functionality should the development occur. These minor drainage lines are not particularly sensitive, and the impacts would likely be low. In addition some of the wetlands, mostly artificial dams, in the area are also delineated as ESA2. Should development make use of the long existing road infrastructure which currently impinges on ESA, the additive habitat loss from the development could be reduced.

There are only minor terrestrial biodiversity impact concerns for the Platdoring River and its associated CBA and ESA, these can be mitigated.

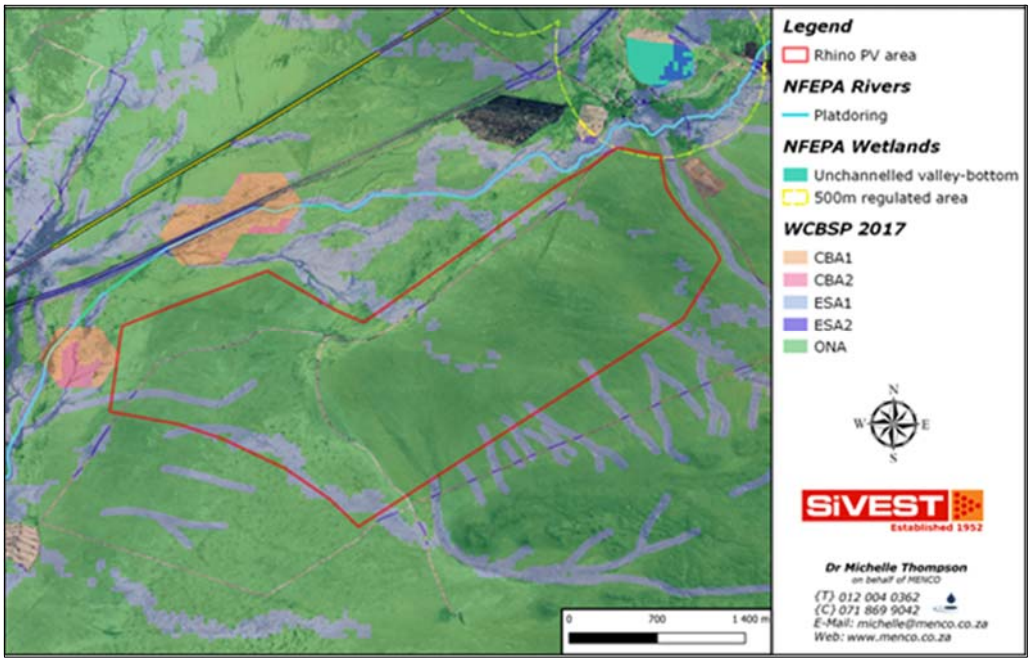

Figure 8-13: Rhino site terrestrial biodiversity sensitivity on a desktop level

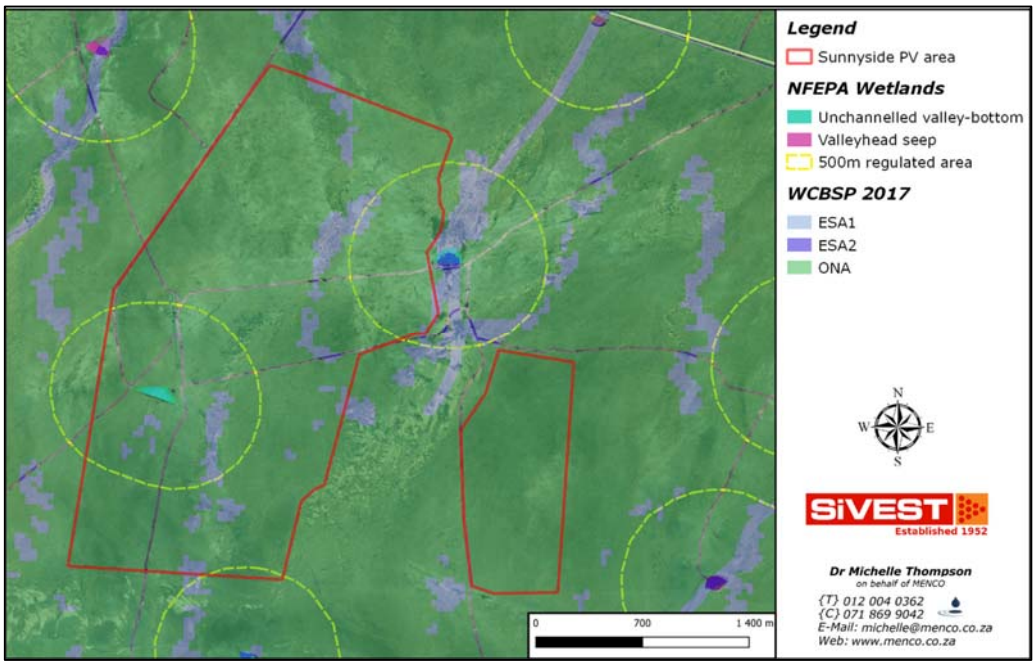

Figure 8-14: Sunnyside site terrestrial biodiversity sensitivity on a desktop level

8.8.3 Protected Areas

Within the 5 km radius of the Sunnyside PV site is the Steenbokkie Private Nature Reserve to the west. This PA is located approximately 9.9 km to the south-west of the Rhino site. Similarly, there are no Important Bird and Biodiversity Areas (IBA) near to the sites with the closest IBA, Karoo National Park, located more than 25 km from the development sites.

8.8.4 Vegetation Type

The sites are situated within the Nama Karoo Biome, within the Lower Karoo Bioregion (Mucina and Rutherford, 2006). The Lower Karoo Bioregion is the lowest-altitude bioregion within the Nama Karoo biome, receiving less rainfall (mean annual precipitation of 203 mm per annum) and less frost than other bioregions. The Rhino site infringes on Southern Karoo Riviere vegetation, classified as Inland Azonal Vegetation.

A national process has been undertaken to identify and list threatened ecosystems that are currently under threat of being transformed by other land uses, as per Section 52 of National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004), as amended (NEMBA). The overarching aim of listing threatened ecosystems is to minimise the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function, and composition of threatened ecosystems.

The vegetation unit for the sites is characteristic of the Gamka Karoo, a least threatened (LT) vegetation type of the Lower Karoo Bioregion. The proposed Rhino PV site slightly encroaches the Southern Karoo Riviere vegetation (also LT) located on the northern boundary of the site along tributaries of the Platdoring River. Both vegetation units are largely still intact with neither having been significantly transformed.

The Gamka Karoo vegetation unit is predominantly contained within a large basin between the Great Escarpment (Nuweveld Mountains) in the north and northwest and the Cape Fold Belt Mountains (mostly

Swartberg Mountains) in the south and from the edge of the Gamka basin catchment area (i.e., Dwyka River tributary) in the west to about the Kariega River in the east. The vegetation unit landscape is characterised by highly irregular to slightly undulating plains with dwarf spiny shrubland dominated by Karoo dwarf shrubs (e.g., *Chrysocoma ciliata*, *Eriocephalus ericoides*) with rare low trees (e.g., *Euclea undulata*). Drought-resistant grasses (*Stipagrostis*, *Aristida*) form dense stands (especially after abundant rains) on broad sandy bottomlands (Mucina and Rutherford, 2006). This was the dominant vegetation type for all the sites, with the area represented largely by tracts of fairly homogenous land.

The Southern Karoo Riviere vegetation unit is found within the Koedoesberge-Moordenaars Karoo, Prince Albert Succulent Karoo, Gamka Karoo, Eastern Lower Karoo, southern parts of the Eastern Upper Karoo as well as some parts of the Albany Thicket Biome south of Cradock within an altitude range of 250 to 1 550 m. The vegetation and landscape are characterised by narrow riverine flats supporting a complex of *Vachellia karroo* or *Tamarix usneoides* thickets fringed by tall *Salsola*-dominated shrubland (up to 1.5 m high), particularly on heavier, salt-laden, soils on broad alluvia. In sandy drainage lines *Stipagrostis namaquensis* may occasionally also dominate. Mesic thicket forms in the far eastern part of this region which may contain *Leucosidea serice*a, *Rhamnusprinoides* and *Ehrharta erecta* (Mucina and Rutherford 2006) This vegetation type overlaps with identified CBA north and west of the Rhino site and is fed by drainage lines (ESA) mainly north of this site. The habitat within this vegetation type is dominated by exotic invasive *Prosopis*, historically brought in to arid regions of the country to provide shade and fodder for livestock.

8.8.5 Fieldwork Findings

8.8.5.1 Plants Species

According to the report, there are no SCC or red-listed species occurring within several medium sensitivity plant species reported in the Screening Tool. None of the medium sensitivity nor red-listed species were recorded during the site assessment.

The proposed sites had low plant biodiversity, as expected with the comparative low species diversity and endemism of the Nama-Karoo. No sensitive species identified by the Screening Tool were found on site. Therefore the site as a whole was determined to be of low plant sensitivity overall.

The Rhino site was characterised by karoo dwarf shrubland which was largely stunted, likely from grazing pressure. The site is pasture for sheep and some antelope species (springbok and blesbok) and is dominated by *Eriocephalus ericoides* and *Pentzia* and *Zygophyllum* species. The south-eastern portion had a landscape that was more diverse and defined by a calcrete terrace where *Pteronia* species dominated. In the lower lying run-off areas to the north-east the sandy soils facilitated large tracts of *Stipagrostis ciliata* and *S. obtusa* to grow. The far eastern section of the site housed karoo shrub vegetation similar in species composition with a higher proportion of bare earth patches and a gravelly soil structure. Areas surrounding artificial water troughs were dominated by alien invasive species (AIP) such as *Prosopis* and *Eucalyptus* with *Euphorbia mauritanica* dominant in the wash-out areas adjacent to these areas.

Similar to the Rhino site, the majority of the Sunnyside site consisted of short karoo shrubland (*Eriocephalus ericoides, Pentzia* and *Zygophyllum* species). Comparatively, Mesemb species were more common in this site and the veld appeared to be in better condition, with less grazing pressure and some areas strongly grass dominant (*Stipagrostis* spp.). A very minor drainage line ran through the western portion of the site resulting in a slightly different vegetation composition (Asparagus and taller Rhigozum obovatum with occasional *Vachellia karroo* interspersed). While this habitat was not sensitive, it was divergent and less common in the landscape. Areas to the south of the western portion as well as the majority of the eastern portion consisted

of Pentzia dominant karoo scrub on gravel plains with a higher proportion of bare earth present.

Some images depicting typical plant species within the sites are showed in **Figure 8-15** and **Figure 8-16**.

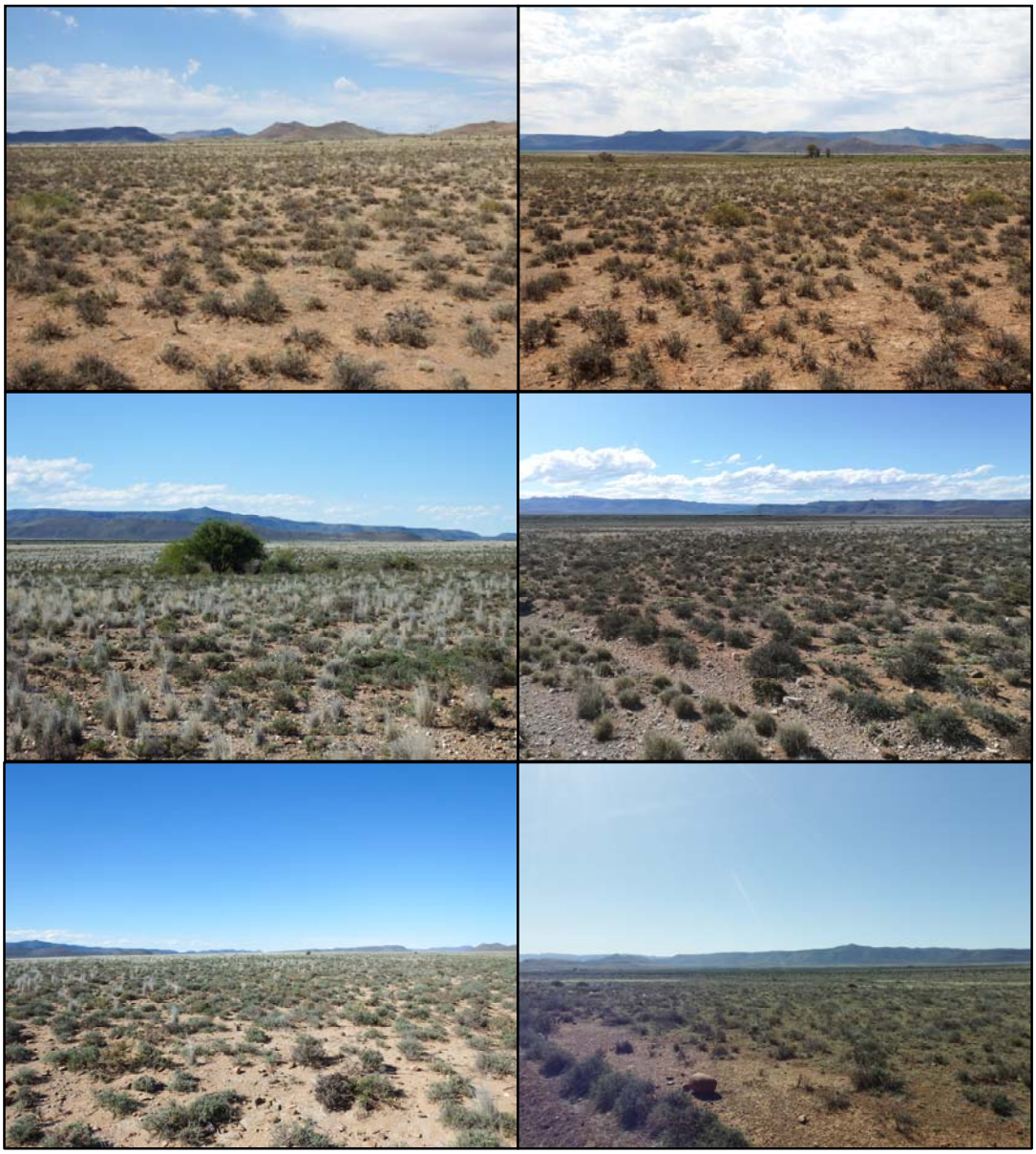

Figure 8-15: Typical vegetation types found at the Rhino PV development site

Figure 8-16: Typical vegetation types found at the Sunnyside PV development site

8.8.5.2 Animals Species

Grazing pressure from sheep was high in the majority of the Rhino site with springbok and blesbok also contributing to the grazing levels but to a lower extent. A single Grey Rhebuck, near threatened (NT), was sighted in the Platdoring River approximately 1.5 km outside the site footprint (to the west). This species is unlikely to make use of the habitat within the footprint due to grazing competition. The presence of mammals within the site was evidenced mostly from scat (particularly lagomorphs) with older evidence from larger mammals such as aardvark also present. Small mammal trapping took place at two locations in the evening of the 10th of October 2023 with a total of ten traps placed at locations where small mammals were expected. The traps were checked early in the morning of the 11th of October 2023, only a single *Rhabdomys pumilio* was captured on site. A Springbok was captured on the camera trap images.

The Sunnyside site was not assessed during the pre-feasibility study conducted in 2022 and thus less time was spent on the site in comparison to the Rhino site. Despite this, a similar mammalian cohort to the Rhino site was recorded, with similar species composition expected. The only species recorded on this site, and not on the Rhino site, was Vervet Monkey.

The Black-footed Cat, is a vulnerable (VU) species that could potentially inhabit the area, even though no direct observations have been made. This diminutive feline species has an established habitat range that includes parts of Southern Africa. It primarily dwells in arid and semi-arid regions, such as South Africa, Botswana, Namibia, and Zimbabwe where it is known to predate on small mammals, birds, reptiles and invertebrates.

While the presence of Black-footed Cats has been confirmed through previous assessments or direct sightings in the area under consideration, it was not found on site during the project assessment. It is, however, worth noting that their elusive nature and solitary behaviour can make them challenging to detect. Considering the Central Karoo is the stronghold for the species, where the highest density of the species occurs, as well as the fact that the species is listed as VU, it is important to exercise caution and consider the potential presence of the Black-footed Cat during the planning and construction phases of the project to ensure its protection and conservation. The species has the potential to occur on both Rhino and Sunnyside sites.

The Riverine Rabbit is endemic to the semi-arid central Karoo region of South Africa. The population is alarmingly small (157 to 207 mature individuals) with no subpopulation having greater than 50 mature individuals. The species is inferred to be declining due to continuing habitat loss and degradation, and ongoing loss of mature individuals. There are an estimated 12 subpopulations (nine in the northern range and three recently discovered south of the historic known range). Large numbers of surveys throughout the distribution range have confirmed current subpopulations but failed to detect subpopulations in some areas of the historic range. The species is cryptic to detect and intense monitoring is required to detect the species. Subpopulations are presumably further fragmented and isolated by anthropogenic barriers to dispersal, such as impoundments in river channels and fencing, and are threatened by illegal hunting and predation by domestic animals. Additionally, both climate change and fracking are emerging threats to Riverine Rabbits.

The sites fall outside the known distributions for Riverine Rabbit populations. The habitat on site was assessed for the potential presence of Riverine Rabbits *Bunolagus monticularis,* critically endangered (CR), which although not identified as present by the Screening Tool may possibly be present due to patchy habitat selection. However, the sites were determined to not contain significant suitable vegetation for the species.

An unexpectedly low number of reptiles were identified on site, with more reptiles recorded on the Sunnyside site compared to the Rhino site. While the reptile diversity is likely higher, no reptiles of conservation concern are expected to occur on site.

As per the requirements for the environmental application process, species identified as SCC by the screening tool must also be investigated. A single SCC species with medium sensitivity was identified. This small tortoise species inhabits dolerite ridges and rocky outcrops of the southern Succulent and Nama Karoo biomes. This well camouflaged species is seldom seen as it is only active for short periods during the day and may aestivate for extended periods during unfavourable environmental conditions. The species is found in isolated populations inhabiting dwarf shrubland, usually with succulent and grassy elements where rocks or rock crevices and/or vegetation can provide refuge.

The generally overgrazed nature of the Rhino solar PV site and lack of sufficient refugia on both PV areas

make the habitat less than ideal for this species to occur. However, the proximity to suitable habitat in the nearby Upper Karroo Hardeveld make it possible that this species could occur. Should this species be located on site during site inspection or during the construction phase the author of this report should be notified so that a specific mitigation strategy can be developed.

Few amphibians have previously been found in the QDGs, and neighbouring grids, encompassing the sites. The restricted nature of amphibian habitats (seasonal pans, drainage lines) and the generally arid nature of the sites translates to an overall low abundance of amphibians, with only Xenopus laevis identified at one of the artificial water holes on the Sunnyside solar PV area. Thus, the long-term impact on amphibians is likely minimal.

8.8.5.3 Site Sensitivities and Habitat Classification

According to the report, the habitat was characterised in terms of the extent of the disturbance, and faunal and floral biodiversity and given a sensitivity ranking (ranked from 1 to 5, with 1 being the least sensitive, refer to **Table 8-2**), refer to **Figure 8-17** and **Figure 8-18**.

Table 8-2: Habitat type delineations

Site	*Habitat types / features*	*Extent of disturbance*	*Fauna and Flora*	*Overall sensitivity* (Rank 1-5)
Rhino PV Facility				
PV	**Arid Karoo scrubland**	Mild – heavy grazing pressure from sheep and low pressure of game grazing. Generally low level of erosion. Habitat is common in the region. Bare earth percentage is high in places	Relatively high biodiversity in comparison to other solar PV facility habitats. Dwarf shrubland interspersed with drought-resistant grass (*Stipagrostis* dominant). No SCC present. Higher mammalian and reptile diversity than other solar PV facility habitats.	2.5
	Arid Gravel Karoo scrubland	Habitat is common in the region. Similar to the common Arid Karoo shrubland discussed above in floral composition and overall biodiversity with the difference of rockier substate, erosion likely higher than in the above habitat type. Bare earth percentage is high in places	Relatively high biodiversity in comparison to other solar PV facility habitats. Dwarf shrubland interspersed with drought-resistant grass (*Stipagrostis* dominant). No SCC present. Higher mammalian and reptile diversity than other solar PV facility habitats.	2.5
	Wash-out areas	Areas degraded by medium to high levels of erosion with a perceived high run-off rate.	Biodiversity degraded. Taller trees particularly *Vachellia karroo* and *Prosopis velutina*. Succulent shrubs (Mesembs and Melktou are dominant. No SCC likely to be	1.5

Site	Habitat types / features	Extent of disturbance	Fauna and Flora	Overall sensitivity (Rank 1-5)
			present.	
	Grassy scrubland	Disturbance largely related to sediment build up. Appears to be lower pressure from livestock grazing currently.	Sandy soil and sediment deposits facilitate large tracts of grass (*Stipagrostis* dominant) with a lower percentage of karoo scrub. Bare earth percentage is high in places. High animal biodiversity. Low plant biodiversity but likely higher seasonal biomass in good rainfall years.	2
	Calcrete ridge	High erosion rate on account of the erosion of shallow sandy soils. Medium grazing pressure from sheep and game on site.	Relatively high biodiversity but no special species present or likely to be present. Species richness similar to karoo shrubland with percentage composition varying. Habitat less common in the landscape.	3
	Artificial areas	Waterholes and water infrastructure. Highly disturbed. Habitat consists of very little natural vegetation.	Low biodiversity and many IAPs. Dominated by exotic tree species such as *Eucalyptus* and *Prosopis*	1
Sunnyside Pv Facility				
PV	**Arid Karoo scrubland**	Mild – heavy grazing pressure from sheep and low pressure of game grazing. Generally low level of erosion. Habitat is common in the region.	Relatively high biodiversity in comparison to other solar PV facility habitats. Dwarf shrubland interspersed with drought-resistant grass (Stipagrostis dominant). No SCC present. Higher mammalian and reptile diversity than other solar PV facility habitats.	2.5
	Arid Gravel Karoo scrubland	Habitat is common in the region. Similar to the common Arid Karoo shrubland discussed above in floral composition and overall biodiversity with the difference of rockier substate, erosion likely higher than above habitat type.	Relatively high biodiversity in comparison to other solar PV facility habitats. Dwarf shrubland interspersed with drought-resistant grass (Stipagrostis dominant). No SCC present. Higher mammalian and reptile diversity than other solar PV facility habitats.	2.5

Site	*Habitat types / features*	*Extent of disturbance*	*Fauna and Flora*	*Overall sensitivity* (Rank 1-5)
	Minor drainage line	Low disturbance in the form of erosion from drainage of neighbouring areas	Slightly different floral species composition with a higher average vegetation height. No SCC found. Habitat less common in the landscape.	3
	Grassy scrubland	Disturbance largely related to sediment build up. Appears to be lower pressure from livestock grazing currently.	Sandy soil and sediment deposits facilitate large tracts of grass (*Stipagrostis* dominant) with a lower percentage of karoo scrub. Bare earth percentage is lower than in Arid karoo shrubland and gravel karoo shrubland. Higher animal biodiversity. Low plant biodiversity but likely higher seasonal biomass in good rainfall years.	2
	Artificial areas	Waterholes and water infrastructure. Highly disturbed. Habitat consists of very little natural vegetation.	Low biodiversity and many IAPs. Dominated by exotic tree species such as *Prosopis* and other tree species (*V. karroo*)	1

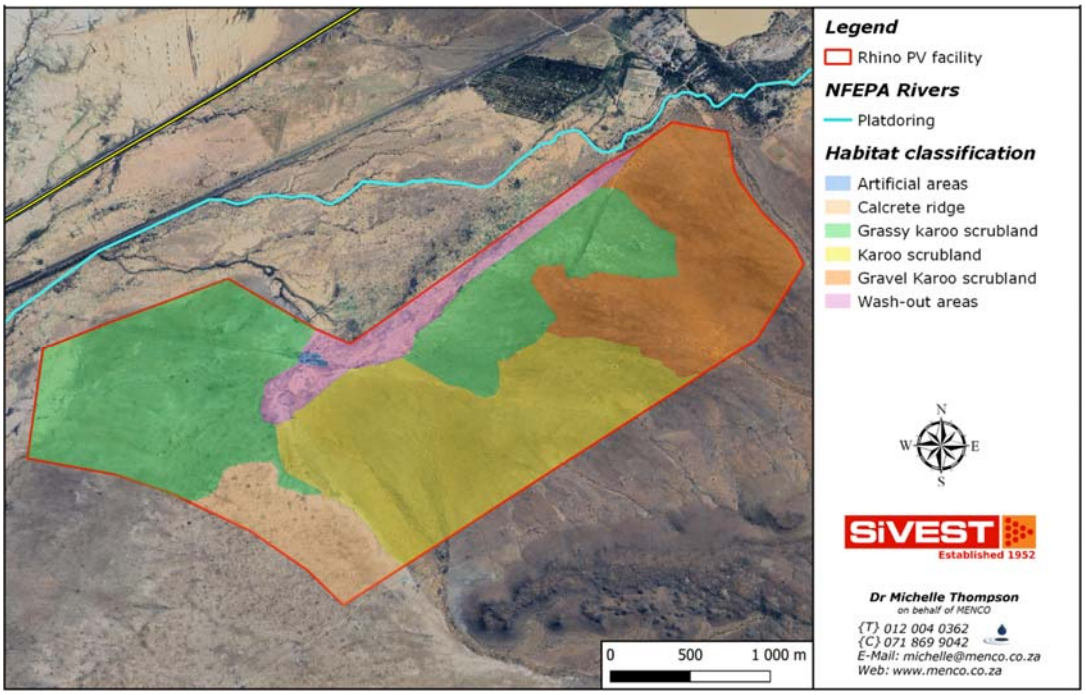

Figure 8-17: Habitat types delineated in the Rhino solar PV site

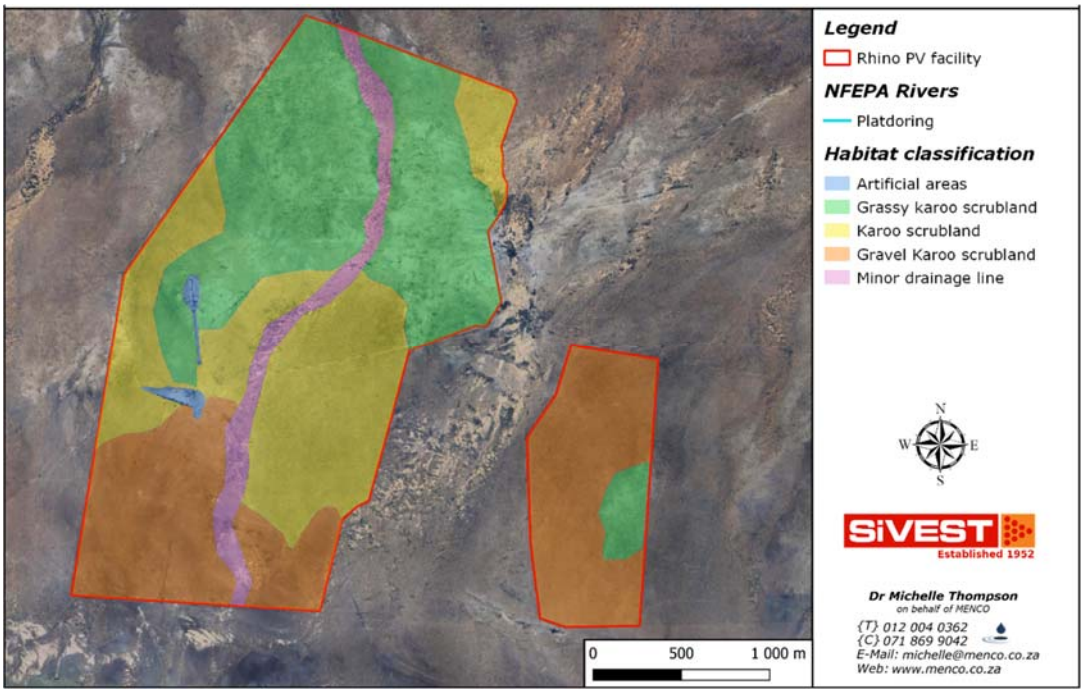

Figure 8-18: Habitat types associated with the Sunnyside solar PV site

A prefeasibility assessment was undertaken from September 2022 to January 2023 to screen the greater project site from an environmental and social perspective. Based on the findings, the project area was adjusted, and the layout was refined to avoid no-go areas. The proposed layout does not encroach into no-go areas identified by the specialist.

8.8.6 Summary and Conclusion

The potential impacts of the activities related to the development of solar PV energy farm sites were assessed in this report. It was found that while the developments would contribute to habitat loss and fragmentation for some species, given the low levels of transformation in the area and in general the low to medium sensitivity of the majority of the area, the development is unlikely to have a high impact on ecological processes.

Therefore, the specialist deems it acceptable to proceed with the necessary EA process, provided the applicant is willing to adhere to the recommendations below.

8.9 Avifaunal Assessment

An Avifaunal Assessment was undertaken by AfriAvian (Pty) Ltd (report dated January 2024, attached in **Appendix 6C**).

8.9.1 Baseline Assessment

8.9.2 Bird Species at the Project Site

Accoding to the report, a total of 183 bird species could potentially occur within the Broader Area where the project area is located. Of the 183 species, 75 are classified as priority species for solar developments. Of the 75 solar priority species, 24 were recorded during the on-site surveys (SSV site visit and pre-construction

monitoring surveys), and 44 solar priority species have a medium to high likelihood of occurring regularly in the project area.

8.9.3 Bird Habitat

8.9.3.1 Biomes and Vegetation Type

According to the report, the landscape character of the project area is typical of the Great Karoo and comprises sections of plains and open valleys with dispersed drainage systems and rougher terrain including mesas (table type mountains/hills), koppies, rocky ridges, outcrops, and plateaus. The current land use in the project area is characterised by large agricultural holdings with mostly low-density livestock and game grazing being the main land use. Dry climatic conditions are such that agricultural activities are very limited and are restricted to valley bottoms often near or around farmsteads.

The project area comprises of flat plains and rugged mountains, with its centre approximately 28 km north-east of the town of Beaufort West in the Nama Karoo biome, in the Lower and Upper Karoo Bioregions (SANBI 2018). The habitat in the project area consists of extensive plains with low shrub and a prominent grass component (refer to **Figure 8-19**), as well as and rougher terrain including rock-strewn mesas, koppies, rocky ridges, outcrops and plateaus covered with grass and low shrub. SANBI (2018) classifies the vegetation in the project area as Gamka Karoo on the plains, with Upper Karoo Hardeveld on the high lying ridges, koppies and mountains. Gamka Karoo consists of dwarf spiny shrubland dominated by Karoo dwarf shrubs (e.g., *Chrysocoma ciliata, Eriocephalus ericoides*) with rare low trees (e.g., *Euclea undulata*). Dense stands of drought-resistant grasses (*Stipagrostis, Aristida*) cover (especially after abundant rains) broad sandy bottomlands. Upper Karoo Hardeveld consists of sparse dwarf Karoo scrub with drought-tolerant grasses of genera such as *Aristida, Eragrostis and Stipagrostis* (SANBI 2018). There are no prominent rivers or drainage lines in the PAOI.

Figure 8-19: Typical Nama Karoo habitat in the project area - A mixture of grass and shrubs on the plains in the project area

SABAP1 recognises six primary vegetation divisions (biomes) within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest. The criteria used by the authors to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community

studies on bird/ vegetation associations. According to the report, using this classification system, the natural vegetation in the project area is classified as Nama Karoo.

8.9.3.2 Woodland

Trees and taller woody shrubs are mostly restricted to watercourses and include *Vachellia karroo, Diospyros lycioides, Grewia robusta, Searsia lancea,* and *Tamarix usneoides* (refer to **Figure 8-20**). This habitat provides suitable foraging and nesting substrate for a number of woodland associated species, as well as some of the raptors.

Figure 8-20: Woodland habitat along a drainage line in the project area

8.9.3.3 Surface Water

Dams, ephemeral drainage lines and associated wetlands are sources of surface water in the project area and are important for most avifauna for drinking, bathing and in some instances foraging (refer to **Figure 8-21**). During winter, flocks of Blue Crane roost at dams, arriving at dusk and departing before sunrise. Large raptors such as Martial Eagle, Tawny Eagle and Verreaux's Eagle use the dams and drainage lines for bathing and drinking. Boreholes with water troughs are also important as they often represent the only permanent source of water during dry periods.

Figure 8-21: A typical ground dam located just outside the project area (on Remainder of Farm 155 Rhenosterkop), but there are similar dams within the project area.

8.9.3.4 Mesas, Ridges and Koppies

The project area contains many mesas, koppies, rocky ridges, outcrops, and plateaus (**Figure 8-22**). These landscape features are important for priority species as nesting and foraging areas including Verreaux's Eagle.

Figure 8-22: Rocky ridges in the project area

8.9.3.5 Alien Trees

The project area is largely devoid of tall trees, except for alien trees which have been planted near homesteads (refer to **Figure 8-23**). Although stands of *Eucalyptus* are strictly speaking invader species, they have become important refuges for some priority species which may use them for roosting and nesting.

Figure 8-23: Stands of alien trees are typically found near homesteads in the project area.

8.9.3.6 Agricultural Lands

Also relevant to the project area are agricultural areas. Cultivation is limited to a few irrigated agricultural lands within the project area. Arable or cultivated land represents a significant feeding area for many bird species in any landscape, but perhaps more so in arid environments. The opening up of the soil surface and land preparation makes many insects, seeds, bulbs, and other food sources accessible to birds and other predators. The crop or pasture plants are often eaten by birds or attract insects which are also eaten by birds. Agricultural areas are of specific importance to Blue Crane and Ludwig's Bustard.

8.9.3.7 High Voltage Powerlines

There are several existing high voltage overhead power lines in the area (refer to **Figure 8-24**). High voltage lines are an important breeding substrate for raptors in the Karoo due to the lack of large trees. Both Verreaux's Eagle and Martial Eagle have been recorded breeding on high voltage lines near the project area.

Figure 8-24: High voltage lines in and near the project area

8.9.4 Fieldwork Findings

The main source of information on the avifaunal diversity and abundance at the Rhino and Sunnyside PV project sites is an integrated pre-construction monitoring programme which covered the development areas of both (i.e., Rhino PV and Sunnyside PV) proposed SEF sites. **The results of the monitoring are equally applicable to both development areas due to the similarity of the habitat**.

The pre-construction avifaunal monitoring programme followed an adapted Regime 2 protocol as defined in the Birds and Solar Energy Best Practice Guidelines which requires a minimum of two surveys over a six-month period.

On site surveys, transect counts were conducted:

- 21–23 August 2023 and,
- 07-08 November 2023.

The abundance of solar priority species (Index of Kilometric Abundance i.e., birds/km = IKA) recorded during the transect counts, is displayed in **Figure 8-25**.

The number of birds and number of different species (species composition) counted during the drive transects conducted during the two monitoring surveys, are presented in the table below:

Table 8-3: Species Composition

Species composition	
All species	50
Priority species	14 (28%)
Non-priority species	36
Total count	
Drive transect	827

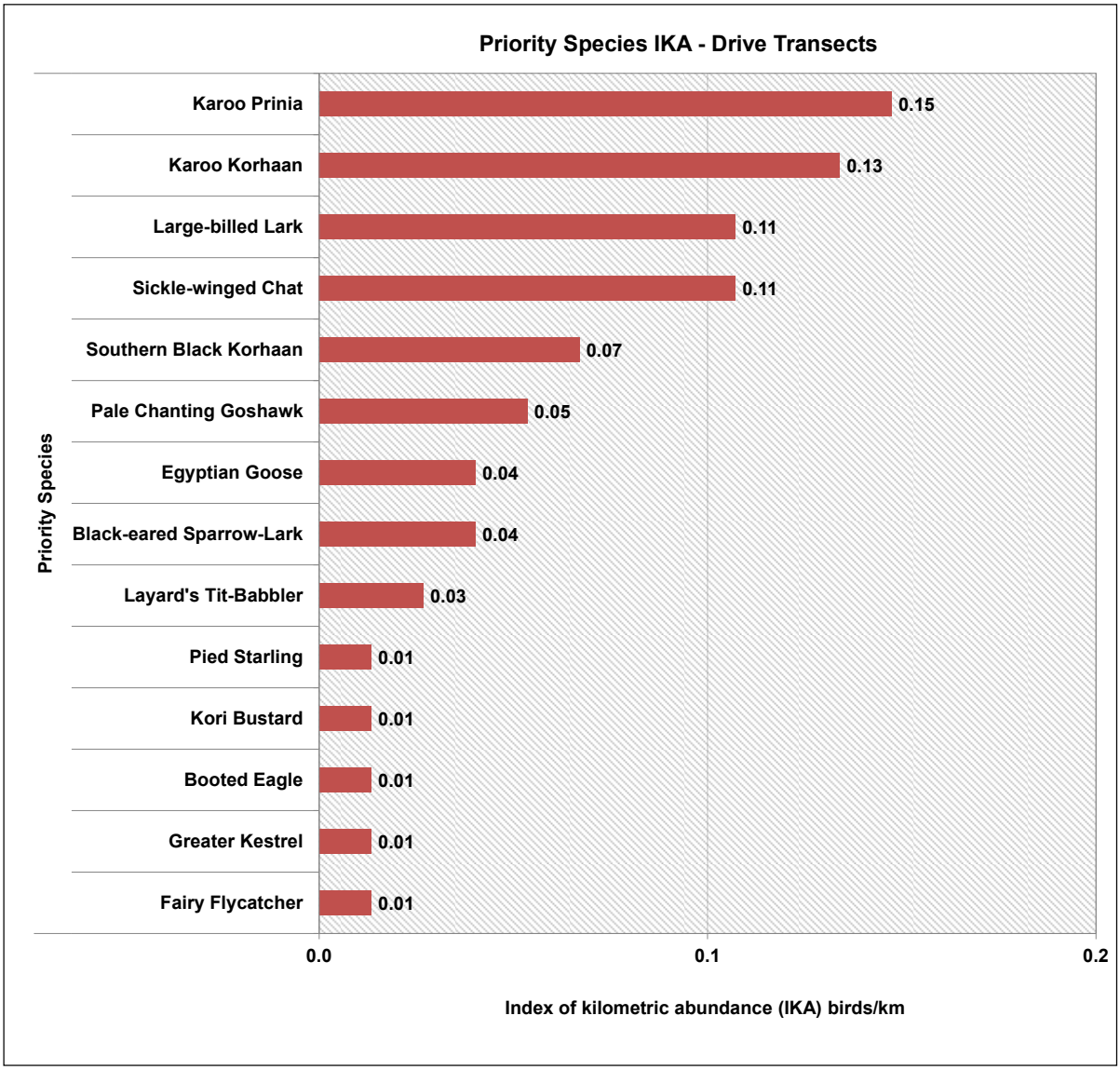

Figure 8-25: IKA of priority species recorded during drive transect counts (two surveys) at the Rhino PV and Sunnyside PV SEF sites.

Figure 8-26 and **Figure 8-27** present the locations of priority species recorded during the two on-site surveys at the Rhino and Sunnyside PV SEF sites during drive transects counts and incidental sightings.

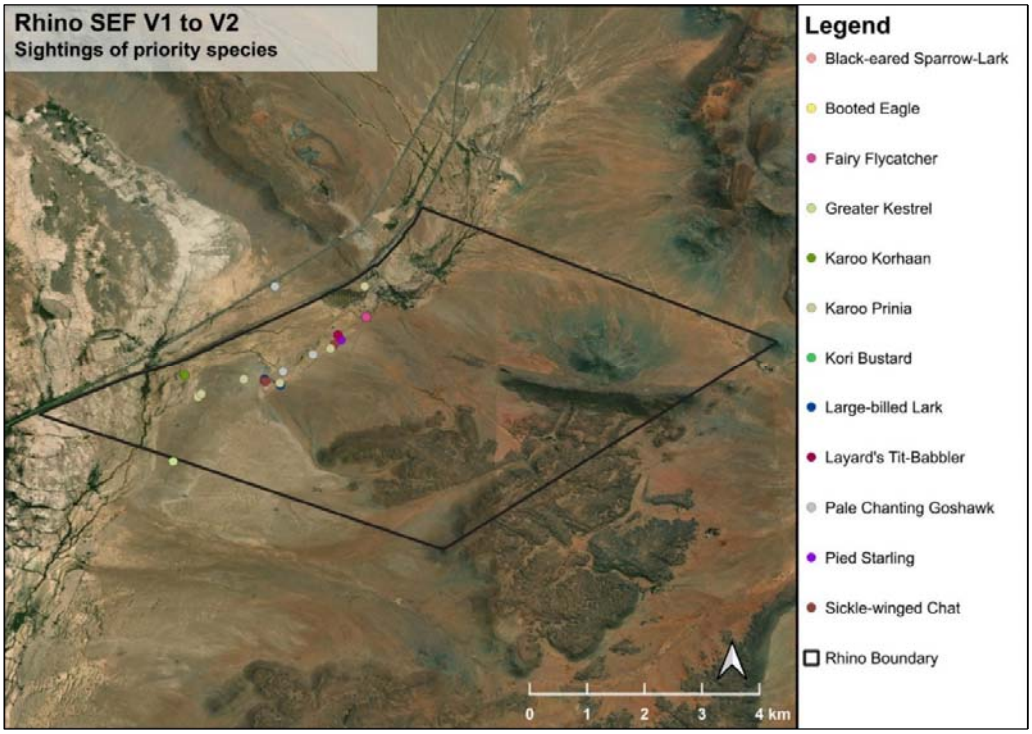

Figure 8-26: Priority species recorded during the pre-construction monitoring surveys at the proposed Rhino PV SEF

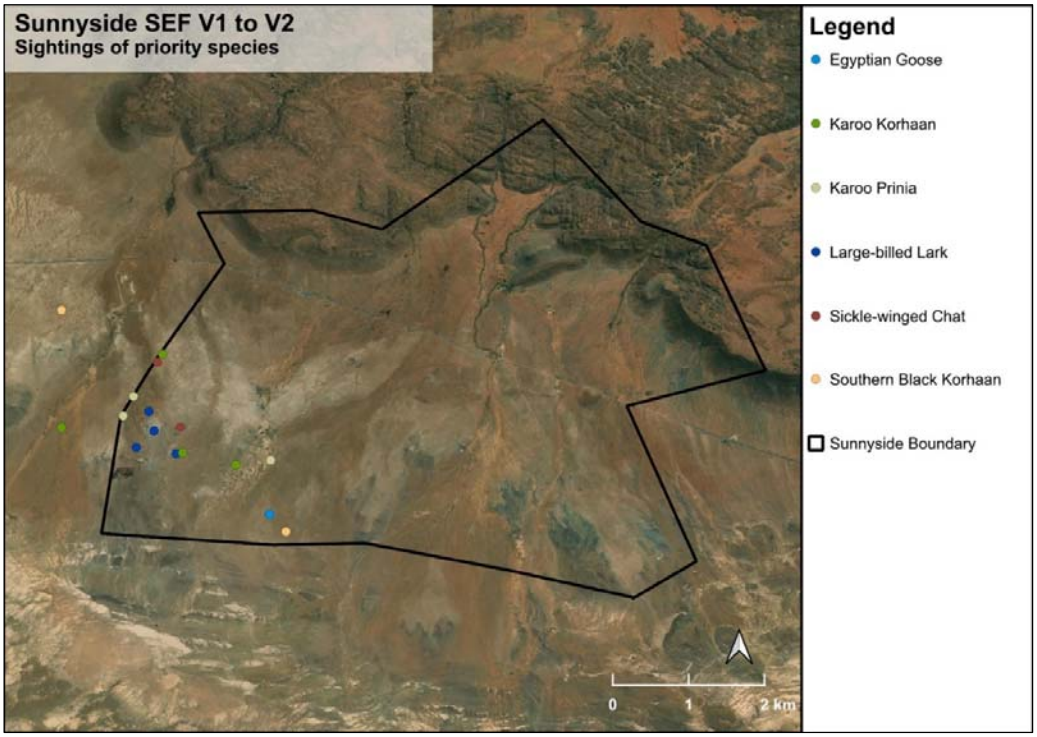

Figure 8-27: Priority species recorded during the pre-construction monitoring surveys at the proposed Rhino PV SEF

8.9.5 Site Sensitivities

The following avifaunal sensitivities were identified at Rhino PV only:

- **Very High Sensitivity Zones: All Infrastructure Exclusion Zones:**
  - **Red Data Raptor Nests:** An all-infrastructure exclusion zone should be implemented and maintained on Remainder of Farm 155 Rhenosterkop (Rhino PV) within 2.5 km of the identified Martial Eagle nest and within 1 km of the identified Verreaux's Eagle nests to avoid displacement due to disturbance. These buffer areas will also reduce the risk of injury to juvenile birds due to collision with solar panels, when they start flying and practicing their hunting techniques near their nests (see **Figure 8-28 and Figure 8-29**). No raptor nests were identified within or near the Sunnyside PV development area.

The following avifaunal sensitivities were identified at both Rhino PV and Sunnyside PV SEFs:

- **High Sensitivity Zones: Solar Panel Exclusion Zones:**
  - **Surface Water and Wetlands:** A solar panel exclusion zone buffer should be implemented and maintained around all surface water features such as dams and reservoirs (200 m), as well as non-perennial drainage lines and associated herbaceous wetlands (150 m) which can, when flowing, attract birds. This is applicable for both the Rhino PV and Sunnyside PV SEF. Surface water area are important congregation points for priority avifauna and many non-priority species. It is important to leave open space with no solar panels for birds to access and leave the surface water area unhindered. Surface water is also an important area for raptors to hunt other birds which tend to congregate around these micro-habitats. Raptors need enough space for fast aerial pursuit of prey. The buffer zones will also benefit species like Blue Crane which prefer to breed close to water bodies.
  - **Agricultural Fields:** Agricultural fields attract many priority and non-priority species to the area in search of food, including Red Listed species such as Blue Crane, Kori Bustard, and Ludwig's Bustard. Agricultural fields should, therefore, be kept free of solar panels.

Refer to **Figure 8-28** and **Figure 8-29** for the avifaunal sensitivities identified for the Rhino and Sunnyside PV SEF.

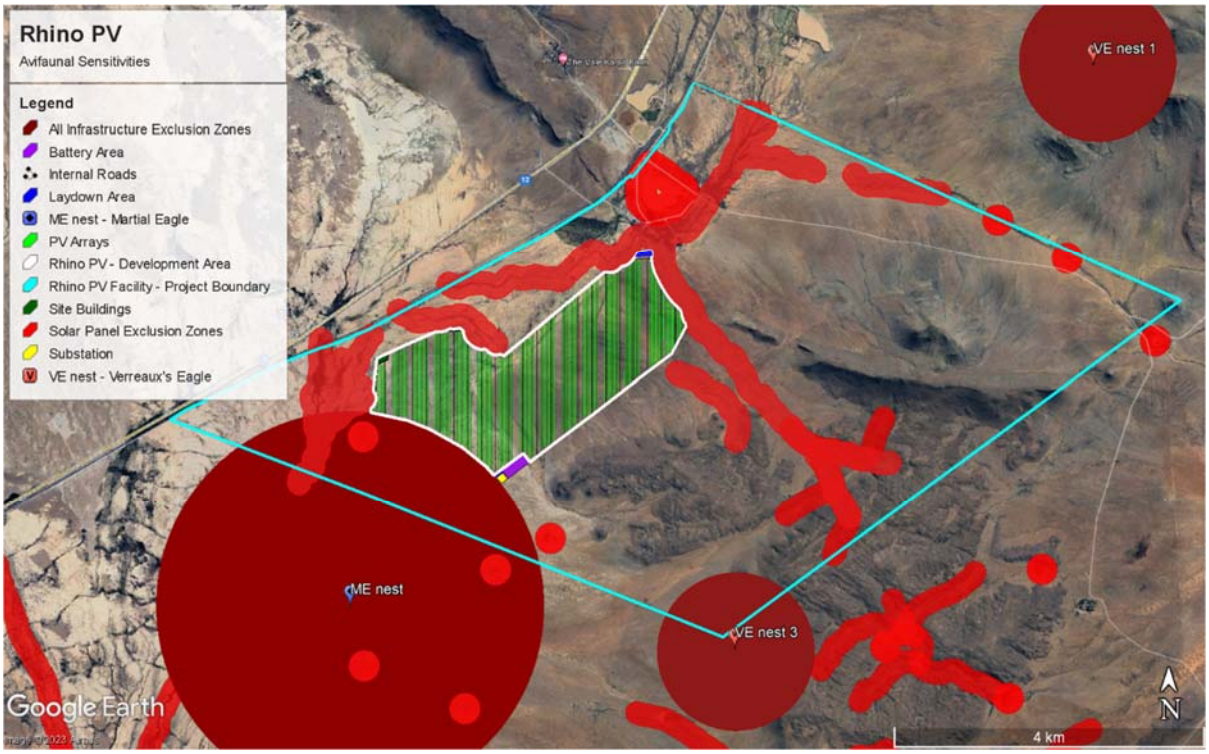

Figure 8-28: Avifaunal sensitivities identified at identified at Rhino PV.

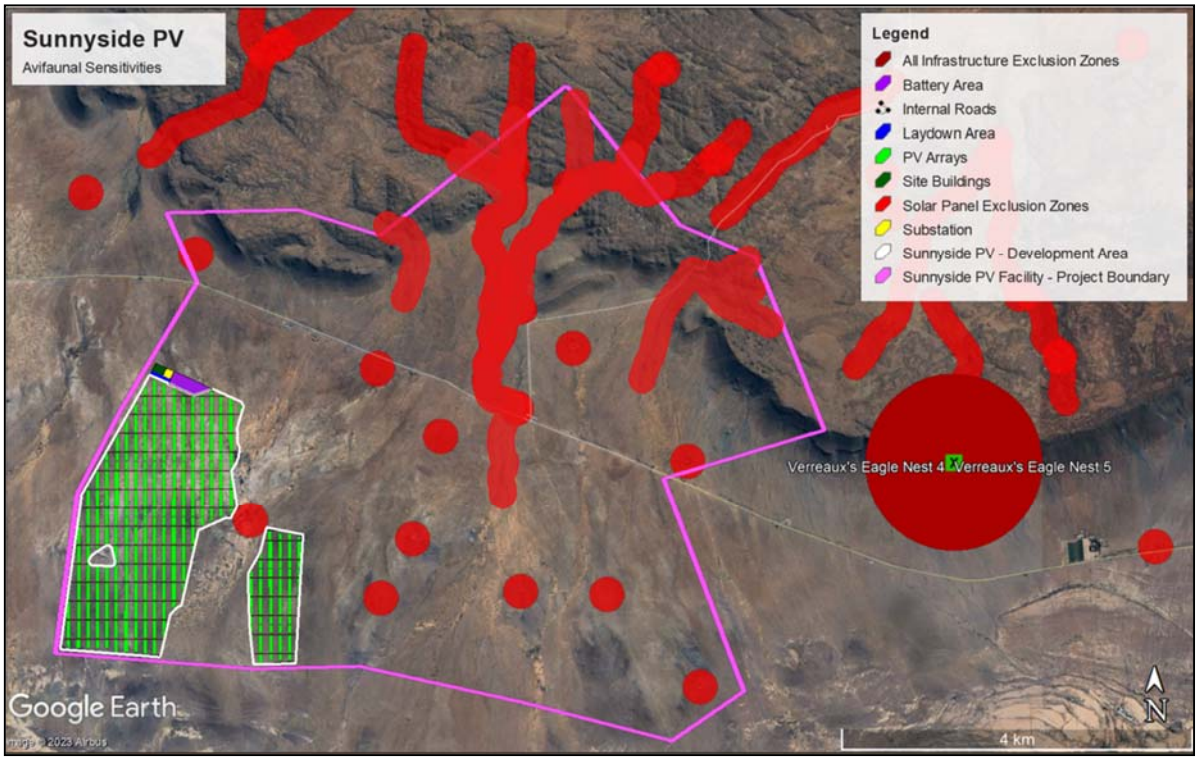

Figure 8-29: Avifaunal sensitivities identified at identified at Sunnyside PV

The proposed layout has avoided the avifaunal sensitivities and does not encroach into no-go areas identified by the specialist. The proposed layout has therefore been deemed acceptable by the avifaunal specialist.

8.9.6 Summary and Conclusion

According to the report, there are no fatal flaws or unacceptable impacts associated with the proposed SEF project, provided the recommendations are strictly implemented and maintained. The impacts identified are acceptably mitigated to Low (negative) impact with the exception of the displacement of avifauna due to habitat transformation as a result of the proposed development. This impact is mitigated to Medium (negative) impact.

The specialist has recommended that the proposed Rhino PV and Sunnyside PV SEF are authorised, on condition that the proposed mitigation measures in the EMPr are strictly implemented.

9. DESCRIPTION OF THE SOCIO- ECONOMIC ENVIRONMENT

9.1 Socio-Economic Characteristics

A Socio-Economic Assessment was undertaken by Urban-Econ Economists (Pty) Ltd (report dated January 2024, attached in **Appendix 6G**).

The Central Karoo District Municipality encompasses three local municipalities, each contributing differently to its overall composition. Within the Central Karoo District Municipality, Beaufort West Local Municipality constitutes 70,83% of the total population and 69,77% of the households (Quantec Standardised Regional, 2023; Stats SA, 2011 forecast to 2023).

Table 9-1 is an overview of the study area's population, income and employment profiles. Population growth between 2012 and 2022 was 0,45% year-on-year for the local municipality, which was lower than the district municipality (0,58%). However, both realised a lower growth rate compared to the Western Cape (1,93%) (Quantec Standardised Regional, 2023; Stats SA, 2011 forecast to 2023). The population's growth rate serves as a key indicator of increasing opportunities within the local municipality (Quantec Standardised Regional, 2023; Stats SA, 2011 forecast to 2023). Furthermore, the population density of 2,45 individuals per square kilometre (km²) signifies adequate space to accommodate a larger population in the local municipality (Quantec Standardised Regional, 2023; Stats SA, 2011 forecast to 2023). The average household income in the local municipality compares close to the district, at an average of R11 360, which is slightly lower than the district's average of R11 518 and significantly lower than the provincial average of R20 266 (Quantec Standardised Regional, 2023; Stats SA, 2011 forecast to 2023).

Table 9-1: Overview of the primary study areas population structure

Indicator	Western Cape	Central Karoo District Municipality	Beaufort West Local Municipality
Area (km^2)	129 462	38 854	21 917
Population	7 181 757	75 934	53 781
Number of Households	1 989 790	20 058	13 994
Population density (/km^2)	55,47	1,95	2,45
Average household size	3,60	3,77	3,83
Annual population growth (2012-2022)	1,93%	0,58%	0,45%

Indicator	Western Cape	Central Karoo District Municipality	Beaufort West Local Municipality
Average monthly household income	**R20 266**	**R11 518**	**R11 360**

Source: (Quantec Standardised Regional, 2023; Stats SA, 2011 forecast to 2023)

The proposed development is poised to draw in a surge of residents to the study area, primarily owing to the numerous employment opportunities that will be generated as a direct result of the project. The creation of multiple job opportunities serves as a compelling magnet, enticing individuals to relocate and settle within the vicinity of the project.

This influx of population is expected to be a natural consequence of the employment prospects that the project brings, thereby contributing significantly to the demographic landscape of the area. As these employment opportunities take place, the local community is likely to witness an influx of new residents, thereby fostering both social and economic growth within the region.

Table 9-2 provides data on the employed and economically inactive individuals, the percentage of the population without employment, and the rate of labour force participation within the study areas. The slightly higher unemployment rate and lower labour force participation relative to the Central Karoo District Municipality and the Western Cape further suggests that the Beaufort West Local Municipality is subject to outward migration due to low employment opportunities available within the local municipality.

Table 9-2: Employment profile of the study areas

Indicator	Western Cape	Central Karoo District Municipality	Beaufort West Local Municipality
Employed	2 473 329	18 389	11 869
Unemployment Rate	24,49%	25,59%	28,07%
Not Economically Active	1 773 248	22 165	16 516
Labour force participation rate	64,88%	52,72%	49,98%

Indicated in **Table 9-3** is the Gross Value Added (GVA) contribution in 2015 constant prices for the study area. The GVA of the local municipality was valued at R4,5 billion in 2022 (constant prices), which accounts for around 68,09% of the district economy's GVA, and 0,34% of the GVA of Western Cape. The proposed development will contribute further to the economy and ensure sustainability.

Table 9-3: Economic structure between 2012 and 2022 (constant 2015 prices; R' millions)

Sector	Western Cape		Central Karoo District Municipality		Beaufort West Local Municipality	
	2012	2022	2012	2022	2012	2022
Agriculture and hunting	4,72%	5,35%	20,42%	23,44%	16,11%	19,20%
Mining and quarrying	0,34%	0,26%	0,06%	0,05%	0,08%	0,07%
Manufacturing	27,02%	22,77%	4,96%	4,25%	5,88%	5,08%
Electricity, gas and water	2,18%	1,89%	4,45%	4,31%	4,20%	3,91%
Construction	7,00%	4,65%	7,43%	4,59%	6,37%	3,63%
Trade	11,78%	11,79%	12,91%	11,17%	12,97%	11,41%
Transport and communication	10,65%	13,74%	14,35%	15,76%	16,51%	17,84%
Finance and business services	22,50%	25,42%	9,64%	10,42%	11,65%	12,72%

Sector	Western Cape		Central Karoo District Municipality		Beaufort West Local Municipality	
	2012	2022	2012	2022	2012	2022
Community services	6,78%	7,43%	11,49%	12,07%	11,67%	11,98%
General government	7,03%	6,69%	14,29%	13,94%	14,56%	14,17%
Total GVA	**R1 167 285**	**R1 321 146**	**R5 647**	**R6 624**	**R3 985**	**R4 510**

Source: (Quantec Standardised Regional, 2023)

The growth in the local municipality over the last few years was largely due to the strong performance of the agricultural, finance and transport sectors. The manufacturing, construction and utilities sectors both indicated a smaller contribution in 2022, than in 2012. Even though trade sector indicated a noticeable contraction in the last 10-years in the local municipality, the sector remains a large contributor in the economy. The agricultural sector in the local municipality is the sector that expanded the most. The predominant agricultural pursuit in the region is sheep farming, primarily yielding wool and meat production. Nevertheless, the area also witnessed extensive farming of goats and cattle. The growth of lamb production exhibited a substantial increase of 97% over the period from 2011 to 2021. This notable increase serves as a significant indicator of the lamb sector's substantial contributions to the growth of the agricultural sector.

The proposed project would have an impact on the reliability and generation of electricity, which will further contribute to the utilities sector within the local municipality, which currently only contributes 3,91% towards the municipality's economy.

Table 9-4: GVA per sector for the Beaufort West Local Municipality (2015 constant prices; in R' millions)

Sector	Beaufort West Local Municipality		
	2012	2022	CAGR
Agriculture and hunting	641,99	865,82	3,04%
Mining and quarrying	3,17	3,22	0,18%
Manufacturing	234,28	228,95	-0,23%
Electricity, gas and water	167,41	176,34	0,52%
Construction	253,70	163,84	-4,28%
Trade	516,91	514,62	-0,04%
Transport and communication	658,16	804,37	2,03%
Finance and business services	464,31	573,73	2,14%
Community services	464,95	540,26	1,51%
General government	580,42	638,90	0,96%
Total GVA	**R3 985,30**	**R4 510,04**	**1,24%**

Source: Quantec Standardised Regional (2023)

The sector with the biggest Compound Annual Growth Rate (CAGR) between 2012 and 2022, was the agricultural sector, with 3,04%. Over the last ten years, the CAGR of the local municipality increased marginally with 1,24%, which is kept growing because of the agricultural, transport and finance including business sectors indicating strong CAGRs. The manufacturing and construction sectors realised a contraction between 2012 and 2022, where the proposed project will aid with improving business activity within these sectors (Quantec Standardised Regional, 2023).

As evident by **Table 9-5** the community services sector makes a large contribution towards employment on

all levels from provincial to local. The mining and quarrying sector contributed the least to employment in the Beaufort West Local Municipality. The utilities sector, being the second-lowest contributor, serves as an indicator of the necessity to boost job prospects within the industry through the proposed development. Beaufort West Local Municipality's construction sector, which accounted for only 3,39% and utilities sector only 0,53% in 2022, is expected to see improvements due to the recommendation of employing local labour for the construction of the proposed project.

Table 9-5: Employment structure and contribution between 2012 and 2022 per economic sector

Sector	Western Cape		Central Karoo District Municipality		Beaufort West Local Municipality	
	2012	2022	2012	2022	2012	2022
Agriculture and hunting	10,17%	10,30%	22,51%	24,99%	16,90%	20,04%
Mining and quarrying	0,08%	0,06%	0,01%	0,01%	0,02%	0,02%
Manufacturing	11,02%	9,94%	1,81%	1,55%	2,23%	2,00%
Electricity, gas, and water	0,35%	0,35%	0,54%	0,59%	0,52%	0,53%
Construction	6,19%	5,48%	4,99%	4,08%	4,50%	3,39%
Trade	22,44%	23,11%	23,51%	21,47%	25,46%	23,73%
Transport and communication	4,48%	4,06%	5,05%	3,87%	5,98%	4,53%
Finance and business services	18,34%	20,14%	8,83%	8,76%	10,78%	10,47%
Community services	20,51%	19,83%	23,34%	23,76%	23,84%	23,82%
General government	6,42%	6,72%	9,41%	10,93%	9,78%	11,48%
Total Employment	**2 246 258**	**2 426 605**	**17 370**	**18 282**	**11 809**	**11 816**

Source: Quantec Standardised Regional (2023)

Western Cape Province, Central Karoo District Municipality and Beaufort West Local Municipality rely on the agricultural sector for employment opportunities. Agricultural activities require significant labour input, so even a slight reduction in the sector's size can result in more job losses compared to capital-intensive industries like manufacturing or utilities. Moreover, the agricultural sector often serves as a major source of employment in rural areas. These factors underscore the sector's importance and why it is usually prioritized in development strategies.

9.1.1 Socio-Economic Potential Impacts

Economic impacts are assessed from the perspective of the national and regional economy within which the proposed development is to be implemented. Economic impacts can be defined as the effects (positive or negative) on the level of economic activity in a given area(s). The net economic impact is usually measured as the expansion or contraction of an area's economy, resulting from the changes in i.e., opening, closing, expansion or contraction of a facility, project or programme.

All new projects have two basic types of investments, an initial capital injection / expenditure which can take the form of either a greenfield development (i.e., new construction project on vacant land) or brownfield development (i.e., a modification of an existing structure and there is an annual investment made to maintain/ operate the investment).

The economic impacts created by a capital injection are once-off impacts that will occur for the duration of construction. Thus, economic impacts associated with the construction phase are not sustainable economic impacts. Hence the temporal nature of capital expenditure and long-term nature of operational expenditure impacts cannot be added together to determine the total economic impact. The net economic impact of an

exogenous change in the economy will be translated according to various direct and indirect economic effects, as outlined below:

Direct economic impacts: The changes in local business activity as a direct consequence of public or private activity in the economy. Furthermore, increased user benefits lead to monetary benefits for some users and non-users within the geographical area:

- For affected residents, benefits may include reduced costs for obtaining goods and services, increased income from selling goods and services to outsiders, and/or increased variety of work and recreational opportunities associated with greater location accessibility. For affected businesses, there may be economic efficiency benefits in terms of product cost, product quality or product availability, stemming from changes in labour market access, cost of obtaining production inputs and/or cost of supplying finished products to customers.

Indirect and induced impacts: The direct benefits to business and the residents of communities and regions may also have broader indirect / induced impacts:

- Indirect – Growth of municipal revenues due to raised taxes and service levies.
- Induced – Business growth as the additional workers (created by direct and indirect economic impacts / effects) spend their income on food, clothing, shelter and other local goods and services.

Economic impacts refer to the impact that the construction, operational and maintenance phases of the proposed development will have on the economy, as measured by the following economic indicators:

- **Contribution to Regional GDP:** Regional GDP is a broader measure of the full income effect. This measure reflects the sum of wage income and corporate profit generated in the study area due to an exogenous change in the regional economy.
- **Employment Creation:** The employment resulting from the construction, operation and maintenance of the project under investigation. The skill level of employment created is also considered.
- **Production / Business Sales:** The value of all inter- and intra-sectoral business sales generated in the economy because of the introduction of an exogenous change in the economy. Explained more simply, new business sales equate to additional business turnover as a result of the introduction of an exogenous change in the economy (e.g., the construction of a powerline and substation).
- **Personal Income:** Refers to the salaries and wages earned as a result of the employment generated from the development of the proposed project.

9.1.2 Summary and Conclusion

The assessment concentrated on gathering both secondary and primary data to establish a comprehensive social baseline, essential for identifying potential socio-economic impacts linked to the proposed development. This report aimed to create a foundation against which the potential social and economic consequences of the development project could be thoroughly assessed and understood. A summary of the potential positive and negative impacts identified for the detailed design and construction, operational and decommissioning phases.

A number of potential positive and negative social impacts have been identified for the proposed development during this BA process. Based on the findings, no red flags or fatal flaws have been identified from a socio-economic perspective which could preclude the progress of the proposed development.

9.2 Cultural Heritage, Archaeology and Palaeontology

A Cultural Heritage, Archaeology and Palaeontology Assessment (HIA) was undertaken by CTS Heritage (Pty) Ltd (report dated January 2024, attached in **Appendix 6E**).

9.2.1 Cultural Heritage

According to the report, the name 'Karoo' has its roots in the Khoisan word meaning 'place of great dryness'. It once supported large grassy flatlands and the San and Khoekhoen migrated across the region for hunting and grazing purposes. Less than two hundred years ago large herds of antelope still roamed the grass plains. With the occupation of the area by stock farmers, the sheep gradually replaced the game and the grass receded along with changing grazing and weather patterns. By the late 17th century, the Khoenhoen had moved from the region into the more water-rich southern Karoo and the coastal plains. During the early colonial period, the harshness of the Karoo region formed an almost impenetrable barrier from the Cape to the interior for colonial explorers, hunters and travellers. The 18th century was characterised by a marked increase in the rate of expansion of the boundaries of the settlement at the Cape. This was associated with the emergence of the migrant stock farmer (trekboer). Early routes into the interior largely followed the tracks initially used by migrating herds of game or the cattle herds and sheep flocks of the Khoekhoen on their seasonal route between coastal and inland grazing grounds. These routes were later reinforced by generations of trek farmers moving between the markets at the Cape and their farms.

Permanent settlement of the region only really occurred in the 19th century with towns being established near permanent water sources. It was during this period that Beaufort West was established as a drostdy in 1818 on the farm Hooyvlakte. In the same year, a mission station was established at Kookfontein, just outside Beaufort West. Beaufort West became the first municipality in South Africa on 3 February 1837 and had the country's first town hall. When the railroad reached the town in 1880 it became a marshalling yard and locomotive depot and today it is the largest town in the Karoo.

The area proposed for development is located near to Nelspoort, a detailed history for which is provided for online[8]. Nelspoort became a hub for the treatment of Tuberculosis. As far back as 1850, the famous explorer David Livingstone extolled the climate of the Karoo and noted it was "suitable for all patients with pulmonary complaints". By 1925, the Nelspoort Sanatorium opened its doors, with the official opening performed by the Prince of Wales, later Edward VIII and then Duke of Windsor in July 1925. As part of this ceremony, a small grove of blue gums were planted. This species has subsequently established itself as an integral part of the cultural landscape of this area.

Nelspoort also has links with the Anglo-Boer War. In 1901, in an effort to prevent the northbound rail link from being destroyed, the British built hundreds of blockhouses. Two were erected to guard the bridges over the Krom River, near Nelspoort. In 1980, however, one was totally destroyed in a flash flood. The other still stands in the shade of pepper trees on the farm Smokey Grove. Guard posts and schantzes were also built on the Nelspoort koppies and soldiers were garrisoned nearby to man the lookouts and blockhouses. Their water source was a perennial fountain, to this day, called Kitchener's Well after Lord Kitchener, British Commander-in-Chief.

According to the report, the area possesses a number of cultural landscape qualities and elements which are outlined below:

[8] https://www.beaufortwest.net/explore/central-karoo/nelspoort/

- The location of the site on the south Central Plateau of the Great Karoo, separated from the Karoo vlakte by the Great Escarpment, characterised by a combination of flat open plains punctuated by mountains and koppies. Parallel valley-ridge systems.
- The folded quality of the landscape - open plains interrupted by ridges and koppies - a function of its geology, semi-arid conditions and low vegetation cover; a relatively ephemeral pattern of human intervention on the landscape resulting in a sense of remoteness and stillness, known also for its night sky.
- Generally a widespread archaeological signature dating to the Earlier and Middle Stone Ages (MSA) described as a low frequency ancient scatter across the landscape, as well as an archaeological signature dating to the Later Stone Age (LSA). In this case, dense archaeology around the dolerite koppies.
- Historical associations with colonial expansion of the northern frontier zone in the late 18th early 19th century resulting in the further displacement of transhumant pastoralism by settled agriculture and the emergence of extensive sheep farming in the early to mid-19th century; the farms Kruidfontein (pre-1890), Poortjie and Louws Baken (pre-1829), being first surveyed during this period.
- A distinctive pattern of settlement informed by access to limited water resources with small, isolated farmsteads forming green oases in the semi-arid landscape, sheltered from the heat by exotic trees and associated with springs, streams, dams and windpumps. The manner in which homesteads are positioned at the base of hills and koppies forming distinctive topographical settings. The dry-packed stone walls historically used for kraals, are a characteristic feature of the landscape.
- The N1 corridor following the alignment of the late 18th century route to the interior and its role as a structuring element in the landscape along which dispersed settlement has occurred like “beads on a string”.
- Nelspoort, significant for its wealth of tangible remains demonstrating a continuous history of occupation from pre-history, through to its mid-19th century role in the local wool farming boom, and development as a 20th century medical sanctuary.
- Poortjie Wes, significant as an identified place on an early linkage route between Beaufort West and Graaf Reinet.

9.2.1.1 *Archaeological features*

According to the report, a number of heritage assessments have been completed within close proximity to the area proposed for development. Archaeological sites include caves and rock shelters, open air artefact scatters, rock engravings and historic structures with their associated cultural materials.” According to ACO (2013, SAHRIS NID 503074), Because of the scarcity of caves and shelters, more than 90% of Karoo archaeological sites are open sites of stone artefacts, ostrich eggshell fragments and occasionally, pottery. Bone remains are rarely preserved. Artefacts of both the Early and MSA are widespread and may generally be described as an ancient litter that occurs at a low frequency across the landscape. Where definable scatters of Early and MSA material occur, they are considered to be significant heritage sites.

More intensive occupation of the Karoo started around 13 000 years ago during the LSA, which is essentially the heritage of Khoisan groups who lived throughout the region. The legacy of the San includes numerous open sites while traces of their presence can also be found in most large rock shelters, often in the form of rock art. They frequently settled a short distance from permanent water sources (springs or waterholes) and made use of natural shelters such as rock outcrops or large boulders or even large bushes. In the Great Karoo, natural elevated features such as dolerite dykes and ridges played a significant role in San settlement patterns” and as such, this broader area is renowned for its well-preserved rock art and other artefacts from this time, including rock engravings and rock gongs. It is likely that similar archaeological heritage exists within the areas proposed for development and as such, impact to these resources must be assessed.

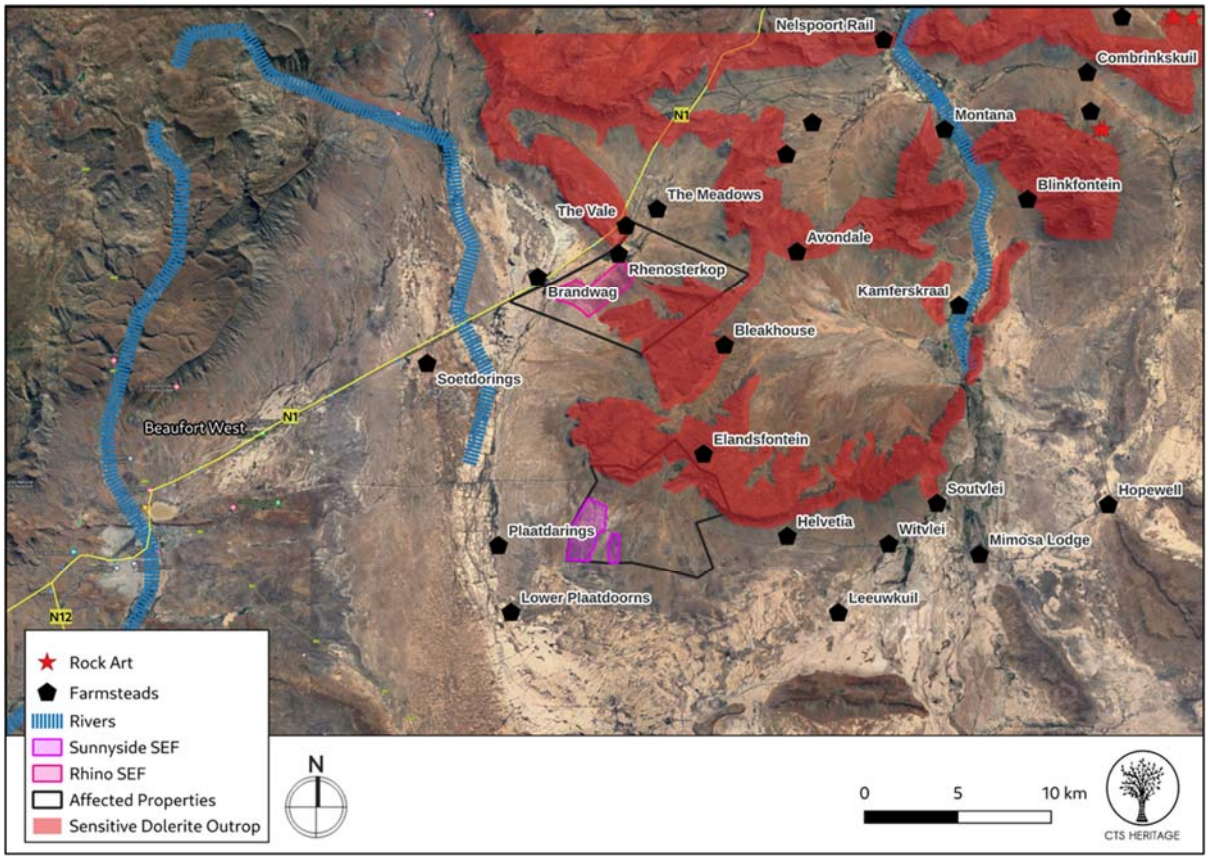

Figure 9-1: Cultural landscape elements

A recent field assessment completed by CTS Heritage for a renewable energy project located immediately north of the development area recorded 111 Observations. The bulk of these were open site scatters of MSA cores, flakes and debitage. Local siltstones and hornfels rock cores had been used in the production of the flakes with very little introduction of exotic stone sourced in other regions. While only a handful of flakes were found dispersed across a very wide area, they form a constant backdrop to the landscape rather than being concentrated particularly in any one area. The MSA materials tended to be heavily patinated and weathered by water and mud runoff after storms with a high clay content. Typologically diagnostic artefacts included some radial cores and a fairly common spread of retouched blades and blade blanks. Earlier MSA material was also found such as bifacial points and larger flakes but we would deduce that most of this layer of occupation is buried on the floodplains. A cluster of conservation-worthy sites were found including LSA engravings on dolerite boulders and an historic ruined kraal. The engravings show a range of well-preserved imagery linking the ethnographic records of the San in the Bleek and Lloyd collection to these sites such as the scene depicted showing a cloudburst of rain, finely engraved eland and elephant. A large number of LSA and historical artefacts were found in association with these sites. Most of the scatters recorded were graded as not conservation-worthy due to the ubiquity of these artefacts across the landscape and the lack of a particular focal point of landscape use.

Fieldwork in this area has identified a correlation between the dolerite outcrops in the area and higher levels of LSA archaeology, rock engravings and rock gongs. It is likely that this pattern is also applicable for the area under consideration in this assessment. As such, the dolerite outcrop located here must be considered to have high levels of archaeological sensitivity.

9.2.2 Palaeontology

According to the the report (refer to **Figure 9-2**), the area proposed for development is underlain by very few sediments of very high paleontological sensitivity (red), some of high sensitivity (orange) and most of low sensitivity (blue). The development area is underlain by the Poortjie Member of the Teekloof Formations, both of the Adelaide Subgroup of the Beaufort Group of sediments. In addition, the Beaufort Group sediments are known to preserve diverse terrestrial and freshwater tetrapods of Tapinocephalus to Lystrosaurus Biozones (amphibians, true reptiles, synapsids – especially therapsids), palaeoniscoid fish, freshwater bivalves, trace fossils (including tetrapod trackways) and sparse vascular plants (Glossopteris Flora, including petrified wood). Based on the known paleontological sensitivity of this area, it is very likely that activities associated with the development of the proposed PV, WEF and grid connections will negatively impact on significant fossil heritage.

According to the report, a recent field assessment of an adjacent site completed by the palaeontologist noted that “The great majority of the project areas is mantled by thick superficial deposits (alluvium, colluvium/ eluvium, calcrete, soils) of low palaeosensitivity. Apart from occasional invertebrate trace fossils of limited scientific interest, the small number of tetrapod fossils recorded from Lower Beaufort Group bedrocks here comprise reworked, fragmentary bones preserved within channel basal breccias or weathered-out into surface gravels. No well-preserved, articulated postcrania or identifiable skull material of high scientific or conservation significance was recorded, although there is still potential for such material occurring at or beneath the surface within the sites.

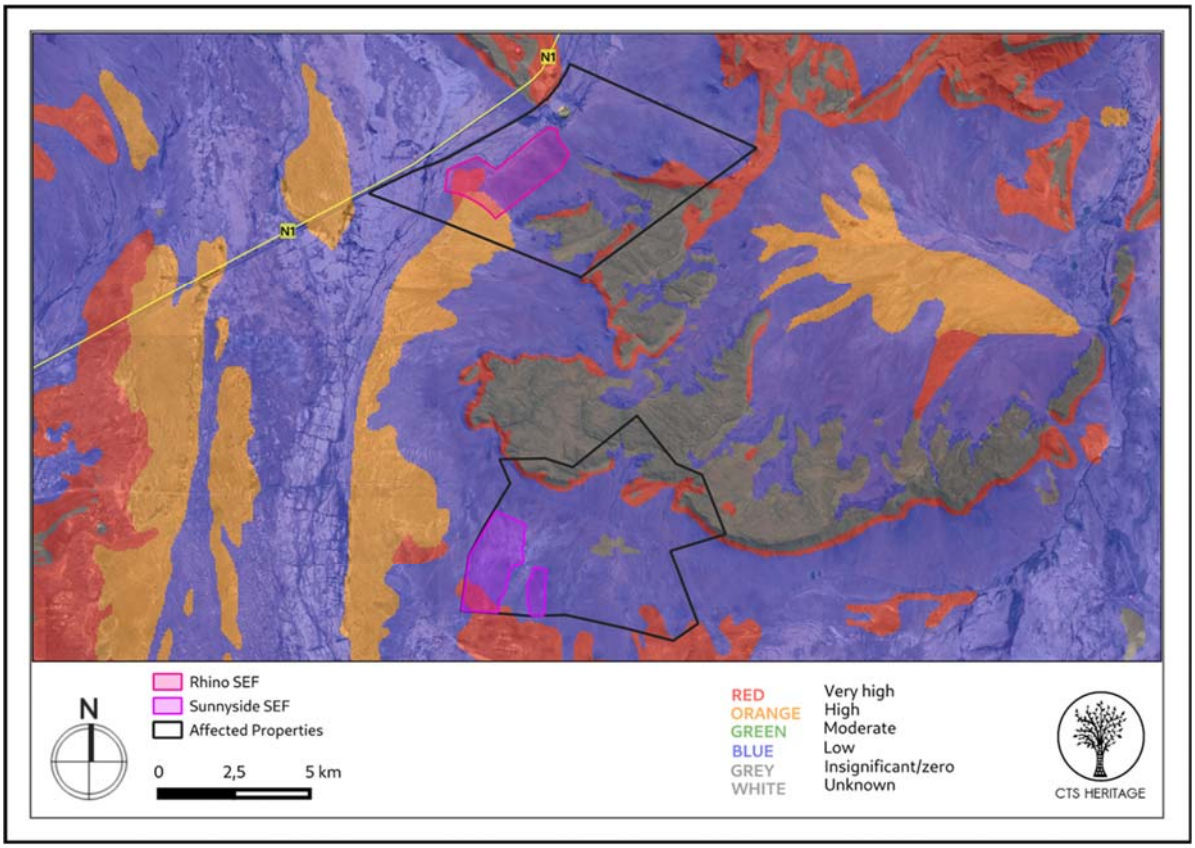

Figure 9-2: Palaeontological Sensitivity of the Site

9.2.3 Heritage Resources Identified and Sensitivities

9.2.3.1 Archaeological

The SEF project areas are underlain at depth by Permian continental sediments of the Lower Beaufort Group (Karoo Supergroup) assigned to the Teekloof Formation which are locally baked by dolerite dykes. Based on desktop studies, including several previous palaeontological heritage reports for the low-lying Beaufort West – Aberdeen region of the Great Karoo, as well as the recent two-day site visit, all of the Rhenosterkop SEF project areas are in practice of low palaeosensitivity. No fossils were recorded here from either the very poorly-exposed, weathered bedrocks nor from the overlying Late Caenozoic superficial sediments (calcrete, alluvium, surface gravels *etc*).

9.2.3.1.1 Rhino PV

According to the report, while no archaeological resources of significance were identified within the area proposed for the development of the Rhino SEF, some were identified in close proximity to the development area, but outside its borders. These sites include Observation 16 which is a high-density scatter of MSA and LSA artefacts. This site is graded IIIB due to its scientific significance. While no direct impact to this site is anticipated due to its position outside of the development, a no go buffer area of 50 m is recommended around this site to ensure its conservation. Sites 45, 46, 47, 48, 49 and 50 form a cluster of archaeological resources of high significance. Site 45 is graded IIIA due to the high local significance ascribed to rock art of this nature in this area, and Site 49 is graded IIIB due to its scientific value. The remaining archaeological sites located here are graded IIIC due to their contextual scientific significance relative to sites 45 and 49. This cluster of sites is located within the dolerite outcrops mapped in the area. No direct impact to these sites is anticipated, and the existing grid alignment runs between this cluster and the area proposed for development. While no direct impact to this cluster is anticipated due to its position outside of the development, various no-go buffer areas are recommended around this cluster to ensure its conservation. Important to note are the high numbers of rock engravings and rock gongs associated with the dolerite outcrops in the area. No direct impact to these dolerite outcrops is anticipated, however, their archaeological sensitivity cannot be overstated and due concern in this regard must be noted. Observation 006 reflects the position of the Rhenosterkop werf and graveyard. This werf includes a Victorian farmhouse, somewhat altered with Cape Dutch. Revival gables. Due to the high local social and spiritual significance of burial grounds, this site is determined to be Grade IIIA. No direct or indirect impact is anticipated for the burial ground. A no development buffer of 400 m is recommended around the Rhenosterkop farm werf in order to ensure that the sense of place associated with this historic farm is retained. It is also noted that a river runs between the proposed development and the werf and burial ground which assists in creating a natural hard edge to retain the sense of place.

9.2.3.1.2 Sunnyside PV

No stone age archaeological resources of significance were identified within this proposed development footprint, and the proposed development area is located well-away from the identified archaeologically sensitive dolerite outcrops. A number of ruins of farm structures were identified within the development footprint, i.e., - Observations 19, 20, 21 and 22. These ruins are associated with the historic farming practices in this area and as such, have been determined to have contextual cultural value. These resources are Graded IIIC. A no development buffer of 50 m is recommended around these sites. Due to the age of these ruins, and their historic nature, excavations that take place in close proximity to these ruins are more likely to negatively impact associated buried archaeological heritage. As such, an area of higher archaeological sensitivity has been identified in **Figure 9-3**. It is recommended that this area be avoided by development activities.

9.2.3.2 Palaeontological

According to the report, the project areas are underlain at depth by Permian continental sediments of the Lower Beaufort Group (Karoo Supergroup) assigned to the Teekloof Formation which are locally baked by dolerite dykes. Based on desktop studies, including several previous palaeontological heritage reports for the low-lying Beaufort West – Aberdeen region of the Great Karoo, as well as the recent two-day site visit, all of the Rhino and Sunnyside SEF project areas are in practice of low palaeosensitivity. No fossils were recorded, from either the very poorly-exposed, weathered bedrocks nor from the overlying Late Caenozoic superficial sediments (calcrete, alluvium, surface gravels, etc.).

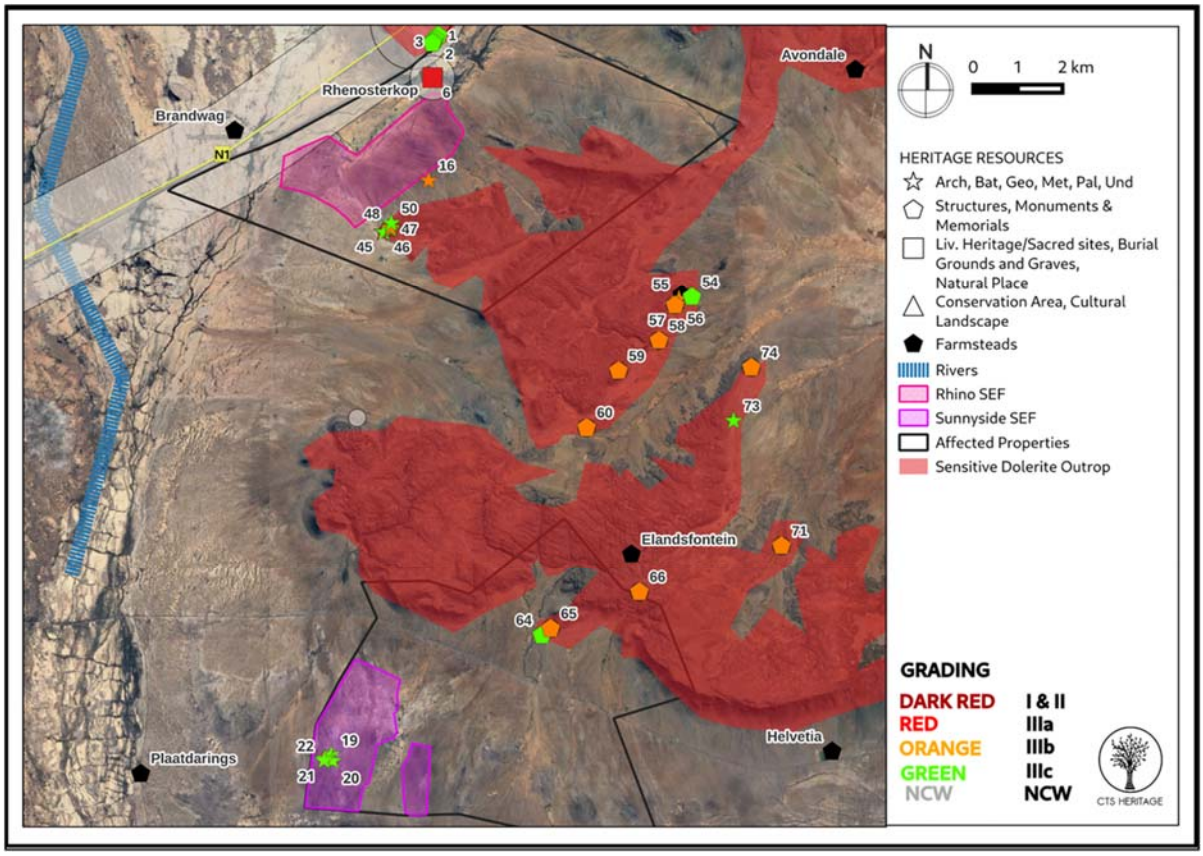

Figure 9-3: Map of archaeological heritage resources within the proposed development area

9.2.4 Summary and Conclusion

The site forms part of a low significance cultural landscape representative of the Central Plateau of the Great Karoo possessing heritage value for historical, aesthetic, architectural, social and scientific reasons. The site possesses some landscape elements contributing to a composite cultural landscape however this particular area is already dominated by existing infrastructure. The addition of the proposed PV facility is therefore unlikely to negatively impact on any significant cultural landscape elements within this immediate context, or the broader context. The proposed development is located sufficiently far from the N1 scenic route, existing railway infrastructure and the Rhenosterkop farmstead that the anticipated impact to the heritage significance of these resources is considered to be negligible.

Although the broader area has archaeological significance in terms of the sensitive dolerite outcrops in the

area and associated rock art sites, no archaeological resources of significance were identified within the area proposed for the Rhino SEF. No further mitigation is recommended. A number of ruins of farm structures were identified within the development footprint for the Sunnyside SEF. These ruins are associated with the historic farming practices in this area and as such, have been determined to have contextual cultural value. These resources are Graded IIIC. A no development buffer of 50m is recommended around these sites.

Due to the age of these ruins, and their historic nature, excavations that take place in close proximity to these ruins are more likely to negatively impact associated buried archaeological heritage. As such, an area of higher archaeological sensitivity has been identified in figures 4.3b and 4.3c of the HIA Report. It is recommended that this area be avoided by development activities.

No observations of palaeontological significance were noted within the area proposed for development. However, the geology underlying the development area remains sensitive for impacts to significant palaeontological heritage. There are limited impacts anticipated to archaeological and palaeontological heritage from this proposed development and as such, the principle of a renewable energy facility in this location is supported from a heritage perspective as the infrastructure is located in an area able to tolerate the impact of the proposed PV infrastructure.

9.3 Landscape/ Visual Assessment

A Landscape/ Visual Assessment was undertaken by SRK Consulting (Pty) Ltd (report dated February 2024 and attached in **Appendix 6J**).

9.3.1 Baseline Assessment

9.3.1.1 Visual Character

The basis for the visual character is provided by the topography, vegetation and land use of the area, which is a rugged rural environment characterised by the sparsely vegetated ridgelines (often) separated by wide flat expanses interspersed with farmsteads and some infrastructure (i.e., the N1, powerlines, substations, railway line routed adjacent to the north-western boundary of the Remainder of Farm Rhenosterkop 155). The visual character of the region rapidly transitions from developed areas such as towns (e.g. Beaufort West, modified rural landscapes) to a rural, undeveloped and fairly inhospitable environment, typical of the Karoo (**Figure 9-4**). The project area can therefore be defined as a *natural transition landscape* as it is mostly rural with few isolated farmsteads and some powerlines, roads and a railway line visible in the landscape.

Figure 9-4: Visual character of the area surrounding the Rhino SEF

9.3.1.2 Visual Quality

The visual quality of the area can be experienced through long closed views across plains of low growing vegetation and prominences and ridgelines defining the horizon and occasional pockets of development such

as farmsteads and small towns, such as Beaufort West. Elevated areas across the landscape add somewhat to visual quality; however, the absence of water forms and diverse vegetation detract from the visual quality and evoke a fairly desolate environment, especially in winter when the muted grey and brown hues of vegetation impart a barren aspect to the landscape.

The visual quality of the sites is consistent with the visual quality of the region: natural, visually untransformed environment that can be experienced by receptors as barren and harsh due to the desolate nature of the landscape. Both sites are used for sheep grazing.

The remainder of Farm Rhenosterkop 155 is a relatively intact and undisturbed landscape, apart from farmsteads and transmission powerlines that extend from the north-east to the south-west, one bisecting the property and the other routed adjacent to the eastern boundary of the property (**Figure 9-5**). These powerlines detract from the visual quality of the site.

The landscape of Farm 400 is also relatively intact and undisturbed. The site generally feels more remote, being accessed by a gravel farm road, and set back from major infrastructure and development (e.g., Beaufort West) (see **Figure 9-6**).

Figure 9-5: Illustration of visual quality of the Rhino SEF site

Figure 9-6: Illustration of visual quality of the Sunnyside SEF site

9.3.1.3 Visual Receptors

Visual receptors have been identified based on surrounding land uses, including the isolated farmsteads and motorists. The visual receptors are briefly described below:

- Farmstead residents: Isolated farmsteads are interspersed throughout the area surrounding the Rhino and Sunnyside SEFs;
- Railway personnel and passengers (Rhino SEF only): The railway is routed to adjacent to the north-west

of the Remainder of Farm Rhenosterkop 155 property; and

- Motorists and tourists: The N1 national road connecting Cape Town to Johannesburg is routed to the north-west of Remainder of Farm Rhenosterkop 155 property. Smaller farm roads bisect and route around both Remainder of Farm Rhenosterkop 155 and Farm 400.

9.3.1.4 Sense of Place

It is often the case that sense of place is linked directly to visual quality and that areas / spaces with high visual quality have a strong sense of place. However, this is not an inviolate relationship, and it is plausible that areas of low visual quality may have a strong sense of place or – more commonly – that areas of high visual quality have a weak sense of place. The defining feature of sense of place is uniqueness, generally real or biophysical (e.g., trees in an otherwise treeless expanse), but sometimes perceived (e.g., visible but unspectacular sacred sites and places which evoke defined responses in receptors). I
The sense of place of the surrounding area is strongly influenced by the surrounding land use, which can generally be described as a natural agricultural area, on natural grazing land, i.e. not managed (irrigated) pastures. The sense of place is not particularly distinct from the rest of the wider region and is not overly memorable, but with its wide open space, gravel roads and somewhat rudimentary, ubiquitous fence lines, is evocative of the Karoo.

The relationship of receptors in the study area to place may be predominantly *biographical*, *cognitive*, *dependent* and in some instances, *spiritual*. A family, for example, whose has farmed in this area for a few generations will have a *biographical, dependent and spiritual* (sense of belonging) and in some cases *cognitive* attachment to the area. A farm worker living on a farm in the area will likely have a *dependent* relationship with the area. Motorists on the N1 comprise, *inter alia*, truck drivers hauling goods across the country and tourists en route to destinations. While many of the motorists share the *dependent* relationship with the study area, the tourists in transit are may have *cognitive* relationship with the place.

9.3.2 Analysis of the Magnitude of the Visual Impact and Sensitivities

9.3.2.1 Visual Exposure

The viewshed indicates that the Rhino SEF is visible up to 5 km from the site boundary to the north, north-east, south, west and north-west (**Figure 9-7**). Therefore, the site will be visible from the N1 routed to the north-west of the site. The SEF cluster will also be visible to railway passengers travelling to the north-west of the site. Beyond 5 km, the SEF will not be visible to receptors due to distance.
The visual exposure of Rhino SEF is deemed ***high***.

The viewshed indicates that the site is visible up to 5 km to the south, north-east and north of the site (**Figure 9-8**). To the east and north-west of the SEF, the project is visible up to approximately 2 km from the boundary. The site will be visible to motorists travelling along a short section of the gravel road to the north of the site.
The visual exposure of Sunnyside SEF is deemed ***moderate.***

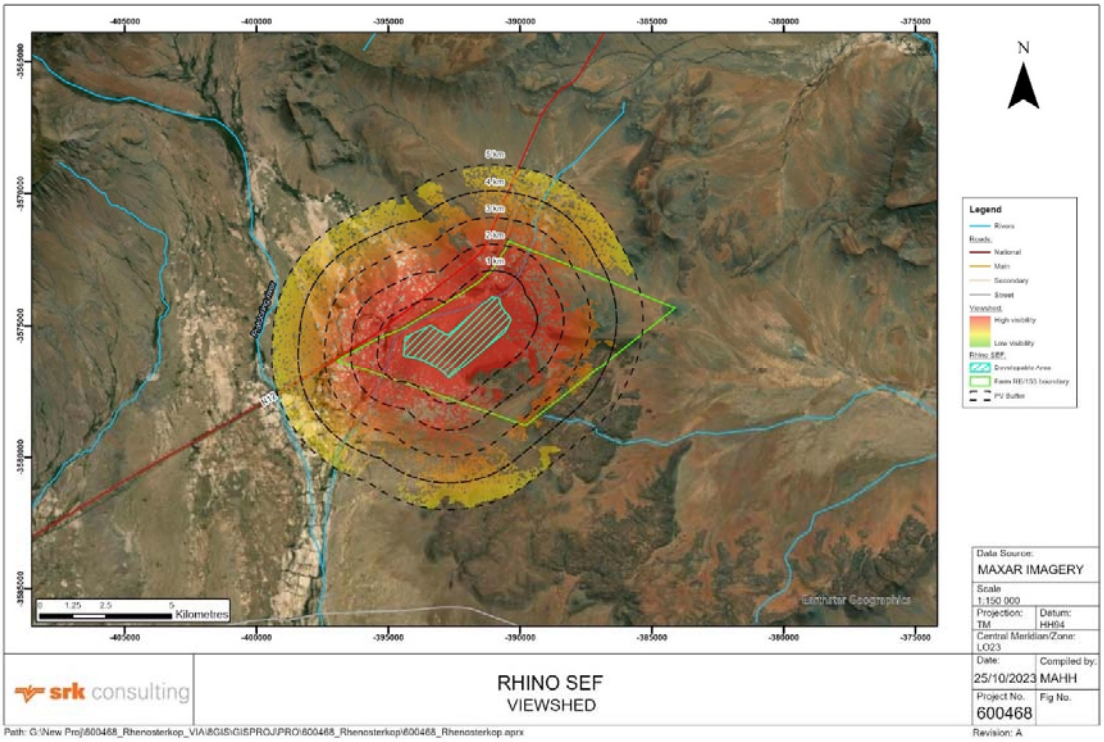

Figure 9-7: Viewshed of the Rhino SEF

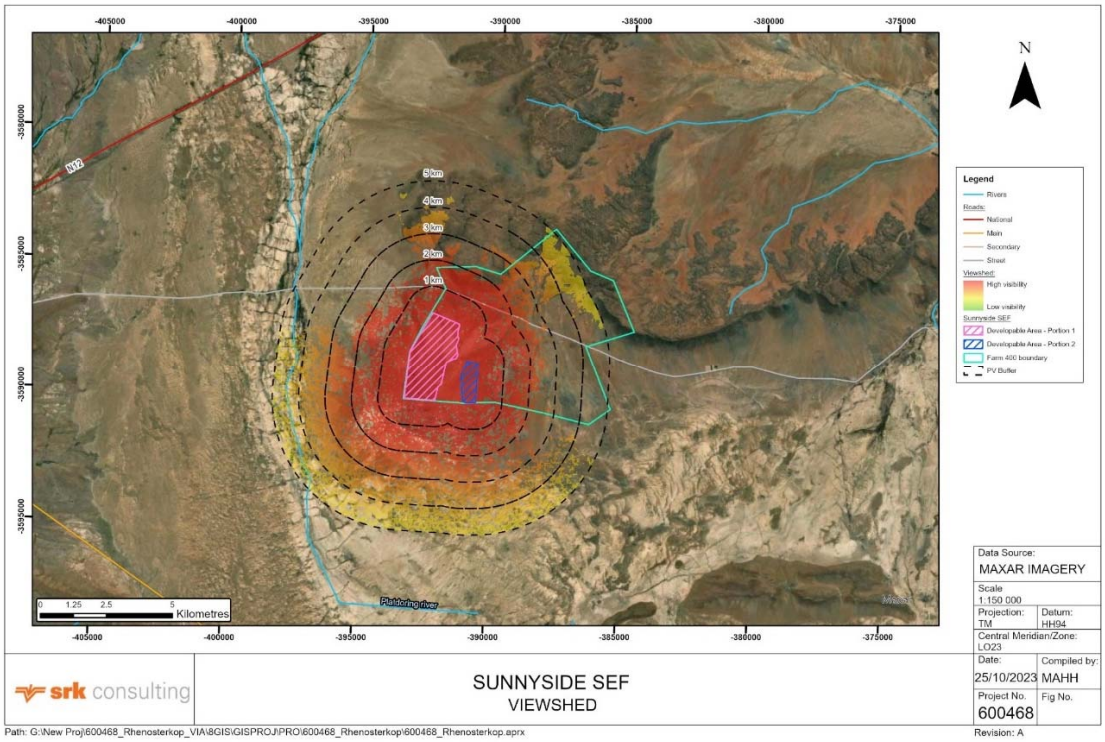

Figure 9-8: Viewshed of Sunnyside SEF

9.3.2.2 Visual Absorption Capacity

Rural areas generally have a low visual absorption capacity (VAC) due to the lack of development and the open spaces in these areas. The low growing vegetation characteristic of the Karoo has only limited potential to screen developments, and therefore further reduces the VAC of the sites. The wide expanses/ plains between the ridges, reducing the VAC, is moderated by the ridges, mountains, koppies and prominences in the landscape.

The low vertical profile of the PV array and the ability of low growing vegetation (and taller thicket) to screen portions of the proposed SEFs marginally increases the VAC.
The study area has a ***low*** VAC for the proposed SEFs.

9.3.2.3 Receptor Sensitivity

The sensitivity of potential viewers identified above is described below:

- **Farmstead receptors:** There are a limited number of isolated farmsteads surrounding the site. The farmsteads located closest to the SEF are on the same property as the SEF. The respective owners of the Remainder of Farm Rhenosterkop 155 and Farm 400, on which the Rhino and Sunnyside SEFs will be located are considered receptors. However, these owners have reached a negotiated agreement with the Applicant and as such, they are not deemed to be sensitive receptors. Farmsteads beyond these are not considered highly sensitive receptors, since they are some distance from the project, therefore have limited visibility.
- **Railway personnel and passengers (Rhino SEF only):** A railway line is routed adjacent to the north-western boundary of the Rhino SEF property. This railway line is both a freight and passenger route. Only few of the individuals travelling on the train are likely to be tourists or visitors to the area. They are considered to have a low sensitivity due to their temporary exposure to the site.
- **Motorists and tourists:**
    - Rhino SEF: The N1 national road is routed to the north-west of the Rhino SEF property. Heavy traffic volumes are common, a large portion being cargo trucks travelling between Cape Town and Gauteng.
    - Sunnyside SEF: A gravel road from Beaufort West transects Farm 400and leads to farms located further east.

Motorists are considered to have relatively low sensitivity as they are transient receptors with fleeting views of the project. Transiting tourists may have higher sensitivity. The limited number of highly sensitive visual receptors is further moderated by the large number of motorists with fleeting views. The sensitivity of the viewers or visual receptors potentially affected by the visual impact of the project is considered to be ***low.***

9.3.2.4 Viewing Distance and Visibility

A number of viewpoints were selected to indicate locations from where receptors may (or may not) view the project. The viewpoints are listed in **Table 9-6** and shown in **Figure 9-9** and **Figure 9-10**. Current views from these points are shown in Appendix B of the Visual Impact Assessment.

The predicted visibility of (any element of the project) from each viewpoint is described in **Table 9-6**, based on the visibility categories. Unlike visual exposure which describes areas from which the project may be visible without taking local screening into account (i.e., the viewshed), visibility describes predicted, actual visibility. The visibility of the projects can be summarised as follows:

- Rhino SEF: Receptors will have limited visibility of the Rhino SEF in general, with the site only being marginally visible to receptors travelling along the railway line and the gravel road approaching the site (VP 3A). The limited visibility of the site is largely related to the distance of the site from receptors and screening of the site by existing vegetation; and
- Sunnyside SEF: The site will be marginally visible from viewpoint (VP) 1B and 2B (directly to the north of the site) as per the Visual Specialist. Motorists travelling through these points, particularly if approaching the site from the west, will have a marginal view of the site. Nevertheless, screening mitigation has been included.

Overall, the proposed SEFs are marginally visible in the background to receptors and are, therefore, their visibility is considered ***low***.

Table 9-6: Visibility from viewpoints

Viewpoint #	Location	Co-ordinates	Direction of view	Potential Receptors	Visibility
Rhino SEF					
VP 1A	N1 & Farmstall	32°13'51.75"S 22°48'23.71"E	Looking east	Motorists travelling on the N1 and patrons to the farmstall.	**Not Visible** The SEF is not visible due to distance and screening by vegetation.
VP 2A	N1 & Farm Road	32°12'41.58"S 22°50'25.51"E	Looking south-east	Motorists travelling on the N1 and the Farm Road.	**Not Visible** The SEF is not visible due to distance and screening by vegetation.
VP 3A	Railway & Farm Road	32°12'56.87"S 22°50'48.61"E	Looking south	Motorists travelling on the farm road and rail passengers.	**Marginally Visible** The SEF will be marginally visible due to screening by vegetation.
VP 4A	Farm Road & dwellings	32°12'35.85"S 22°51'15.41"E	Looking south	Motorists travelling on the farm road and residents of the farm dwellings.	**Not Visible** The SEF is not visible due to distance and screening by intervening topography and vegetation.
VP 5A	N1 & Farm Road	32°12'18.62"S 22°50'55.13"E	Looking south	Residents of farmstead and motorist travelling on the N1.	**Not Visible** The SEF is not visible due to distance and screening by intervening topography and vegetation.
VP 6A	Farmstead North	32°12'18.62"S 22°50'55.13"E	Looking south	Residents of farmstead and motorist travelling on the N1.	**Not Visible** The SEF is not visible due to distance and screening by intervening topography and vegetation.
Sunnyside SEF					
VP 1B	Gravel road North	32°19'35.48"S 22°50'9.27"E	Looking south	Motorists travelling on the gravel road.	**Marginally Visible** The SEF will be marginally visible due to screening by vegetation.

Viewpoint #	Location	Co-ordinates	Direction of view	Potential Receptors	Visibility
VP 2B	Gravel road North-East	32°20'14.66"S 22°52'13.65"E	Looking south-west	Motorists travelling on the gravel road.	**Marginally Visible** The SEF will be marginally visible due to screening by vegetation.
VP 3B	Farmstead Road	32°20'27.44"S 22°52'48.10"E	Looking south-west	Motorists travelling on the gravel road.	**Not Visible** The SEF will not be visible due to screening by intervening topography.
VP 4B	Gravel road East	32°20'45.29"S 22°53'38.96"E	Looking west	Motorists travelling on the gravel road.	**Not Visible** The SEF will not be visible due to screening by intervening topography.
VP 5B	Farmstead East	32°21'18.84"S 22°56'56.88"E	Looking west	Residents and motorists travelling on the gravel road.	**Not Visible** The SEF will not be visible due to distance and screening by intervening topography.

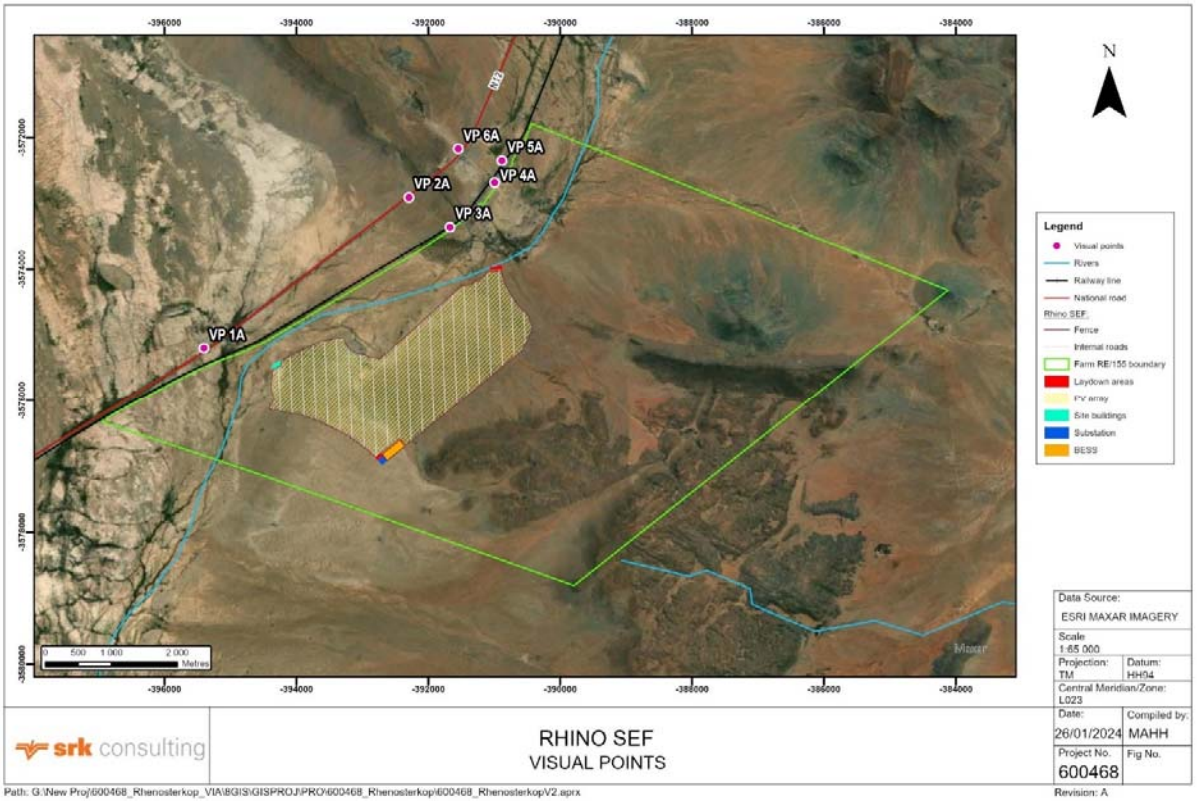

Figure 9-9: Rhino SEF viewpoints

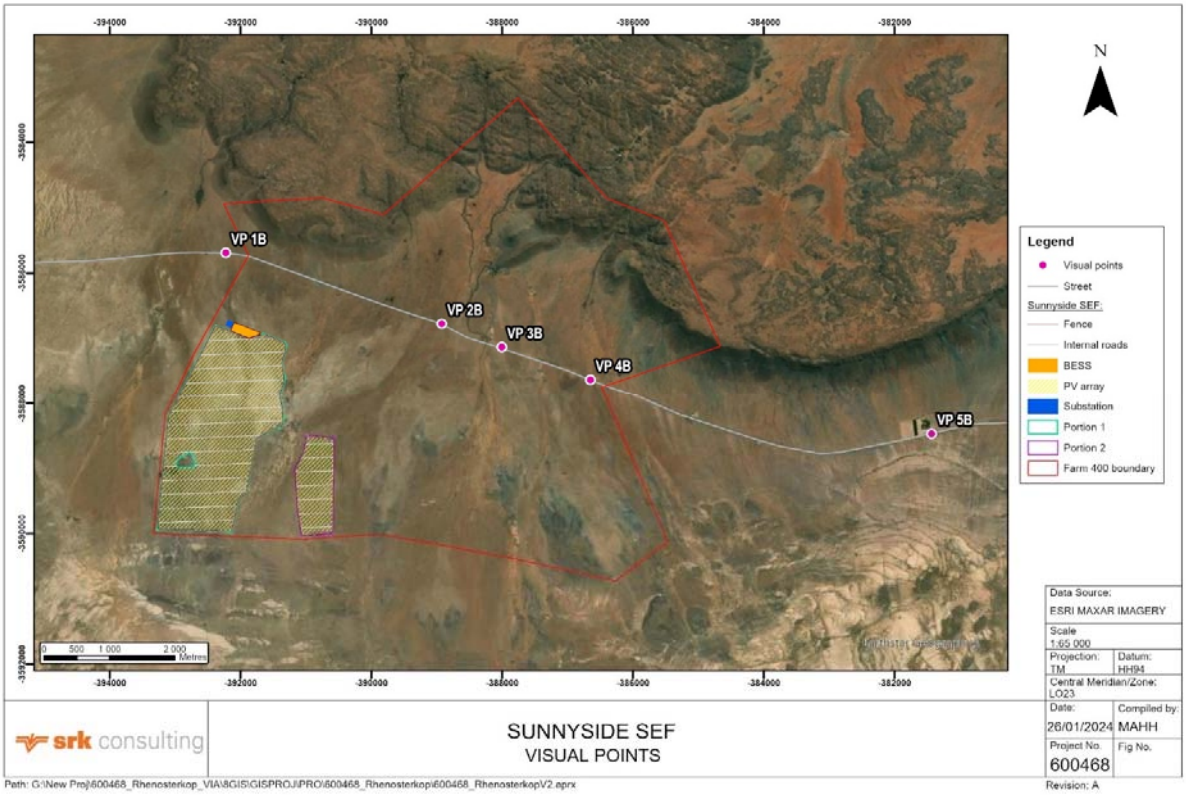

Figure 9-10: Sunnyside SEF viewpoints

9.3.2.5 Compatibility with Landscape Integrity

Landscape (or townscape) integrity refers to the compatibility of the development/ visual intrusion with the existing landscape. The landscape integrity of the project is rated based on the relevant criteria listed in **Table 9-7**.

Table 9-7: Landscape integrity criteria

Criterion	Landscape integrity		
	High	**Moderate**	**Low**
	The project is:		
Consistency with existing land use of the area	Consistent	Moderately consistent	Not consistent / very different
Sensitivity to natural environment	Highly sensitive	Moderately sensitive	Not sensitive
Consistency with urban texture and layout	Consistent	Moderately consistent	Not consistent / very different
Congruence of buildings / structures with / sensitivity to existing architecture / buildings	Congruent / sensitive	Moderately congruent / sensitive	Not congruent / sensitive
Scale and size relative to nearby existing development	Similar	Moderately similar	Different

The proposed project is located within a rural area comprising large, undeveloped farms with natural vegetation predominantly used for grazing. The vast, undeveloped expanse of arid landscape can be experienced by receptors as desolate. The Rhino SEF is bisected and bordered by two transmission powerlines. No other renewable facilities are visible from the SEF sites.

PV arrays will introduce a large, uniform anthropogenic artefact into the landscape discordant with scale, texture and current land use around the SEFs. The discordant nature of the SEF will result in the SEF being experienced as a visual intrusion in the landscape. Where the SEF is visible in the foreground, the rows of panels and the vertical dimensions may be discernible to receptors. When visible in the middle- or background from various elevated viewpoints in the surrounding area, the array will appear as a dark, uniform two-dimensional geometric unit.

The project is deemed to have a ***low*** integrity with the surrounding landscape.

9.3.2.6 Solar Reflection

The suite of visual receptors that may (in theory) be impacted by glint and glare caused by any new development may include:

- Residents;
- Motorists;
- Train drivers; and
- Pilots and air traffic controllers.

Visual receptors potentially exposed to solar reflection by this project are residents, motorists and train personnel and passengers.

9.3.2.7 Glare Thresholds

The ocular (or visual) impact of glare has been categorised into the following three categories:

- Green: low potential to cause after-image;
- Yellow: potential to cause temporary after-image; and
- Red: potential to cause retinal burn (permanent eye damage)[9].

The Glare Hazard Plot (**Figure 9-11**) illustrates the ocular impact of solar glare as a function of the intensity of the glare source on the retina (retinal irradiance) and the portion of a viewer's field of vision that the glare occupies (subtended source angle).

According to the report, no content requirements or guidelines relating to glint and glare thresholds or reporting have been released by South African authorities. German guidelines on acceptable glare thresholds have been defined as less than 30 minutes per day or 30 hours per year. When glare exceeds this threshold, glare is considered significant, and mitigation is required.

SRK's framework for assessing the magnitude of glare is based on the two categories of glare applicable to PV facilities (Green glare and Yellow glare) in the Glare Hazard Plot and the German guidelines. The framework is presented in **Table 9-8**.

[9] Retinal burn is typically not possible from SPV glare as the SPV panels do not focus the reflected sunlight.

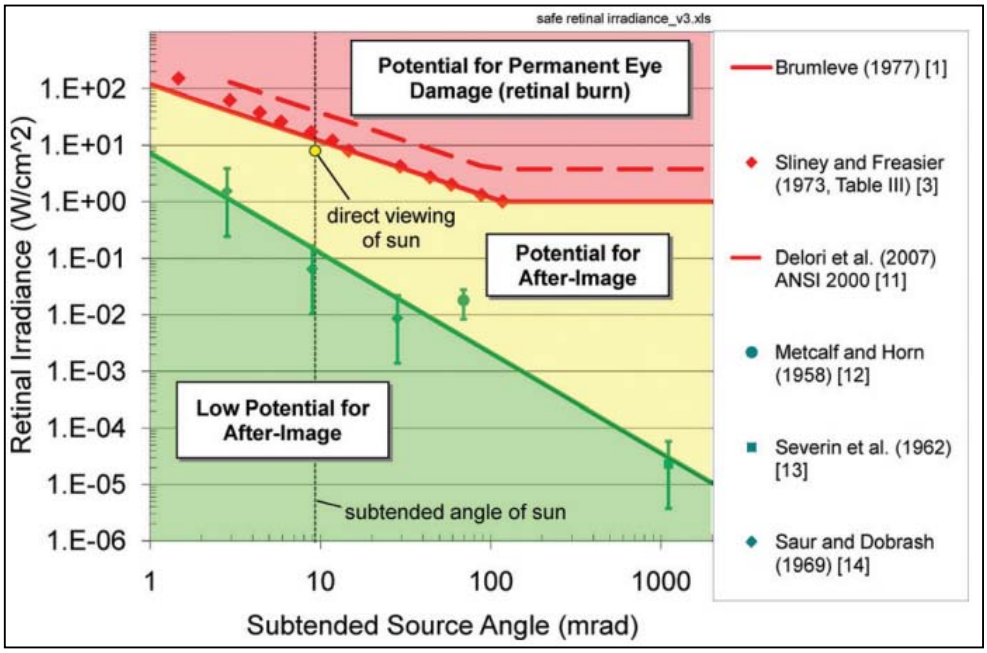

Figure 9-11: Potential impacts of retinal irradiance as a function of subtended source angle

Table 9-8: Magnitude of glare impacts for PV facilities

Impact	Category of Glare[10]	Duration of Glare
High[11]	Yellow	> 30 minutes per day and >30 hours per year
Moderate	Yellow	> 30 minutes per day or > 30 hours per year
Low	Yellow or Green	< 30 minutes per day and < 30 hours per year

9.3.2.8 Modelling Glare

Glare modelling was conducted for the proposed layouts for the PV arrays using ForgeSolar's GlareGauge. The parameter inputs used to model glare for the proposed project are included in **Table 9-9** and the GlareGauge report appended.

Table 9-9: Solar reflection model parameters

Parameter	Input
Panel height (centroid)	1.55 m
Axis tracking	Single
Tracking axis orientation	North – South
Tracking axis tilt	0°
Tracking axis panel offset	0°
Maximum tracking angle	60°
Resting angle	0°
Panel material	Smooth glass without anti-reflection coating

[10] Category of glare in terms of the Glare Hazard Plot; Red Glare, Yellow Glare and Green Glare (Ho, Ghanbari, & Diver, 2011).

[11] Exceeds the German glare guideline

Parameter	Input
Receptor height – Residents[12]	1.5 m
Receptor height - Motorists	1.5 m
Receptor height – Railway	2 m

According to the report, a total of 12 Observation Points (OPs), comprising one Air Traffic Control Tower (ATCT), two OPs around Sunnyside SEF and nine OPs around Rhino SEF, were modelled to ascertain whether glare would be experienced by receptors (e.g., residents and ATCT) surrounding the site (**Figure 9-12** and **Figure 9-13**). The viewshed and the visibility recorded during the site visit was reviewed during the selection of OPs, as glare can only be experienced if the PV array is visible to the receptor.

Potential glare experienced by motorists on the N1 and the gravel road from Rhino and Sunnyside SEFs were also modelled in both directions (two-way road) (**Figure 9-12 and Figure 9-13**). Glare from Rhino SEF, experienced by railway personnel and passengers, was also modelled in both directions (**Figure 9-12**).

The Karoo Gateway (Beaufort West) Airport is located approximately 15 km to the south-west of Rhino SEF and approximately 16 km west of Sunnyside SEF. The flight approach paths for the single runway were also modelled (**Figure 9-12 and Figure 9-13**).

Based on the input parameters (**Table 9-9**), the glare analysis demonstrated that glare from only Sunnyside SEF will be experienced by motorists on the gravel road. The full glare modelling report is included in **Appendix D**.

Modelling of glare from Rhino SEF shows that no visual receptors at the OPs, routes and flight paths will experience glare from Rhino SEF.

Principal findings from the modelling of glare from Sunnyside SEF are summarised below:

- None of the OPs (OP1, OP2 or ATCT) will experience yellow category glare from the Sunnyside SEF;
- Motorists will experience short durations of glare while travelling on the gravel road. Less than 2.5 hours of yellow category glare will be experienced per year along the gravel road; and
- No glare will be experienced by pilots as they approach the runway at the Karoo Gateway Airport.

Glint is not modelled. However, if the PV panels are visible to moving receptors, then glint and an after-image may be experienced.

No OP or route will be exposed to glare originating from Rhino SEF, as such exposure to glare is anticipated to be ***low / none***.

None of the OPs (including airports and motorists) will be exposed to glare originating from Sunnyside SEF for a duration > 30 minutes per day **and** > 30 hours per year: as such exposure to glare is anticipated to be ***low***.

[12] Assumption that average eye level standing is 1.5m.

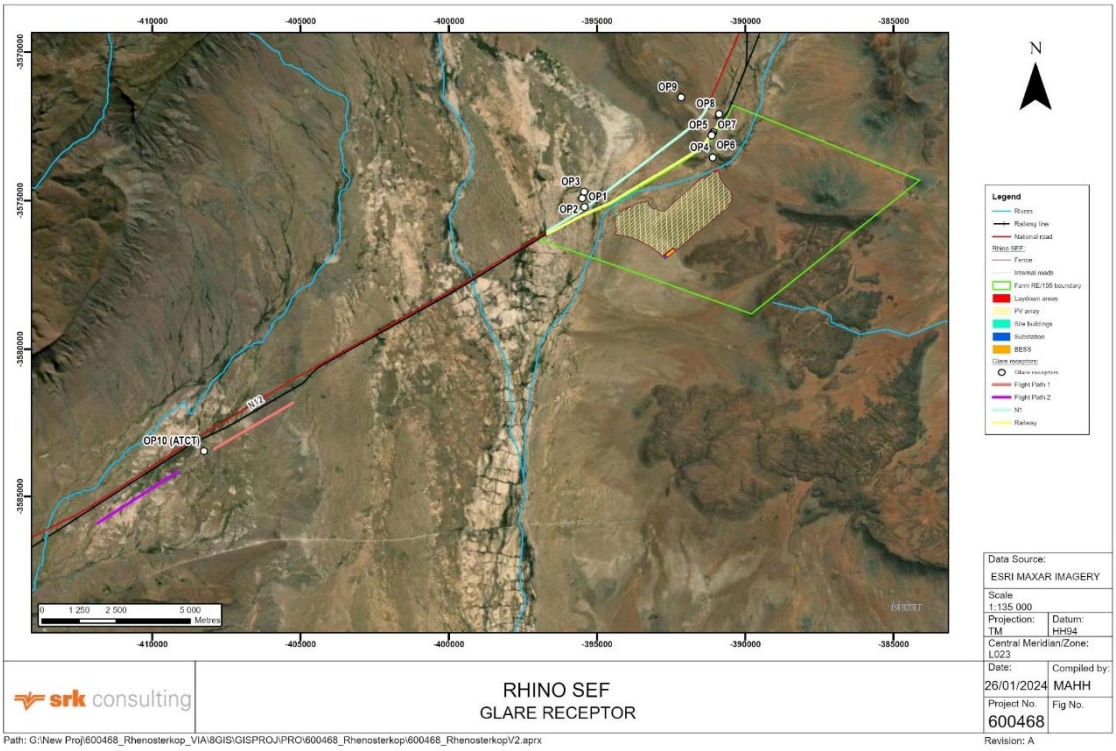

Figure 9-12: Rhino SEF glare receptors

Figure 9-13: Sunnyside SEF glare receptors

9.3.3 Summary and Conclusion

The proposed project comprises the development of the Rhino and Sunnyside SEFs. These SEFs are discordant with the scale, texture and use of the current land use. Furthermore, the region has a low VAC due to the absence of development around the site, open space and low growing vegetation. These considerations are moderated by the low overall view sensitivity, visibility and exposure to solar reflection for the SEFs. Therefore, the SEFs are anticipated to result in a moderate visual impact.

It is the recommendation of the assessment that with mitigation, the proposed development is unlikely to significantly degrade the local landscape and visual resources.

9.4 Transportation

A Transportation Assessment was undertaken by iWink (Pty) Ltd (report dated February 2024, attached in **Appendix 6I**).

9.4.1 Proposed Accesses

According to the report, the proposed access to the Rhino PV site is from the N1 onto an existing farm road located to the north of the development site. The recommended access route to the development area will then follow an existing farm road, which may need to be upgraded in some locations to cater for large construction vehicles. The direct site access will then be located on the northern side of the development as indicated in **Figure 9-14** and **Figure 9-15**.

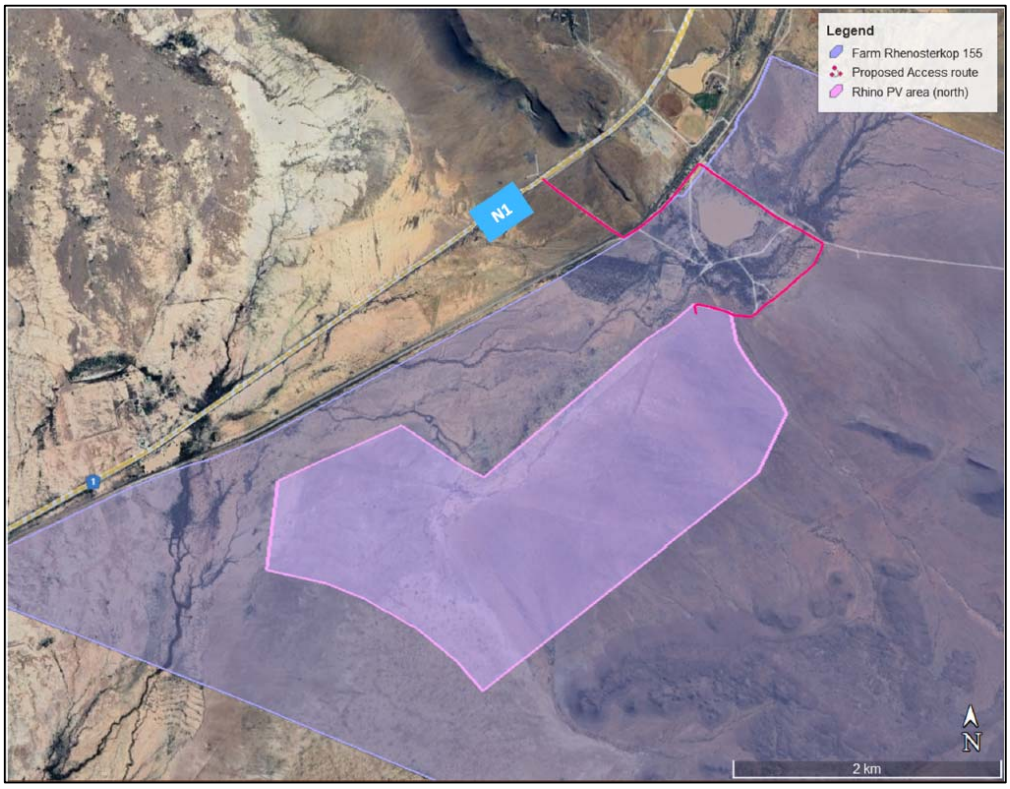

Figure 9-14: Rhino Access Road

Figure 9-15: Access road from N1 towards Rhino solar PV site

The required minimum shoulder sight distances are met in both directions at the proposed access points. However, it needs to be ensured that sight lines are kept clear of any shrubbery or trees and that no obstructing signage or similar is erected.

For Sunnyside PV, it is proposed that construction vehicles turn from the R61 onto an existing road towards the site approximately 3 km outside Beaufort West and follow this road to the site (see **Figure and Figure 9-17**). This access route (shown in orange in **Figure**) may require upgrading to accommodate larger construction vehicles.

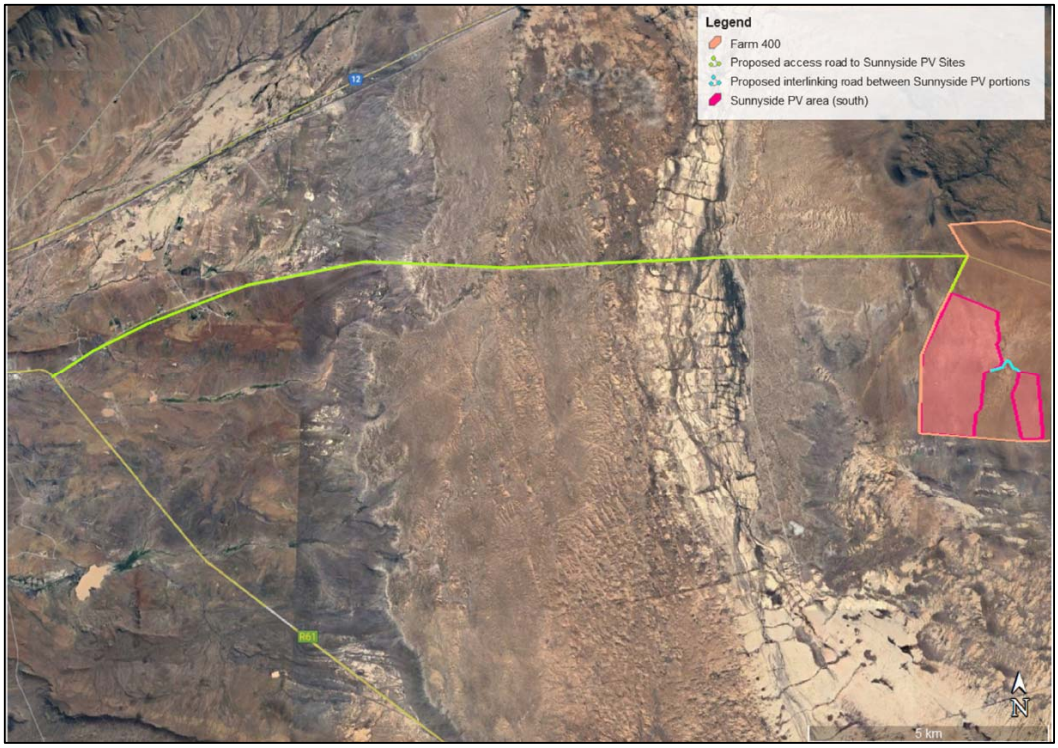

Figure 9-16: Aerial view of the recommended Sunnyside solar PV site access road

Figure 9-17: Access route to Sunnyside solar PV site

The required minimum shoulder sight distances are met in both directions when turning into the R61 from the farm road. However, it needs to be ensured that sight lines are kept clear of any shrubbery or trees and that no obstructing signage or similar is erected.

Especially the sight lines in a western direction for vehicles turning from the farm road into the R61 need to be kept clear as there is a bend situated along the R61. However, due to the area being flat with low vegetation, the sight distances are acceptable. No obstructing signage or larger vegetation should be erected to ensure safe turning movements at this intersection.

The respective turnoffs from the N1 (for Rhino PV) and R61 (for Sunnyside PV) need to be maintained and any road surface damage caused by construction vehicles needs to be repaired. The same applies to the access route towards the sites. The radii at the access onto the site need to be large enough to allow for all construction vehicles to turn safely.

During the construction phase, temporary road signage in line with the South African Road Signs Manual (SARTSM) will need to be erected along the stretch of the N1 and R61 passed the turnoffs towards the respective sites to alert general traffic that construction vehicles turn into and out of R61/ N1.

9.4.2 Internal Roads

The geometric design and layout for the internal roads from the site access need to be established at detailed design stage. Existing structures and services, such as drainage structures, signage and pipelines will need to be evaluated if impacting on the roads. It needs to be ensured that the gravel sections remain in good condition and will need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed.

The geometric design constraints encountered due to the terrain should be taken into consideration by the geometric designer. Preferably, the internal roads need to be designed with smooth, relatively flat gradients (recommended to be no more than 8%) to allow a larger transport load vehicle to ascend to the respective laydown areas.

9.4.2.1 Transportation of Materials, Plant and People to the proposed site

It is assumed that the materials, plant, and workers will be sourced from the surrounding towns as far as possible, such as Beaufort West.

9.4.2.2 Public Transport and Non-Motorised Transport

In terms of the National Land Transport Act, 2009 (Act 5 of 2009) as amended (NLTA), the assessment of available public transport services is included in this report. The following comments are relevant in respect to the public transport availability for the proposed development.

It is expected that minibus taxis travel along the N1 and R61. However, in many cases, the developer or appointed contractor of a large-scale project, such as many renewable energy projects, either provides shuttle buses or similar or alternatively may accommodate workers on site during the construction phase.

9.4.3 Transport Routes to Site

9.4.3.1 Port of Ngqura

The Port of Ngqura is a world-class deep-water trans-shipment hub offering an integrated, efficient, and competitive port service for containers on transit. The Port forms part of the Coega Industrial Development Zone (CIDZ) and is operated by Transnet National Ports Authority.
The shortest route from the Port of Ngqura to site (approximately 430 km to both sites) will take construction and haulage vehicles via the R75 onto the R329 after Kleinpoort, and then the R338, R63 and N1. An alternative route for the Rhino PV site would be staying on the R75 until turning onto the R63 at Graaff Reinet and eventually the N1 (travel distance approximately 475 km).

9.4.3.2 Port of Saldanha

The Port of Saldanha is located in the Western Cape and is the largest and deepest natural port in the Southern Hemisphere able to accommodate vessels with a draft of up to 21.5 m. This port covers a land and sea surface of just over 19 300 ha within a circumference of 91 km with maximum water depths of 23.7 m. Unique to the port is a purpose-built rail link directly connected to a jetty bulk loading facility for the shipment of iron ore. The Port is operated by Transnet National Ports Authority.

One possible route is via the R45, R311, N7 and N1 to site with a travel distance of approximately 550 km.

9.4.4 Transportation Requirements

It is anticipated that the following vehicles will access the site during construction:

- Conventional trucks within the freight limitations to transport building material to the site;
- 40-feet container trucks transporting solar modules, frames, and the inverter, which are within freight limitations;
- Flatbed trucks transporting the solar modules and frames, which are within the freight limitations;
- Light Differential Vehicle (LDV) type vehicles transporting workers from surrounding areas to site;
- Drilling machines and other required construction machinery being transported by conventional trucks or via self-drive to site; and
- The transformers will be transported as abnormal loads.

9.4.4.1 Abnormal Load Considerations

Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions on road freight transport in terms of the National Road Traffic Act, 1996 (Act 93 of 1996) as amended (NRTA), and the National Road Traffic Act Regulations, 2000 as amended (NRTA Regulations):

- Length: 22 m for an interlink, 18.5 m for truck and trailer and 13.5 m for a single unit truck
- Width: 2.6 m Height: 4.3 m measured from the ground. Possible height of load – 2.7 m
- Weight: Gross vehicle mass of 56 tons (t) resulting in a payload of approximately 30 t
- Axle unit limitations: 18 t for dual and 24 t for triple-axle units
- Axle load limitation: 7.7 t on the front axle and 9t on the single or rear axles

Any dimension/ mass outside the above will be classified as an Abnormal Load and will necessitate an application to the Department of Transport and Public Works for a permit that will give authorisation for the conveyance of said load. A permit is required for each Province that the haulage route traverses.

In addition to the above, the preferred routes for abnormal load travel should be surveyed prior to construction to identify any problem areas, e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, which may require modification. After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, to ensure that the vehicle can travel without disruptions. It needs to be ensured that gravel sections (if any) of the haulage routes remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.

There are bridges and culverts along the National and Provincial routes, which need to be confirmed for load bearing capacity and height clearances. However, there are alternative routes which can be investigated if the selected route or sections of the route should not be feasible.

Any low hanging overhead lines (lower than 5.1 m), e.g., Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles.

9.4.4.2 Load Limitations

The maximum load that a road vehicle or combination of vehicles will be allowed to carry legally under permit on a public road is limited by:

- the capacity of the vehicles as rated by the manufacturer,
- the load which may be carried by the tyres,
- the damaging effect on pavements,
- the structural capacity on bridges and culverts,
- the power of the prime mover(s),
- the load imposed by the driving axles, and
- the load imposed by the steering axles.

9.4.4.3 Dimensional Limitations

A load of abnormal dimensions may cause an obstruction and danger to other traffic. For this reason, all loads must, as far as possible, conform to the legal dimensions. Permits will only be considered for indivisible loads, i.e., loads that cannot, without disproportionate effort, expense, or risk of damage, be divided into two or more loads for the purpose of transport on public roads. For each of the characteristics below there is a legally permissible limit and what is allowed under permit:

- Width, height and length,
- Front Overhang,
- Rear Overhang,

- Front Load Projection,
- Rear Load Projection,
- Wheelbase,
- Turning Radius, and
- Stability of Loaded Vehicles.

9.4.4.4 Route for Components manufactured within South Africa

In South Africa, more than half (52%) of the manufacturing industry's national workforce resides in four metros - Johannesburg, Cape Town, Gqeberha and eThekwini. It is therefore anticipated that elements that can be manufactured within South Africa, will be transported to the site from the Cape Town, Johannesburg, Gqeberha or Pinetown/ Durban areas. Components will be transported to site using appropriate National and Provincial routes. It is expected that the components will generally be transported to site with normal heavy load vehicles.

9.4.4.5 Route from Cape Town Area to Site – Locally sourced materials and equipment

Cape Town has a large manufacturing sector located throughout the metro. The proposed industrial hubs being considered to source the required materials and components are currently unknown. With quite an extensive and widespread industrial market, a specific route to the site cannot be considered at this point in time. However, no road limitations are envisaged along the routes (i.e., via N1 or N2) for normal load freight. The estimated travel distance via the N1 is approximately 500 km.

9.4.4.6 Route from Johannesburg Area to Site – Locally sourced materials and equipment

If components from the Johannesburg area are considered, normal loads from Johannesburg to the proposed site can be transported via the route. No road limitations are envisaged along the route for normal load freight. The travel distance from the Johannesburg area to site is approximately 900 km via the N1.

9.4.4.7 Route from Pinetown area to Site - Locally sourced materials and equipment

Normal loads can transport elements via two potential routes from Durban and Pinetown to the site. No road limitations are envisaged along the route for normal load freight. The travel distance from Pinetown to the site via the N3, N5 and N1 is approximately 1 150 km.

9.4.4.8 Route from Gqeberha area to Site - Locally sourced materials and equipment

If loads are transported from the Gqeberha area to site, several routes to site are available. One potential route is via the R75, R338 and R61 with a travel distance of approximately 400 km.

9.4.4.9 Surrounding road network

The construction vehicles for the proposed Rhino and Sunnyside Solar PV project will take access via the R61 or N1 as described above.

The N1 is a national route that runs from Cape Town though Bloemfontein, Johannesburg, Pretoria and Polokwane to Beit Bridge on the border with Zimbabwe. The R61 is a provincial route that connects Beaufort West with Port Shepstone via Graaff Reinet, Komani, Mthatha and Port Edward.

According to the road classification of the surrounding road network as per the Road Infrastructure Strategic

Framework for South Africa (RISFSA) and COTO's TRH26 South African Road Classification and Access Management Manual, the N1 can be classified as a Class R1 rural principal arterial in the vicinity of the project sites, which typically carries countrywide traffic. The R61 can be classified as Class 2 rural major arterial, which typically carries inter-regional traffic.

9.4.5 Summary and Conclusion

According to the report, the construction and decommissioning phases of a solar energy facility are the only significant traffic generators and therefore noise and dust pollution will be higher during these phases. The duration of these phases is of temporary nature, i.e., the impact of the solar energy facility on the external traffic on the surrounding road network is temporary and solar facilities, when operational, do not add any significant traffic to the road network. It should be noted that changes to the internal layout of the facility such as location of buildings, location of electrical infrastructure, and technology options for the BESS will not affect the traffic impact on the surrounding road network (as assessed in the Transportation Assessment Report). These alternatives will have the same implications and are considered equally acceptable from a transport perspective. No fatal flaws were picked up during the assessment provided that the mitigation measures are considered as far as possible. The proposed development of the Rhino and Sunnyside Solar PV Energy Facility is supported from a traffic engineering perspective provided that the recommended mitigation measures are adhere to.

9.5 Risk

A Risk Assessment was undertaken by iSHECON (Pty) Ltd (dated February 2024, attached in **Appendix 6F**).

9.5.1 Proposed Design Lithium Solid State Batteries

According to the report, the one type of battery technology being considered for the BESS is a Solid-State Battery (SSB), preferred technology, which consists of multiple battery cells that are assembled together to form modules. Each cell contains a positive electrode, a negative electrode and an electrolyte. The BESS will comprise of multiple battery units or modules housed in shipping containers and/or an applicable housing structure which is delivered pre-assembled to the project site. Containers are usually raised slightly off the ground and laid out in rows. They can be stacked if required although this may increase the risk of events in one container spreading to another container. Supplementary infrastructure and equipment may include substations, power cables, transformers, power converters, substation buildings and offices, HV/ MV switch gear, inverters and temperature control equipment that may be positioned between the battery containers. The SSBs that are being considered are Lithium-ion systems.

9.5.2 Proposed Design Vanadium Redox Flow Batteries

According to the report, the alternative type of battery technology being considered for the BESS is vanadium redox flow battery (VRFB), typically Vanadium chemistry based. These energy storage systems can be supplied either as containerized units or as a fixed installation within a building, etc. For this project, containerized units are envisioned. However, in order to present contrasting hazards with the containerized lithium batteries in the section above, this report will discuss redox flow systems housed within a large battery building. If containerized systems are used, the essential hazards remain the same, but may just be slightly smaller in magnitude. For this project (500 MW) there are expected to be up to 750 containers, each with six 25 cubic meter (m^3) tanks of electrolyte within the containers, hence approximately 112 500 m^3 of electrolyte in the entire project. Each container acts as bund (secondary containment) able to hold at least the volume of one tank. In addition a bund mound/ trench (tertiary containment primarily for any runoff) will be constructed around the entire facility.

9.5.3 BESS Hazards

9.5.3.1 Solid State Lithium Battery Hazards

The lithium in the batteries is usually in the form of lithium salts dissolved in an electrolyte solution that is absorbed within the electrodes and/or lithium plated onto the surface of the electrode. These are referred to as SSBs because electrolyte liquid is not freely available in a form that can easily leak or be extracted. The electrolytes are typically ethylene carbonate or di-ethyl carbonate. The flash points (FP) of these carbonates can vary from 18 – 145 °C which means they can be highly flammable (FP < 60 °C) or merely combustible if involved in an external fire (FP > 60 °C). Some of the lithium compound in the electrolyte include lithium hexafluorophosphate, lithium perchlorate, lithium cobalt oxide, etc.

Upon heating of the contents of a battery due to shorting, contaminants, external heat or exposure to water and reaction heat, the lithium salts in batteries begin to break down exothermically to release either oxygen (oxidants) that enhances combustion, possibly leading to explosion, or fumes such as hydrogen fluoride or chlorine that are toxic.

These exothermic break down reactions are self-sustaining above a certain temperature (typically 70 °C) and can lead to thermal run away. In this process the battery gets hotter and hotter, the decomposition reactions happen faster and faster and excessive hot fumes are generated in the battery. Eventually the pressure in the battery builds up to the point where those gases need to vent, usually via the weakest point in the system. These vented fumes can be flammable due to vaporization of the electrolyte and can ignite as a flash fire or fire ball (if large amounts) leading to the fire spreading to any surrounding combustible materials, e.g., plastic insulation on cables, the electrolyte, the electrodes and possibly even the plastic parts of the battery casing, etc. If the vented flammable vapours do not ignite immediately, they can accumulate within the surrounding structures. If this flammable mixture is ignited later, e.g., due to a spark, this can lead to a violent explosion of the module, cabinet, room, container, etc.

In addition to being flammable the vented gases will contain toxic components. These could include:

- the products of combustion such as carbon dioxide/monoxide, hydrogen cyanide
- volatile organic carbons (VOC) like benzene and ethylene
- decomposition products such as hydrogen fluoride, hydrogen chloride, phosphorous pentafluoride, phosphoryl fluoride and oxides of aluminium, cobalt, copper, etc.

The temperature in the batteries and of these vented gases can be extremely high, e.g., > 600 °C. In the situation where oxygen is released internally as part of the decomposition (e.g., lithium perchlorate) the oxygen is available to react with the combustible electrolyte and if all this happens extremely fast in a self-sustaining manner within the confines of the device, an explosion of the device can occur with only localized impacts.

A BESS is composed of individual batteries which are combined into different size packs such as modules and racks. The very high temperature generated by one battery cell in thermal run away could lead to overheating of adjacent cells. This cell in turn then starts thermal decomposition and so the process propagates through the entire system, as illustrated on the diagram below. In order to prevent propagation, there are separation requirements between cells, modules, etc. Separation could be with physical space or insulating materials, etc.

Although extremely unlikely due to the structure of the batteries, should electrolyte liquid leak out of the

batteries, it can be potentially flammable as well as corrosive, etc. If ignited as fire, or explosion, the smoke would contain toxic components. If unignited it can still be extremely harmful especially if its decomposition products include hydrofluoric acid.

9.5.3.2 Vanadium Redox Flow Battery Hazards

The vanadium redox battery (VRB), also known as the vanadium flow battery (VFB) or VRFB, is a type of rechargeable flow battery that employs vanadium ions in different oxidation states to store chemical potential energy. The VRB exploits the ability of vanadium to exist in solution in four different oxidation states, and uses this property to make a battery that has just one electroactive element instead of two.

In redox flow batteries, the electrodes should not participate in the reactions for energy conversion and should not cause any further side reactions (e.g., undesirable gas formation). Most VRFB are, therefore, based on carbon electrodes.
The redox pair VO2+/ VO2+ are at the positive electrode and the redox pair V2+/ V3+ at the negative electrode. The use of the same ions in the positive and negative electrolytes permits relatively high concentrations of active material. It also overcomes the cross-contamination degradation issues which plague other flow type batteries. The energy storage solution consists primarily of vanadium sulphate in a diluted (2 mols per litre) sulphuric acid (possibly containing a low concentration of phosphoric acid) and is, therefore, roughly comparable to the acid of lead/ acid batteries. The energy density is limited by the concentration of the pentavalent + VO2.

The VRFB is, without doubt, the best investigated and most installed redox flow battery.

For several reasons, including their relative bulkiness, most vanadium batteries are currently used for grid energy storage, i.e., attached to power plants or electrical grids. Currently, there are over 100 VRFB installations globally with an estimated capacity of over 209 800 kWh of energy and the use of vanadium in energy storage applications has doubled to 2.1% of the global vanadium consumption in 2018.

The electrolyte in the VRFB system is corrosive. It is composed of a sulphuric acid-based solution similar to common automotive lead acid batteries. Unlike traditional lead-acid batteries, VRFBs do not include lead. Therefore, VRFBs do not have the toxicity issues of lead that conventional car batteries have. The only potential source of human toxicity in a VRFB is Vanadium.

Vanadium in various physio-chemical states can have a relatively high aquatic and human toxicity. Acute oral exposure to high doses can lead to haemorrhaging, while chronic exposure leads to adverse effects on the digestive system, kidneys, and blood (diarrhea, cramps, etc.).

Inhalation hazards lead to irritation of the respiratory tract, bronchospasm, pulmonary congestion. There is little evidence that vanadium compounds are reproductive toxics or teratogens. There is also no evidence that it is carcinogenic (United States of America's Environmental Protection Agency Risk Assessment Information Systems, Toxicity Profiles, Vanadium 1998).

In the electrolyte, the concentration levels of Vanadium are so low that when it is mixed into liquid form in the final product and put into operation, the VRFB is deemed non-toxic. In addition, VRFBs have a lower concentration of sulfuric acid than traditional lead-acid batteries. Vanadium poses a hazard when it is in powder form, i.e., when making up the electrolyte solution. However, the battery energy facilities will purchase electrolyte already made up and there will be no solid vanadium powder on site.

Toxicity or corrosion risks may be present from off-gassing produced by over-heating aqueous or vaporized electrolytes. In addition, flow batteries in fire scenarios may generate toxic gas from the combustion of hydrocarbons, plastics, or acidic electrolytes. Refer to sections on fire below for mitigation measures.

Electrical shock presents a risk to workers and emergency responders if the energy storage system cannot be “turned off”. This is referred to as “stranded energy” and presents unique hazards. Arc flash or blast is possible for systems operating above 100 V. Li-ion systems operate from 48 to 1 000 V, depending on the battery design. In the area of shock hazard, a flow battery produces voltage only when electrolytes are in a cell stack. For most designs, if the motors are turned off and fluids drained from the cell stack, then the cell stacks have no measurable voltage at the terminals. This happens not only when the battery is forcible turned off but also in the standby mode as vanadium batteries do not include any metal plates to hold the chemical reactions / charges / voltages and can be fully drained when not in use.

If not fully drained, VRFB are also unique in terms of short circuiting in that the internal dynamics of the battery are such that the energy discharge is limited to the fluid in the battery at any given time and the is typically less than 1% of the total stored energy. Therefore, together with the relatively low energy density of the vanadium electrolyte, the immediate release of energy, which occurs as a result of electrical shorting, is somewhat limited. The high heat capacity of the aqueous electrolyte is also beneficial in limiting the temperature rise.

VRFB have been tested under dead-short conditions resulting in normal operation with no danger to either equipment or personnel.

Over 50% of the electrolyte solution is made up of water, which gives the electrolyte a non-flammable property. In the event of short circuiting, intense heat or high pressure, it is unlikely for the battery to catch fire. There is no “thermal runaway” risk when compared to other battery technologies.

Whilst some heat may be discharged from the battery, it will not be at a level that is deemed unsafe.

Like all other RFBs, VRFBs also have a Battery Management System (BMS). A BMS ensures optimum and safe conditions for battery operation. Often a heat management system is integrated to avoid too high or too low temperatures.

As with all other aqueous batteries, aqueous energy storage media from RFB are also subject to water limitations. In case of too high voltages or more precisely too high or too low half-cell potentials, the water is decomposed into its components, hydrogen and oxygen.

The generation of hydrogen in particular is often present as a very small but undesirable side reaction and causes a charge carrier imbalance between positive and negative half-cells, which leads to a slow loss of capacity. It also presents a fire/ explosion hazard.

With VRFB, due to the flowability of the energy storage medium, the reaction products that would normally remain in the half-cell can be transported out of the cell and stored in separate tanks thus allowing the capability for a higher capacity than that attainable with conventional batteries. In addition, any deviations from safe operating parameter will trigger the shutdown of the system pumps ceasing to charge the electrolyte and thereby reducing the changes of accidental H_2 generation. In addition, the thermal mass of the electrolyte tanks can provide an additional barrier to overcharging conditions by allowing ambient temperature during the discharge times to cool the VRFB for the next charge cycle.

Unfortunately, pentavalent vanadium ions have a tendency to react with each other, which leads to the formation of larger molecules which precipitate as solids and can thus damage the system. The reaction depends on the temperature and the concentration of VO2+ (state of charge) but is also a function of the proton concentration. Temperature and concentrations therefore need to be controlled within specified ranges.

Should the concentration of undesirable components increase in the electrolyte, a part may need to be purged and replaced with fresh electrolyte. There may be facilities for regenerating purged electrolyte or it may have to be disposed of to a suitable hazardous waste facility.

Leaks must be expected in any hazardous-fluid handling equipment. Secondary containment is typically designed into the system and standard corrosive personal protective equipment (PPE) is required for handling liquid. Reliable leak detection, warning alarms, and containment is paramount. As with any chemicals plant, a suitable design with detection, alarm and trip instrumentation that has been subject to a thorough Hazard and Operability Study (HAZOP) study, should be in place, e.g., detection of dry running of pumps, detection of dead heading of pumps, prevention of reverse flow, detection of drop in tank levels, etc.

9.5.3.3 Other Chemicals or Hazards

The BESS is composed not only of the batteries, but also electrical connections, switches, power converters, cooling systems, etc. The diagram below shows a typical complex system for a SSLB facility.

Due to the need to keep the batteries within a specified temperature range most of the containerized modular system have built-in air-conditioning systems while the VRFB building systems may have cooling water systems. Some have only fans for air cooling with filters to remove dust prior to cooling. Others, particularly those in hot environments requiring more cooling, may have refrigerant-based systems. These would have a refrigerant circuit usually containing non-flammable, non-toxic refrigerant such as R134a (simple asphyxiant) as well as a low hazard circulating medium such as an ethylene glycol-based coolant. At high temperatures above 250 °C R134 may decompose and may generate hydrogen fluoride and other toxic gases. Ethylene glycol is really only harmful if swallowed. In the environment, it breaks down quickly and at low concentrations that would typically occur from occasional small spills, it has no toxicity.

Although these are only effective for some fire scenarios, some of the solid-state containerized systems come fitted with “Clean agent” fire suppressant systems. These are pressurized containers of powder/gases that are released into the container to snuff a fire and do not leave a residue on the equipment. Some containers have water sprinkler systems installed to quench thermal run-away reactions.

In general fire fighters may respond with water cannons/hydrants, foam systems, etc. Such responses may generate large amount of contaminated and hazardous water runoff. A system to contain as much of this as possible should be in place.

Whatever the configuration of the battery containers or buildings, there will be electrical and electronic equipment in the battery compartment, the battery building as well as outside. In some installations the main electrical equipment such as the power conversion system is in a separate compartment separated by a fire wall. In others it can be in a separate container.

Wherever there is electrical equipment there is a possibility of shorting and overheating and fire.

9.5.4 Summary and Conclusion

According to the report, the recommended preventative and mitigative measures necessary to ensure risks are not unacceptably high. There will always be residual risks but with the recommended preventative and mitigative measures these could be considered suitably low and therefore broadly acceptable.

The Risk Assessment has found that for the proposed BESS installation at the Rhino and Sunnyside SEF near Beaufort West, Western Cape Province, provided suitable preventative and mitigative measures in place, none of the identified potential risks are excessively high, i.e., from a SHE risk perspective no fatal flaws were found with either type of technology and therefore from a SHE risk perspective there is no reason to prohibit the development.

The design should be subject to a full HAZOP prior to commencement of procurement. A HAZOP is a detailed technical systematic study that looks at the intricacies of the design, the control system, the emergency system, etc., and how these may fail under abnormal operating conditions. Additional safeguards may be suggested by the team doing the study.

10. POLICY AND LEGISLATIVE CONTEXT

The relationship between the project and certain key pieces of environmental legislation is discussed in the subsections to follow.

10.1 The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)

The Constitution of the Republic of South Africa, Act 108 of 1996 (as amended) (The Constitution), sets the legal context in which environmental law in South Africa occurs and was formulated. All environmental aspects should be interpreted within the context of the the Constitution, NEMA and the Environment Conservation Act, 1989 (Act 73 of 1989) as amended.

The Constitution has enhanced the status of the environment by virtue of the establishment of environmental right (Section 24) and other rights created in the Bill of Rights may impact on environmental management through, for example, access to health care, food and water and social security (Section 27). Section 24 of The Constitution states that: *"Everyone has the right to:*

- *an environment that is not harmful to their health or well-being; and*
- *have their environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:*
    - Prevent pollution and ecological degradation;
    - Promote conservation and
    - Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

The Constitution is the overarching legislation for South Africa. Although it provides for certain rights and obligations, the NEMA has been promulgated in order to manage the various spheres of both the social and natural environment.

10.2 National Environmental Management Act, 1998 (Act 107 of 1998), as amended

The NEMA was promulgated in 1998 but has since been amended on several occasions from this date. The act intends to provide for:

- co-operative environmental governance by establishing principles for decision-making on matters affecting the environment;
- institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state;
- to provide for the prohibition, restriction or control of activities which are likely to have a detrimental effect on the environment; and
- to provide for matters connected therewith.

NEMA is the overarching legislation which governs the EIA process and environmental management in South Africa. Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an EA. Activities that may significantly affect the environment must be considered, investigated and assessed prior to implementation.

According to Section 2(3) of the NEMA, “development must be socially, environmentally and economically sustainable”, which means the integration of these three factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.

The EIA Regulations identify lists of activities which have the potential to result in detrimental environmental impacts and thus require EA, subject to either “BA” or “S&EIR”. The EIA Regulations prescribe the procedural and substantive requirements for the undertaking of EIAs and the issue of EAs.

The proposed project triggers listed activities under Listing Notice 1, 2 and 3, as detailed in sections above, and thus requires an EA subject to a BA process.

10.2.1 Environmental Impact Assessment Guideline for Renewable Energy Projects, Notice 989 of 2015

The purpose of this document is primarily to provide guidance on the environmental management legal framework applicable to RE operations and all the role players in the sector. The guideline is principally intended for use by the following stakeholder groups:

- Public Sector Authorities (as regulator and/or CA);
- Joint public sector authorities and project funders (e.g. Eskom, IDC, etc.);
- Private Sector Entities (as project funder/ developer /consultant); and
- Other I&APs (as determined by the project location and/or scope).

This guideline seeks to identify activities requiring authorisation prior to commencement of that activity and provide an interface between the EIA Regulations and other legislative requirements of various authorities.

The guidelines are applicable for the construction, installation and/or development of the following RE projects:

- Concentrating Solar Power Plant;
- Wind Energy Facility;

- Hydropower Station; and
- PV Power Plant.

As the proposed development is for a solar PV plant, it is subject to the recommendations proposed in the guidelines.

10.3 National Water Act, 1998 (Act 36 of 1998)

The NWA was promulgated on the 20th of August 1998. Tthis act provides for a framework to protect water resources against over exploitation and to ensure that there is water for socio-economic and economic development, human needs and to meet the needs of the aquatic environment. The NWA also recognises that water belongs to the whole nation for the benefit of all people.

Water resources as defined include a watercourse, surface water, estuary or aquifer. Specifically, a watercourse is defined as (*inter alia*) a:

- river or spring;
- natural channel in which water flows regularly or intermittently; and
- wetland, lake or dam into which, or from which water flows.

Due to the possible encroachment into wetland areas, the following Section 21 Water Uses in terms of the NWA may be triggered and require licensing:

- (c) impeding or diverting the flow of water in a watercourse; and
- (i) altering the bed, banks, course or characteristics of a watercourse.

In light of the above, there are a number of stipulations within the NWA that are relevant to the potential impacts on rivers, streams and wetlands that may be associated with the proposed development. An Aquatic/ Freshwater Assessment has been conducted to explore how the proposed development may impact on identified water resources as protected by the NWA. Should the proposed development require a General Authorisation (GA) or Water Use Licence (WUL), which it is likely to, it will be determined and applied for separately prior to construction.

10.4 The National Heritage Resources Act, 1999 (Act 25 of 1999)

The NHRA promotes good management of the heritage resources of South Africa which are deemed to have cultural significance and to enable and encourage communities to ensure that these resources are maintained for future generations.

The aim of the NHRA is to introduce an integrated, three-tier system for the identification, assessment and management of national heritage resources (operating at a national, provincial and local level). This legislation makes provision for a grading system for the evaluation of heritage resources on three levels which broadly coincide with their national, provincial and local significance.

This act requires investigation to determine the impact of heritage resources when developments exceed the thresholds list in section 38 (1) of the act:

- the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;

- the construction of a bridge or similar structure exceeding 50 m in length;
- any development or other activity which will change the character of a site:
  - exceeding 5 000 m^2 in extent; or
  - involving three or more existing erven or subdivisions thereof; or
  - involving three or more erven or divisions thereof which have been consolidated within the past five years; or
  - the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- the re-zoning of a site exceeding 10 000 m^2 in extent; or
- any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.

The proposed development would involve the underlined above.

Under the legislation the SAHRA was established, which replaced the National Monuments Council. SAHRA is responsible for the preservation of heritage resources with exceptional qualities of special national significance (Grade I sites). A Provincial Heritage Resources Authority, Heritage Western Cape (HWC) in this case, established in each province will protect Grade II heritage resources which are significant within the context of a province or region. Buildings and sites of local interest (Grade III sites) are the responsibility of local authorities as part of their planning functions. In this case, the SAHRA and HWC will need to be consulted with extensively throughout the process.

Within the scope of this project, Section 38 of the NHRA, as described above, states that an assessment of potential heritage resources in the development area needs to be done. A HIA has therefore been commissioned to explore how the proposed development may impact on heritage resources and potential cultural artefacts as protected by the act.

10.5 National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004) as amended

As the principal national act regulating biodiversity protection, the NEMBA, which is administered by the DFFE, is concerned with the management and conservation of biological diversity, as well as the use of indigenous biological resources in a sustainable manner.

The overarching aim of the NEMBA, within the framework of the NEMA, is to provide for:

- The management and conservation of biological diversity within South Africa, and of the components of such biological diversity;
- The use of indigenous biological resources in a sustainable manner; and
- The fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources.

In terms of this act, the developer has a responsibility to:

- Conserve endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA Regulations);
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity; and

- Limit further loss of biodiversity and conserve endangered ecosystems.

The SANBI was established in terms of the NEMBA, its purpose being (*inter alia*) to report on the status of the country's biodiversity and the conservation status of all listed threatened or protected species and ecosystems.

The NEMBA provides for a range of measures to protect ecosystems and for the protection of species that are threatened or in need of protection to ensure their survival in the wild, including a prohibition on carrying out a 'restricted activity' involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7 of the act.

A Terrestrial Biodiversity (including Animal and Plant Species) Assessment as well as the Avifaunal Assessment will be conducted to explore how the proposed development may impact on biodiversity as protected by the act.

In addition, all relevant conservation departments (such as the DFFE, SANBI, etc.) will be invited to provide comments with regards to the proposed development.

10.6 National Environmental Management Protected Areas Act, 2003 (Act 57 of 2003) as amended

The overarching aim of the National Environmental Management Protected Areas Act, 2003 (Act 57 of 2003) as amended, within the framework of NEMA, is to provide for:

- the declaration and management of PAs;
- co-operative governance in the declaration and management of PAs;
- effect a national system of PAs in South Africa as part of a strategy to manage and conserve its biodiversity;
- a representative network of PAs on state land, private land and communal land;
- promote sustainable utilisation of PAs for the benefit of people, in a manner that would preserve the ecological character of such areas;
- promote participation of local communities in the management of PAs, where appropriate; and
- the continued existence of South African National Parks.

The proposed project is not located in any PA.

10.7 National Forests Act, 1998 (Act 84 of 1998) as amended

The National Forest Act, 1998 (Act 24 of 1998) as amended (NFA), was enacted to:

- Provide for the protection, management and utilisation of forests;
- The protection of certain plant and animal life;
- The regulation of trade in forest produce; and
- The control and management of a national hiking way system and National Botanic Gardens.

The NFA enforces the necessity for a license to be obtained prior to destroying any indigenous tree in a natural forest and, subject to certain exemptions, cutting, disturbing, damaging, destroying or removing any protected tree. The list of protected trees is currently contained in GN 908 of 21 November 2014. Licences are issued by the Minister/ Member of the Executive Council and are subject to periods and conditions as

may be stipulated.

10.7.1 Protected Trees

According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.
No protected trees were delineated on site.

10.7.2 Forests

Prohibits the destruction of indigenous trees in any natural forest without a licence.

The NFA is relevant to the proposed development as the removal and/or disturbance and/or clearance of indigenous vegetation will be required and a license in terms of the NFA may be required for this to be done.

10.8 National Veld and Forest Fire Act, 1998 (Act 101 of 1998) as amended

This act provides for a requirement for veldfire prevention through firebreaks and required measures for firefighting. Chapter 4 of the act places a duty on landowners to prepare and maintain firebreaks. Chapter 5 of the act places a duty on all landowners to acquire equipment and have available personnel to fight fires.

10.9 Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) as amended

The Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983), as amended (CARA), controls the utilisation of natural agricultural resources in South Africa. The act promotes the conservation of soil, water sources and vegetation as well as the combating weeds and invader plants. The act requires the protection of land against soil erosion and the prevention of water logging and salinization of soils by means of suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges and watercourses are also addressed.

The primary objective of the act is to conserve natural agricultural resources by:

- maintaining the production potential of land;
- combating and preventing erosion and weakening or destruction of the water resources;
- protecting vegetation; and
- combating weeds and invaders plants.

In terms of this act, no degradation of natural land is permitted. Rehabilitation after disturbance to agricultural land is also managed by this act. The CARA is relevant to the proposed development as the construction of a SEF as well as other components (such as permanent guardhouse) may impact on agricultural resources and vegetation on the site. The act prohibits the spreading of weeds and prescribes control measures that need to be complied with in order to achieve this. As such, measures will need to be taken to protect agricultural resources and prevent weeds and exotic plants from invading the site as a result of the proposed development.

Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:

- Category 1 plants: are prohibited and must be controlled.
- Category 2 plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.
- Category 3 plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

A SSV and Agricultural Compliance Statement has been prepared to explore how the proposed development may impact on the agricultural production potential of the proposed site.

10.10 Subdivision of Agricultural Land Act, 1970 (Act 70 of 1970) as amended

The Subdivision of Agricultural Land Act, 1970 (Act 70 of 1970), as amended (SALA), controls the subdivision of all agricultural land in South Africa, prohibiting certain actions pertaining to agricultural land. Under the Act, the owner of agricultural land is required to obtain consent from the Minister of Agriculture in order to subdivide agricultural land.

The development requires approval from the National Department of Agriculture, Land Reform and Rural Development (DALRRD) because it is on agriculturally zoned land. There are two approvals that apply. The first is a No Objection Letter for the change in land use. This letter is one of the requirements for receiving municipal rezoning. This application requires a motivation backed by good evidence that the development is acceptable in terms of its impact on the agricultural production potential of the development site. This agricultural assessment report will serve that purpose.

The second approval is a consent for long-term lease required in terms of the SALA. SALA approval is not required if the lease is over the entire farm portion. If DALRRD approval for the development has already been obtained in the form of the No Objection letter, then SALA approval is likely to be readily forthcoming. SALA approval can only be applied for once the Municipal Rezoning Certificate and Environmental Authorisation has been obtained.

The DALRRD will be notified as an I&AP.

10.11 National Road Traffic Act, 1996 (Act 93 of 1996) as amended

The NRTA, provides for all road traffic matters and is applied uniformly throughout South Africa. The act enforces the necessity of registering and licensing motor vehicles. It also stipulates requirements regarding fitness of drivers and vehicles as well as making provision for the transportation of dangerous goods.

All the requirements stipulated in the NRTA will need to be complied with during the construction and operational phases of the proposed development.

10.12 Civil Aviation Act, 2009 (Act 13 of 2009) as amended

The Civil Aviation Act, 2009 (Act 13 of 2009) as amended (CAA), controls and regulates aviation within South Africa. It provides for the establishment of a South African Civil Aviation Authority (SACAA) and independent Aviation Safety Investigation Board in compliance with Annexure 13 of the Chicago Convention. It gives effect to various conventions related to aircraft offences, civil aviation safety and security, and provides for additional measures directed at more effective control of the safety and security of aircrafts, airports and matters connected thereto.

Although the act is not directly relevant to the proposed development, it should be considered as the establishment of electricity distribution infrastructure (such as a substation) may impact on aviation and air traffic safety, if located directly within aircraft flight paths.

The Air Traffic and Navigation Services Company Limited and the SACAA will be consulted with throughout the BA process and the required approvals will be obtained, where necessary. It is not, however, anticipated that any approvals will be required.

10.13 Astronomy Geographic Advantage Act, 2007 (Act 21 of 2007) as amended

The Astronomy Geographic Advantage Act, 2007 (Act 21 of 2007) as amended, provides for:

- The preservation and protection of areas that are uniquely suited for optical and radio astronomy; and
- Intergovernmental cooperation and public consultation on matters concerning nationally significant astronomy advantage areas and matters connected therewith.

Under Section 22(1) of the act, the Minister has the authority to protect the radio frequency spectrum for astronomy observations within a core or central astronomy advantage area. As such, the Minister may under section 23(1) of the act, declare that no person may undertake certain activities within a core or central Astronomy Advantage Area (AAA). These activities include the construction, expansion or operation of any fixed radio frequency interference source, facilities for the generation, transmission or distribution of electricity, or any activity capable of causing radio frequency interference or which may detrimentally influence the astronomy and scientific endeavours.

In terms of Section 7(1) and (2) of the act, national government established the following AAAs:

- Karoo Central AAA (GN 198 of 2014) – proposed development encroaches this AAA
- Sutherland Central AAA – proposed development falls outside this AAA
- Northern Cape AAA (GN 115 of 2010) – proposed development falls outside of this AAA

It is SiVEST understanding that the applicant will undertake this process in their capacity.

10.14 National Energy Act, 2008 (Act 34 of 2008) as amended

South Africa has two acts that direct the planning and development of the country's electricity sector, namely:

- The National Energy Act, 2008 (Act 34 of 2008) as amended (NEA); and
- The Electricity Regulation Act, 2006 (Act 4 of 2006) as amended (ERA).

The NEA has, as one of its key objectives, the promotion of diversity of supply of energy and its sources. From this standpoint, the act directly references the importance of the RE sector, with a mention of the solar energy sector included. The aim is to ensure that the South African economy is able to grow and develop, fast-tracking poverty alleviation, through the availability of a sustainable, diverse energy mix. Moreover, the goal is to provide for the increased generation and consumption of RE (Republic of South Africa, 2008).

10.15 Electricity Regulation Act, 2006 (Act 4 of 2006) as amended

In 2011, the electricity regulation on new generation capacity was published under Section 35(4) of the ERA. This act applies to the procurement of new generation capacity by organs of state. The objectives of the act

include:

- To facilitate planning for the establishment of new generation capacity;
- The regulation of entry by a buyer and a generator into a Power Purchase Agreement (PPA);
- To set minimum standards or requirements for PPAs;
- The facilitation of the full recovery by the buyer of all costs efficiently incurred by it under, or in connection with, a PPA including a reasonable return based on the risks assumed by the buyer thereunder and to ensure transparency and cost reflectivity in the determination of electricity tariffs; and
- The provision of a framework for implementation of an IPP procurement programme and the relevant agreements concluded.

The Act establishes a National Energy Regulator as the custodian and enforcer of the National Electricity Regulatory Framework. The act also provides for licenses and registration as the manner in which generation, transmission, distribution, trading and the import and export of electricity are regulated.

10.16 Protection of Public Information Act, 2013 (Act 4 of 2013) as amended

The Protection of Public Information Act, 2013 (Act 4 of 2013) as amended (POPIA), recognises the Constitutional requirement that everyone has a right to privacy. Ultimately the act promotes “the protection of personal information processed by public and private bodies; to introduce certain conditions so as to establish minimum requirements for the processing of personal information; to provide for the establishment of an Information Regulator to exercise certain powers and to perform certain duties and functions in terms of this act and the Promotion of Access to Information Act, 2000 (Act 2 of 2000) as amended; to provide for the issuing of codes of conduct; to provide for the rights of persons regarding unsolicited electronic communications and automated decision making; to regulate the flow of personal information across the borders of the Republic; and to provide for matters connected therewith”.

Due to the requirements around the PPP, SIVEST will process and capture information aligned to the POPIA and always obtain consent from I&APs for information to be gathered, stored and distributed for the purpose of this project only.

10.17 Renewable Energy Development Zones and Strategic Transmission Corridors

The Strategic Environmental Assessment (SEA) for Wind and Solar PV Energy in South Africa (CSIR, 2015) originally identified eight formally gazetted Renewable Energy Development Zones (REDZs) that are of strategic importance for large-scale wind and solar PV development in terms of Strategic Integrated Project 8: Green Energy in Support of the South African Economy, as well as associated Strategic Transmission Corridors (STCs), including the rollout of its supporting transmission and distribution infrastructure, in terms of Strategic Integrated Project 10: Electricity Transmission and Distribution.

- REDZs for large-scale wind and solar PV development;
- associated STCs which support areas where long-term electricity grid will be developed;
- process of EIA to be followed and reduced decision-making timeframe for processing of applications for EA in terms of the NEMA; and
- acceptance of routes which have been pre-negotiated with all landowners as part of applications for EAs for powerlines and substations.

It should be noted that the proposed PV plant is located within the Beaufort West REDZ for the purpose of development of solar and wind energy generation facilities (refer to **Figure 10-1**). Ultimately, the proposed

development is subject to a BA process in terms of the EIA Regulations.

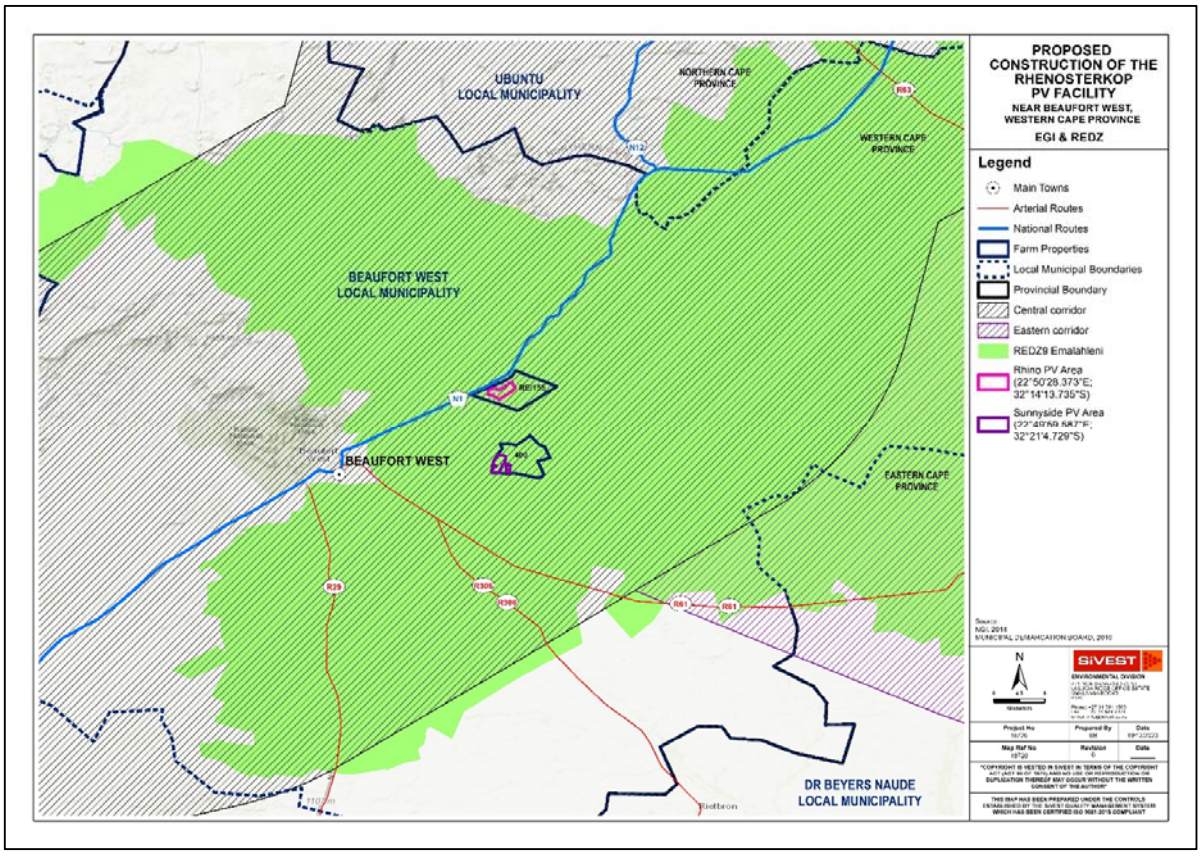

Figure 10-1: Formally gazetted REDZs in South Africa and the proposed Rhino and Sunnyside PV Plant location in relation to the REDZs

10.18 Additional Relevant Legislation

- White Paper on the Energy Policy of the Republic of South Africa (1998)
- Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended (OHSA);
- Road Safety Act, 1996 (Act 93 of 1996) as amended;
- National Environmental Management Air Quality Act, 2004 (Act 39 of 2004) as amended;
- National Environmental Management Waste Act, 2008 (Act 59 of 2008), as amended;
- Development Facilitation Act, 1995 (Act 67 of 1995) as amended;
- The Hazardous Substances Act, 1973 (Act 15 of 1973) as amended;
- Water Services Act, 1998 (Act 108 of 1998) as amended;
- Municipal Systems Act, 2000 (Act 32 of 2000) as amended;
- Subdivision of Agricultural Land Act, 1970 (Act 70 of 1970) as amended;
- Mineral and Petroleum Resource Development Act, 2002 (Act 28 of 2002), as amended;
- Industrial Policy Action Plan (IPAP2) 2018/19 – 2020/21
- IRP for Electricity 2010-2030: Update Report 2019
- National Development Plan (NDP) 2030 (2012)
- New Growth Path Framework (NGPF), 2010

- White Paper on Renewable Energy (2003)

11. KEY DEVELOPMENT STRATEGIES AND GUIDELINES

A policy review plays an integral role in the early stages of a development. The review establishes whether the development is aligned with the goals and aspirations of the developmental policies of a country. This chapter provides a policy review to highlight issues that could jeopardise the development of the Rhino and Sunnyside solar PV facility in accordance with the relevant policies.

The following policies and strategic documents were identified as applying to the study areas:

- National:
  - Industrial Policy Action Plan, 2018/19-2020/21
  - NDP 2030 (2012)
  - NEA
  - Renewable Energy Vision (REV), 2030 South Africa
  - NGPF (2010)
  - White Paper on Renewable Energy (2003)
  - South African Renewable Energy Masterplan (SAREM)
  - Just Energy Transition Investment Plan (JET IP), 2023 – 2027
  - National Framework for Sustainable Development (NFSD), 2008
  - REIPP, 2022
  - The Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) in Context
- Provincial:
  - Western Cape Provincial Spatial Development Framework (SDF), 2014
  - Western Cape Green Economy Strategy Framework, 2013
  - Western Cape Strategic Plan for 2020-2025
- Local:
  - Central Karoo District Municipal SDF, 2019
  - Central Karoo District Municipality Integrated Development Plan (IDP), 2017 – 2022
  - Karoo Readiness Action Plan, 2021
  - Beaufort West Municipality IDP, 2022/2027

11.1 National and Provincial Policies

The national and provincial policies are discussed in the table below.

Table 11-1: Relevant National and Provincial Policies for the Solar PV Facility

Policy	Key Policy Objectives	Source
National Policy: South Africa		
National Development Plan (NDP), 2030	• Creating jobs and livelihoods • Expanding infrastructure • Transitioning to a low-carbon economy • Transforming urban and rural spaces • Improving education and training • Providing quality health care • Building a capable state • Transforming society and uniting the nation	NPC, 2012

Policy	Key Policy Objectives	Source
	• Fighting corruption and enhancing accountability	
New Growth Path Framework (NGPF), 2011	• Infrastructure investment • Main economic sectors as employment sectors • Seizing the potential of new economies • Investing in social capital and public services • Fostering rural development and regional integration	South African Government, 2011
Renewable Energy Vision (REV), 2030 South Africa	• RE as an exceptional source of flexible supply within the context of uncertain energy demand • Comprehensive RE base will support a resilient South African future • A sustainable energy mix that excludes undue risks for the environment of society	World Wildlife Fund, 2014
The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996) as amended	• "Everyone has the right to an environment that is not harmful to their health or well-being" (Section 24) • The environment should be protected for the benefit of present and future generations, through reasonable legislative and other measures that: o Prevent pollution and ecological degradation o Promote conservation o Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development	Republic of South Africa, 1996
White Paper on Energy Policy of the Republic of South Africa, 1998	• Seeks to ensure that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options • Aims to create energy security by diversifying the energy supply and energy carriers	Department of Minerals and Energy, 1998
White Paper on the Renewable Energy Policy of RSA, 2003	• Pledges government support for the development, demonstration and implementation of RE sources for both small and large-scale applications	Department of Minerals and Energy, 2003)
South African Renewable Energy Masterplan (SAREM)	• One of the goals of the SAREM is to boost the economy by developing new RE projects by 2030 • Another of the aims of the SAREM is to intervene and create a programme to rollout solar generating units for schools, clinics and hospitals (among others)	Mineral Resources & Energy Science and Innovation Trade, Industry and Competition, 2023
Just Energy Transition Investment Plan (JET IP), 2023 - 2027	• To meet Nationally Determined Contribution targets, the JET IP has a goal to speed up reasonably priced and diversely owned RE systems. • In accordance with the energy policy Eskom intends to stop using seven coal plants.	The Presidency of The Republic of South Africa, 2023
Industrial Policy Action Plan, 2018/19-2020/21	• As a part of the radical economic transformation plan, the policy aims to transition from carbon emitting energy sources to renewable energy sources. • The policy identifies that the government sees renewable energy generation as a key for industrial development. • To motivate independent renewable power, the SA government has implemented the REIPPP (Renewable Energy Independent Power Producers Programme).	Department of Trade and Industry, 2018

Policy	Key Policy Objectives	Source
National Framework for Sustainable Development (NFSD), 2008	• The framework outlines that funds have been allocated to the university sector to benefit the development of alternative energy solutions. • Eskom has initiated the South African Bulk Renewable Energy Generation (SABRE-Gen) initiative aimed at fostering the growth of fresh energy ventures, which include solar facilities.	The Department of Environment and Tourism, 2008
REIPP, 2022	• An objective of this programme is to enhance electricity generation in South Africa through IPPs. • To broaden the nation's energy sources and reduce the reliance on diesel and coal, promoting greater diversity in the energy mix.	TownPlanner.co.za, 2023)
National Infrastructure Plan, 2012	• Aims to facilitate socio-economic development, is the "greening" of electricity generation. • One of the Strategic Integrated Projects aims to provide support for green energy initiatives.	Presidential Infrastructure Coordinating Commission, 2012
The Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) in Context	• This programme identifies the shortfall of electricity production. This objective is identified in the IRP, 2019. • Another objective of the programme is to move away from diesel generators. • To be able to call on IPP's to generate additional electricity in case of production shortfalls that lead to load shedding.	Department: Mineral Resources and Energy, n.d.
Provincial Policy: Western Cape		
Western Cape Provincial Spatial Development Framework (SDF), 2014	• The SDF advocates for the promotion of the transition to RE sources. • As part of the Resource Management Policy, there is an emphasis on restricting the utilization of scarce resources. • Under the POLICY R4: recycle and recover waste, deliver clean sources of energy to urban consumers, shift from private to public transport, and adapt to and mitigate against climate change: o To promote air quality, it is suggested to make use of RE sources. o To benefit the energy sectors, diverse energy generating sources should be pursued.	Western Cape Government, 2014
Western Cape Green Economy Strategy Framework, 2013	• The Western Cape Government's Green Economic Strategic Framework aims to grow the RE sector, by injecting capital into Power Purchase Agreements (PPAs). • One of the objectives outlined in the framework is to establish a policy framework that prioritizes the development of green infrastructure. • An objective is to cultivate RE sources with the aim of achieving a 42% contribution to the total new generated power by the year 2030. • The GreenCape initiative was rolled out in 2010 to assist the national RE development. • A specific action item for the Western Cape Government entails actively pursuing prospective opportunities for the development of RE generation projects. • To cultivate a specialized workforce in the field of green energy, a dedicated training centre has been established at the Cape Peninsula University of Technology.	Western Cape Government, 2013
Western Cape Strategic Plan for 2020-2025	• A goal is identified to enforce viable energy solutions. • This plan also refers to the National Environmental Management Air Quality Act, 2004 (Act 39 of 2004) as amended (NEMAQA), which has	Western Cape Government, 2020

Policy	Key Policy Objectives	Source
	a goal to drive down air pollution. • Section 24 of the Constitution of the Republic of South Africa states that every person has the right to an environment that does not cause harm to their health. In the plan, an aim to achieve this human right, is to prevent air pollution and the pollution of the environment. • This plan outlines the objective to move towards a low carbon emitting economy.	

11.2 District and Local Municipalities

The local policies are discussed in the table below.

Table 11-2: Relevant District and Local Municipal Policies for the Solar PV Facility

Policy	Key Policy Objectives	Source
District & Local Municipal Policy: Central Karoo District Municipality & Beaufort West Local Municipality		
Central Karoo District Municipal SDF, 2019	• The SDF identifies opportunities to develop solar and wind power generating plants in the Central Karoo. • The SDF refers to Policy A5: Support and Promote the Renewable Energy Economy, which states to identify and promote green energy projects that can be developed in the area. The Policy states that incentives should be in place to boost green energy projects. The proposed development meets the goals set in the SDF to develop Solar and Wind generating plants. This development would be in a position to provide green energy to the facility.	Western Cape Government, 2019
Central Karoo District Municipality Integrated Development Plan (IDP), 2017 – 2022	• A solution to relieve pressure on the biodiversity, is to use energy generated by renewable sources. • The IDP refers to the Air Quality Management Plan under Environmental Protection. • The Air Quality Management Plan has a goal to reduce greenhouse gas emission and assist with the reserving of resources. The proposed development aligns with IDP goal to reduce greenhouse gas emission, Solar PV facility which uses solar or photovoltaic cells to convert sunlight into electricity, is very clean in that it doesn't produce air pollutants or contribute to greenhouse gas emissions.	Central Karoo District Municipality, 2017
Beaufort West Municipality IDP, 2022/2027	• The IDP identifies the national goal to create new RE projects that produce a total of 24.4 GW. • Air pollution is identified as a municipal function. • Section 15(2) of the NEMAQA, refers to the aim to reduce greenhouse gas emission, which is identified in the plan. The proposed development aligns with IDP goal to create new RE projects and to reduce greenhouse gas emission. Solar PV facility which uses solar or photovoltaic cells to convert sunlight into electricity, is very clean in that it doesn't produce air pollutants or contribute to greenhouse gas emissions.	Hardcastle, 2021

Policy	Key Policy Objectives	Source
Karoo Readiness Action Plan, 2021	• The plan identifies the need to include green energy projects in SDF's and IDP's. • The plan outlines the need to increase air quality, by implementing more RE projects, in order to reduce the reliance on coal generated electricity. • One of the actions of the plan is to improve air quality compliance, as well as to create by-laws to control air quality. The proposed development can create opportunities to help action some of the plans in place including improving air quality. Solar energy can help tackle pollution by reducing air pollution, conserving water, eliminating dependence on non-renewable energy.	Beaufort West Municipality, 2022

The review of relevant legislation, policies and documentation pertaining to the proposed development indicates that the establishment of the solar farm and associated infrastructure is supported at a national, provincial, and local levels, and that the proposed project will contribute positively towards several targets and policy aims.

12. NEED AND DESIRABILITY

South Africa is continuously challenged with a pressing electricity supply crisis, resulting in the recurring imposition of load shedding. The repercussions of these power outages have sent shockwaves through the national economy and society at large. Moreover, the compounding factors of the COVID-19 pandemic aftershock, decreasing business confidence, and successive national credit downgrades have collectively cast a shadow over the country's economic landscape. In light of these multifaceted challenges, this section aims to underscore the imperative and attractiveness of the proposed project, aligning its relevance with the above-mentioned circumstances. This section was influenced by the outcomes of the Impact Assessment.

12.1 South Africa's Energy Economy

In South Africa, the energy sector is at the heart of economic and social development. The energy sector contributes significantly to the economy, and it is essential for job creation, economic growth, and improved living standards. According to the NDP, South Africa will have an energy sector that supports economic growth and development by investing in energy infrastructure by 2030. As of 2016, coal is the dominant energy source in South Africa, accounting for 80% of the country's electricity generation. Other major sources of energy in South Africa include crude oil and petroleum products (14%), natural gas (3%), nuclear (3%), and renewables (11%).

The South African government is committed to diversifying the country's energy mix and reducing its reliance on coal. The government has set a target of 100% RE for electricity generation by 2050. To achieve this target, the government is investing in RE projects, such as solar and wind power. The energy sector is facing a number of challenges, including climate change, energy security, and energy poverty. The government is working to address these challenges by investing in RE, promoting energy efficiency, and ensuring that everyone has access to reliable and affordable energy.

12.1.1 Energy Provision Crisis

South Africa has endured recurring power interruptions known as load shedding for years. Eskom, the nation's

primary provider of electricity, first announced in 2007 that it was unable to provide power to the entire country simultaneously due to deteriorating infrastructure (The culture trip, 2019). Eskom continues to implement national blackouts as of July 2022 as it struggles to meet the national energy demand. The increasing strain on infrastructure has led to South Africans experiencing daily power outages of up to nine hours, which is referred to as stage 6 load shedding (BBC News, 2022). These outages have affected many people and businesses across the nation. Some of the most prominent impacts of the current energy crisis include (Generator Parts, 2022):

- Production loss and subsequent GVA reduction: Since the majority of businesses rely on electricity for lighting as well as powering machinery and other equipment required for daily operations, the outages have undermined their ability to function at full capacity.
- Declining profits and subsequent loss of employment: When there is a substantial drop in production, there is also a significant fall in profits. This, in turn, leads to businesses not being able to pay employees.
- Increased poverty: This is due to loss of employment and thus reduced living standards.
- Theft and burglary: These are as a result of loss of employment as well as the failure of burglar alarms and other forms of security during power outages.

For South Africa to have enough generating, transmission, and distribution capacity, it has been estimated that the country will need to spend close to R 1.2 trillion by 2030. According to Eskom's Former CEO, Mr André de Ruyter, RE is the quickest and most cost-effective method to fix the country's electricity crisis (BusinessTech, 2022).

12.1.2 Renewable Energy as a Solution

As South Africa's energy crisis worsens, RE has gained popularity as a potential solution (Creamer Media, 2022). The 2003 White Paper on Renewable Energy is one of the policy documents that established the framework for the promotion of RE in South Africa. It encourages the move to RE in order for the country to transition to a low carbon economy (Department of Mineral Resources and Energy, 2003). RE is created from naturally replenishing and endless sources. The different kinds of RE include:

- bioenergy;
- geothermal energy;
- hydrogen;
- hydropower;
- marine energy;
- wind energy; and
- solar energy

RE has several benefits that impact the economy, ecology, national security, and human health. Some of the more prominent benefits include (U.S. Department of Energy, 2022):

- enhanced resilience, security, and dependability of the country's national electricity grid;
- generation of jobs in the RE sectors; and
- reduced air pollution and carbon emissions from energy generation.

The potential for RE use is abundant in South Africa, notably for wind and solar energy. According to the International Renewable Energy Agency (International Renewable Energy Agency, 2019), there is potential

for wind power development across more than 80% of the country's territory with the possibility of reaching about 67 000 gigawatts. The country also has an abundance of solar energy potential with an annual sunshine duration of about 2 500 hours while the daily solar radiation intensity is between 4.5 kWh/m^2 and 6.6 kWh/m^2. Despite the immense potential for exploiting RE, the amount of electricity produced from these sources is still very modest (Green Finance & Development Center, 2019). The map below depicts the PV Yield Tracking and solar irradiance potential in the proposed location for the Solar PV facility and its surrounding areas.

As can be seen in the map above, the study area is in a region with a fairly moderate PV yield. As a result, the installation of a 500 MW AC solar PV facility seems to be fair given the need for more RE sources and the region's moderate potential for solar energy. There are areas with higher PV in the area however, the moderate potential is expected to work for the development fairly. It is still crucial however to consider all of the impacts that could result from the construction of the proposed site. The impacts related to the construction of the 500 MW AC solar PV facility and associated infrastructure will be examined further in the BAR.

12.2 Need and Desirability Assessment

Table 12-1: Need and Desirability Assessment

Aspect	Comment
The socio-economic context of the area based on strategic documents	The strategic national, provincial, and local-level documents focus on improving the lives of communities by promoting decent work and economic development, improving and expanding infrastructure and prioritising RE concerns. The proposed solar PV facility, with its potential to create employment opportunities and contribute to the green economy, appears to be in line with the objectives outlined in these strategic documents. By investing in RE infrastructure, the project aligns with the goal of transitioning to cleaner and more sustainable energy sources.
Spatial characteristics	The proposed location for the solar PV facility is situated on land surrounded by various farms and has limited infrastructure besides electrical powerlines. The site benefits from convenient accessibility, as it is connected to local roads that link to the N1 and N11 which will serve as the primary route for the construction and operation of the facility. As a security measure, a fence will be constructed to enclose the designated area. The chosen site presents minimal risks, given the nature of the solar energy project. However there in some infrastructure present on site and around namely telecommunication towers and electric powerlines which may be affected by the proposed project. Moreover, it is worth noting that the site is situated on land with a moderate potential for PV energy generation.
Equitable impacts in the short and long term as well as social and economically sustainable considerations	The proposed solar PV facility is expected to have both short- and long-term impacts on economic and social sustainability. One of the positive identified impacts relates to its potential to provide employment opportunities to some of the region's households in the short term (during construction of the facility) and over the long term (during its operations). The proposed development will also contribute to enhancing energy resilience as it will support RE development.
Creation of residential and employment opportunities nearby or amongst the different communities	The proposed development is expected to create employment opportunities at all skill levels, allowing the residents of local communities to work closer to their homes in the short and long term. Though skills capabilities still need to be assessed, it is expected that most permanent jobs will be filled by those in local communities.

Aspect	Comment
Discouragement of urban sprawl and contribute to compaction/densification	The development has the potential to sustain local employment levels, providing continued job opportunities for the community. While some unemployed individuals from the local municipalities may choose to migrate to urban areas in search of opportunities, it is important to note that this migration is not directly linked to the development itself.
Encouragement of environmentally sustainable land development practices and processes	The proposed development is a solar PV facility, thus encouraging the sustainable use of RE. By harnessing solar power, the facility aims to contribute to the reduction of carbon emissions and the conservation of natural resources. Furthermore, the utilisation of clean and RE aligns with the global shift towards a more sustainable future. The environmental specialists may provide additional guidance on further environmental benefits and drawbacks that the site may have.
Consideration of special locational factors that might favour the specific location	The location of the proposed solar PV project has moderate PV yield, making it an appropriate site for solar PV facility. In addition, the land is currently unutilised and thus available for development.
Impact on the sense of history, sense of place, and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area	The proximity of the proposed location to the nearby farms may have visual impacts on residents, which will be further examined in the visual report. The development of the solar PV facility site is anticipated to stimulate economic activity, leading to new developments and increased business opportunities. However, the influx of job seekers may also contribute to a potential increase in crime rates within the area.
Limitations of current knowledge (gaps, uncertainties, and assumptions)	This study is based only on the material provided by the client and secondary research. No interviews with the many affected parties were done (either those directly or indirectly affected); this raises the level of uncertainty as not all risks could be thoroughly investigated. Information from I&APs will be obtained during the PPP.
Availability of labour able to take up the job opportunities provided by the development of the Rhino and Sunnyside site and associated infrastructure	As indicated in Chapter 4, most of the residents have low-medium skills. The employment opportunities will be for people of various skill levels during both the construction and the operation of the proposed solar PV facility. Most of the opportunities will be for low-semiskilled people thus the population will reasonably meet the requisite capabilities
The location of job opportunities versus the location of impacts	As discussed in Socio-Economic Assessment report, the majority of residents in the area possess low to medium skill levels. The employment opportunities associated with the construction and operation of the proposed sites will cater to individuals with diverse skill levels. A significant portion of these opportunities will be suitable for low to semi-skilled individuals, ensuring that the local population can reasonably meet the required capabilities.
Socio-economic impacts of the development based on the socio-economic context	The proposed development is anticipated to have both positive and negative socio-economic impacts. The construction and operation of the solar PV facility site will stimulate the economy, leading to increased household income and tax revenue. It will generate temporary employment during the construction phase and provide long-term, sustainable employment during operations. Furthermore, the project's focus on RE will contribute to sustainable practices. Additionally, the facility has the potential to support the growth of small businesses in the area, further benefiting the local economy.

12.2.1 Just Energy Transition

According to International Institute for Sustainable Development (IISD), 2018, energy transitions are shifts in the way people produce and consume energy using different technologies and sources. A low-carbon energy transition is a type of energy transition involving a shift from high-carbon energy sources such as oil, gas and coal to low-carbon and zero-carbon energy sources such as renewables.

A just energy transition (JET) is a negotiated vision and process centred on dialogue, supported by a set of guiding principles, to shift practices in energy production and consumption. It aims to minimise negative impacts on workers and communities with stakes in high-carbon sectors that will wind down, and to maximise positive opportunities for new decent jobs in the low-carbon growth sectors of the future. It strives to ensure that the costs and benefits of the transition are equitably shared.

Acting sooner rather than later can make energy transitions less expensive and more equitable, while also providing new opportunities for countries to build low-carbon industries. Nonetheless, overcoming "carbon lock-in" is difficult, and targeted political and media efforts are required to speed up JETs. Much may be done to help these processes, which are either underway or in the initial stages in many nations. Based on case studies and research, the table below lists concrete steps that governments can take to begin or accelerate a JET.

Table 12-2: Implementation Steps for JET

Understanding the context	• Map the political economy of an energy transition • Use detailed analyses of positive and negative impacts of an energy transition (at national, regional or even plant level)
Identifying champions	• Facilitate international and regional exchange and peer learning between countries at various stages of energy transition processes, including engagement with labour, businesses, civil society, especially for developing country contexts • Round tables at the country level to start or enhance a conversation on a just transition between all concerned stakeholders • High-level dialogue between countries in similar situations to promote the idea of a just transition at the highest levels of government (e.g., at the EU[13], OECD[14] or G20 level or bilaterally)
Making the case	• Develop communications strategies for JETs • Set up inclusive processes for “two-way communications” • Train government officials in communications
Implementing just transition measures	• Promote localized green jobs, including in decentralized energy and energy efficiency, and link this explicitly to the energy transition • Mobilize additional funding to promote visible and tangible just transition measures, and communicate about the benefits • Share best practices of just transition measures

According to Trade and Industry Policy Strategies, South Africa's just transition plan is both essential and conspicuously absent as the reality of a coal transition and coal power decommissioning approaches. The need to manage the transition's effects on employees and local economic development, particularly in coal-dependent regions and communities, is urgent. It is necessary to have a credible fact base from which to make suitable and widely supported decisions.

Several specific political consensuses must be brokered in this conceptual clearing in order to enable policy creation and execution, as well as investment, for a green and just transition

According to JET IS, the coal plant decommissioning will need R 4.1 billion between 2023 and 2027. Coal plant-decommissioning costs reflect what Eskom has currently provided for in its planning. These costs exclude the costs of repurposing or repowering retired plants and other infrastructure investments.

[13] European Union
[14] Organisation for Economic Co-operation and Development

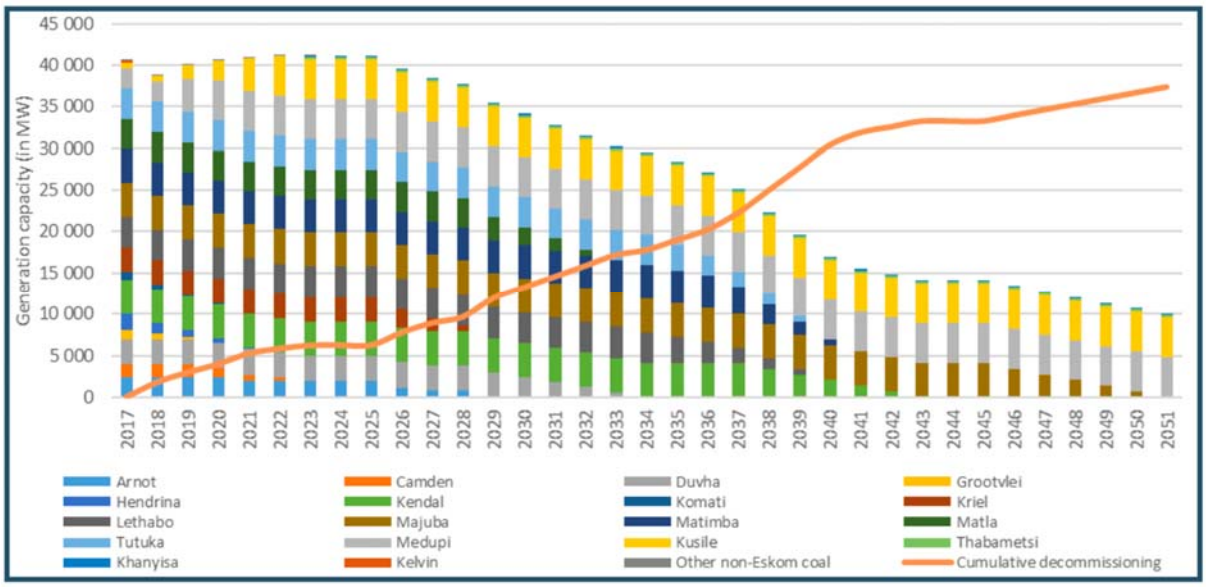

Figure 12-1: South Africa's coal-based generation capacity and scheduled decommissioning (Urban-Econ, 2023)

As per the JET IS, the infrastructure investment priorities are:

- To manage the decommissioning of the retiring coal generation fleet, in line with a revised IRP, and in tandem with the development of RE generation at scale and pace.
- To timeously strengthen the transmission grid infrastructure to accommodate the shift to RE.
- To modernise the electricity distribution system.

12.2.2 National Sub-Investments Downgrades

During 2022, Moody's Investor Service surprised market expectations by improving South Africa's credit rating status, shifting it from negative to stable. This upgrade came as a surprise, as there has been an anticipated downgrade. Before the credit rating upgrade, Moody's had assigned South Africa a "junk status". One of the known impacts of the downgrade was that South Africa fell out of the World Government Bond Index (WGBI) and other popular bond indexes, an index that measures the performance of fixed-rate, local currency, investment-grade sovereign bonds.
The sub-investment rating means that South Africa has dropped out of some of the widely used global bond indexes and forced international funds which track these indexes to sell South African bonds. It is estimated that between $22-$28 billion in capital has already flowed out of local markets since 2018 with the recent downgrade account for between $1,5 and $8 billion. South Africa remains excluded from the WGBI since its initial removal. Despite the passage of time, South Africa has not yet been reinstated into this global financial index.

The absence of South Africa from the WGBI has significant implications for its international financial standing, as it restricts the country's access to a vital platform that influences investment decisions and market perceptions worldwide. The reasons behind this exclusion and the efforts, if any, to regain membership remain a topic of interest and concern within the global financial community.

Trading Economics assigned South Africa a credit rating of 41, ranking it fourth in Africa, under countries such

as Botswana, Mauritius, and Morocco. South Africa's rating is comparable to that of Namibia and Ivory Coast. At the start of 2023, South Africa saw its credit rating outlook shift from positive to stable, according to S&P Global, 2023, a prominent financial information provider. This adjustment was primarily attributed to the persistent issue of load shedding that plagued most of 2023. This downgrade occurred despite signs of economic recovery observed in the middle of 2022.

In Fitch's credit rating evaluation, Fitch has linked South Africa's diminished GDP, load shedding and infrastructure failures, to its low credit rating. It's worth noting that Fitch has classified South Africa's credit rating as "stable," which aligns with the rating assigned by S&P Global. South Africa's credit rating, as assessed by Fitch, Moody's, S&P Global, and DBRS, currently falls within the uppermost category of Speculative Grade, which is the level below Investment Grade. This indicates that there has been some progress after the previous downgrades, but South Africa's credit rating still carries higher risk compared to investment-grade nations. The country's overall rating is currently stable, indicating a neutral position in terms of its economic and financial outlook.

In terms of direct impacts on the construction of the proposed project, is that of currency fluctuations. With an unstable local currency, there may be unexpected and unplanned costs involved when importing technology for the project. The development and utilisation of local supply chains could go a long way in minimising the risks associated with currency fluctuations.

12.2.3 Assessment of Business Confidence Level in South Africa

The South African Chamber of Commerce and Industry (SACCI) Business Confidence Index (BCI) increased by 1,1 index points from an average of 108,5 index points in 2021 to 109,6 index points in 2022. However, the business confidence gained strong momentum towards the end of 2022 with the BCI improving from an average of 108.6 in the 1st half of 2022 to 110.7 in the 2nd half of 2022.This was followed by an increase in BCI to 112.9 in January 2023.

In the period between December 2022 and January 2023, eight out of the fourteen sub-indices comprising the BCI exerted a favourable influence on it when analysed on a month-to-month basis. Notable among these contributing sub-indices were heightened levels of merchandise imports, an increase in tourist arrivals, improved real retail sales, particularly during the Black Friday period, and a rise in stock prices. These specific indicators played a significant role in driving up the BCI in January 2023.

Conversely, the energy supply situation, including incidents of electricity blackouts, had an immediate and substantial adverse impact on business confidence in January 2023. However, there was some relief in the form of lower fuel costs, although they remained relatively high, with a 23% increase compared to the previous year. The delayed repercussions of electricity load shedding are a source of significant concern for other sectors of the economy and overall business confidence.

The following indicators should be taken into consideration when analysing the business environment as they negatively contributed to the BCI:

- Energy Supply
- Exports
- Retail Sales
- Inflation
- Real financing cost
- Rand exchange rate

The further development of RE would likely lead to improved supply of electricity for the development of the economy. This is likely to improve business confidence in the country as sustainable energy supply is one of the key concerns of business moving forward. International investors have also noted, with concern, that the lack of availability of a consistent energy system does not lend itself to growth of Foreign Direct Investment (FDI). The development of RE systems is seen by local and foreign business owners as the future of energy generation and may increase business confidence both locally and internationally.

12.2.4 Agricultural price increases

Fuel and diesel are commonly used for tillage, harvesting, machinery and transportation, making them a critical component for both small-scale and commercial farmers, as well as the entire agricultural value chain. According to van Wyk. the ongoing increase in fuel costs is adversely affecting the agricultural industry. Diesel has become the second highest expenditure for grain farmers, following fertilizer. In a nation where maize is a crucial food source, the surge in diesel prices will also impact poor communities.

As reported by Farmers Weekly, diesel prices surged by R8,29 per litre (R/l) from November 2021 to November 2022. This increase in diesel costs is noteworthy, especially considering that on average, diesel accounts for approximately 14% of a farmer's overall production expenses. Currently, diesel costs R23,06/l, marking a R1,78 decrease since its peak prices witnessed in 2022. According to the Agriculture Portal, in 2021, grain farmers had an average diesel expenditure of R1 031 per ha. However, this cost escalated to R1 529 per ha by the end of 2022.

Increasing expenses in inputs, including elevated costs of fuel, labour, fertilizers, energy, and agrochemicals, are putting pressure on producers in the field crops and horticulture sectors. There have been calls for intervention to address this issue. In the case of direct input products like glyphosate, atrazine, and metolachlor, their prices rose by 99%, 33%, and 32% respectively in 2021. This upward trend also applies to major fertilizers such as ammonium nitrate, urea, and potassium chloride, which saw price increases of 107%, 58%, and 125% respectively..

These increases in input costs continuously put pressure on farmers on a daily basis. It is worth mentioning that the proposed development could help diversify the landowner’s income, potentially helping to counter these escalating costs.

13. MOTIVATION FOR THE PREFERRED SITE, ACTIVITY AND TECHNOLOGY ALTERNATIVE

The layout included in this BAR has been refined based on specialist findings and a final proposed layout has been compiled for approval. The final proposed layout, preferred development footprint, that is being put forward is the most feasible layout configuration.

All no-go areas identified to date by the specialists as indicated in the sensitivity mapping below have been taken into account and the development area and supporting infrastructure shifted where necessary to inform the proposed development layout for the SEF. All PV and associated infrastructure have been placed within buildable areas that have been determined. Refer to **Figure 13-1** to **Figure 13-3** for the PV and supporting infrastructure layout including identified sensitivities.

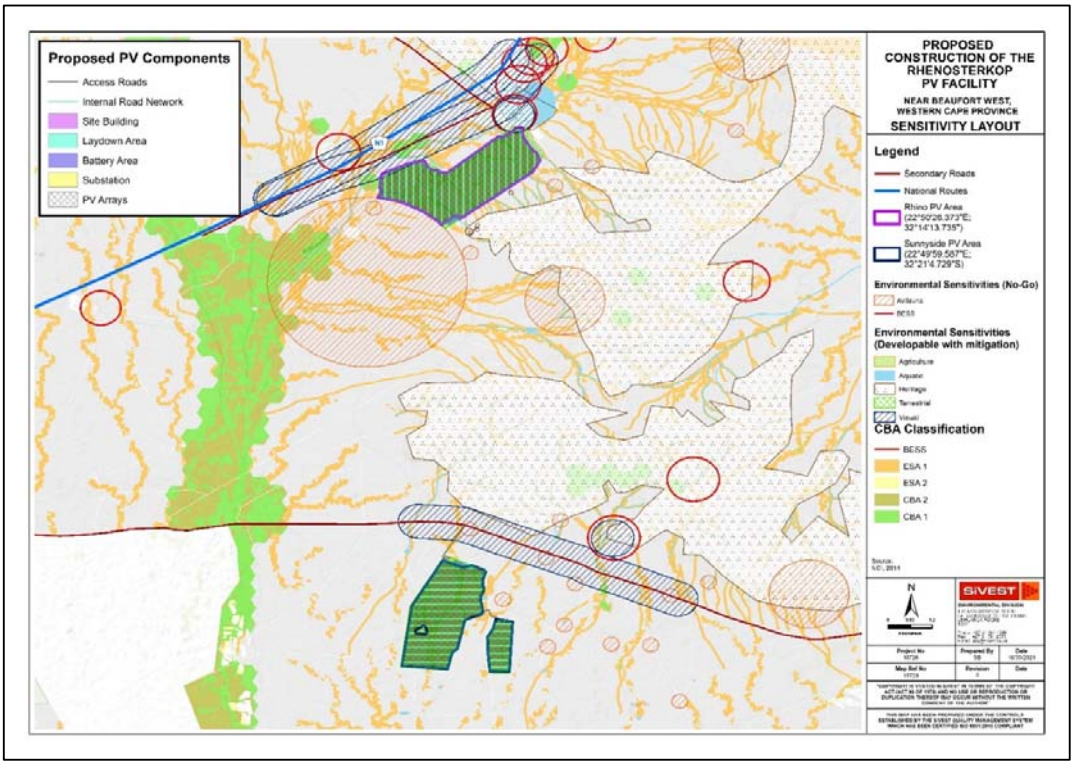

Figure 13-1: Proposed layout/ development footprint with site sensitivities

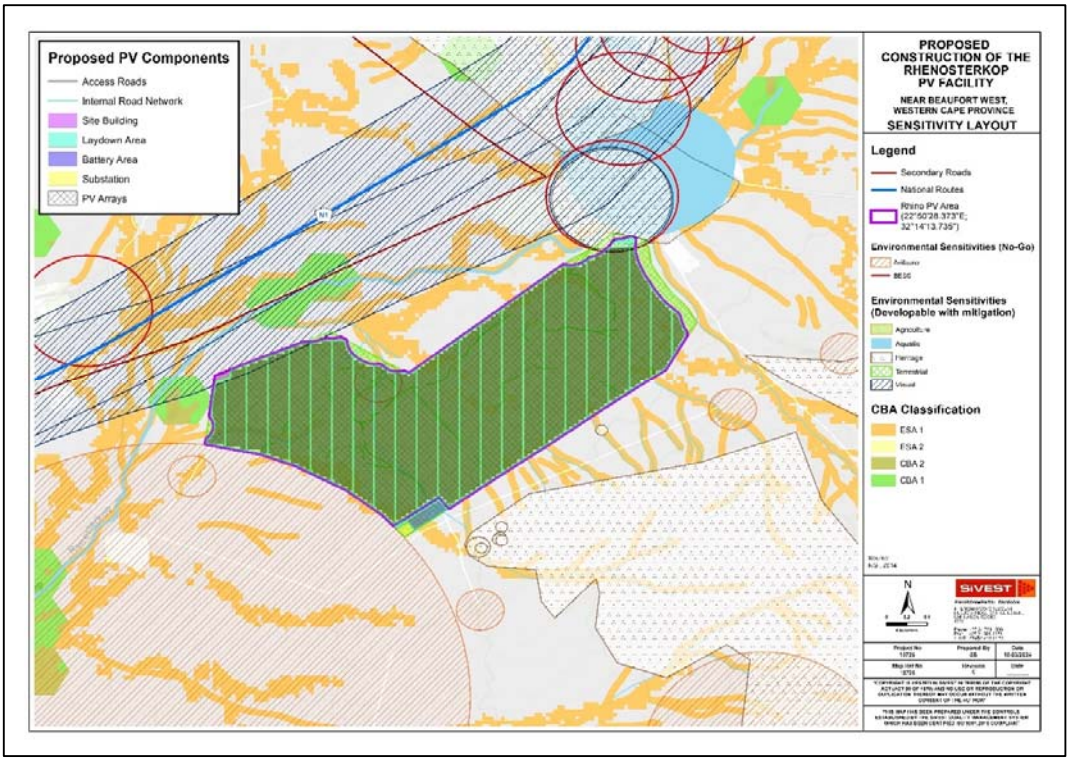

Figure 13-2: Proposed Rhino layout/ development footprint with site sensitivities

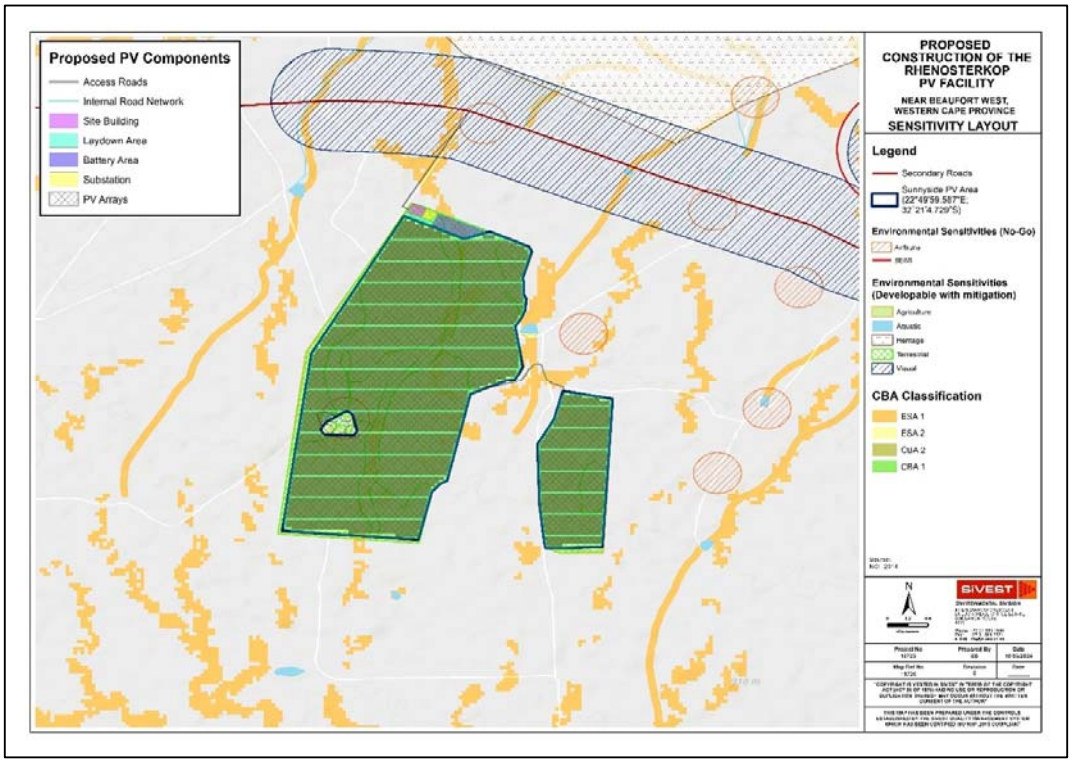

Figure 13-3: Proposed Sunnyside layout/ development footprint with site sensitivities

The following updates have been made to the proposed development layout after specialist input:

- All buildable areas/ panels are located outside of the no-go areas identified by specialists (all no-go areas are inclusive of the buffers imposed by the various specialists).
- All buildable areas/ panels are located outside of watercourses.
- The substation, O&M Building and construction laydown areas have been placed in areas deemed acceptable by the specialists.
- Some associated roads and cables do cross drainage lines in some instances, however existing crossings have been used as far as possible. Specialist recommendations and mitigations will be applied in areas where crossing of drainage lines / watercourses is required.

The proposed solar PV facility forms part of a larger proposed renewable energy development which includes both solar and wind energy facilities. Currently, there are two SEF clusters proposed, Rhino and Sunnyside. The wind energy facility (WEF) is being considered of which a small portion extends into Farm Rhenosterkop 155 and Farm 400. It should be noted that this BA *only* covers the Rhino and Sunnyside SEF.

An Environmental Site Establishment (ESE) process was undertaken from September 2022 to January 2023 to screen the greater project site from an environmental and social perspective. The aim of the ESE was to define the scope of the BA phase of the project.

Originally, for the solar PV facility, the farm Rhenosterkop 155 was identified as most suitable from a topographic, local, and environmental perspective. However, due to an avifauna (Martial Eagle) perspective no-development buffer, the development area was reduced significantly. Furthermore, the landowner did not support solar PV facility development on some sections of the property due to (a) agriculture preference, and

(b) the development's potential visual impact as the development would be within direct view of the guest house existing in the farm.

To ensure that the project remains feasible, alternative sites were identified to compensate for the 'lost' capacity. The landowners were consulted, and due to the discussions undertaken, agreed to the solar PV facility development under certain conditions.

Development proposed on Farm 400 needed to be located to the southwest of the property so that it is not visible from the farmstead. A layout was then developed and discussed with the landowner which was agreed upon Presented with the proposed development area, the landowner noted their support of the development, and that development would be within an area that is not preferred by sheep for grazing that always migrate back to the preferred areas (green polygon) as shown in **Figure 13-4**.

For Farm Rhenosterkop 155, the development footprint was reduced to what is shown in **Figure 13-5** below. The layouts consider the ESE results, and the landowner's comments and recommendations.

Other alternative locations were identified and assessed from a development perspective. The alternative locations, including surrounding farms, are less desirable to develop due to increased distance from the cluster. From a financial and environmental perspective, the development of other properties would also require additional servitudes that may not be feasible from a cost perspective.

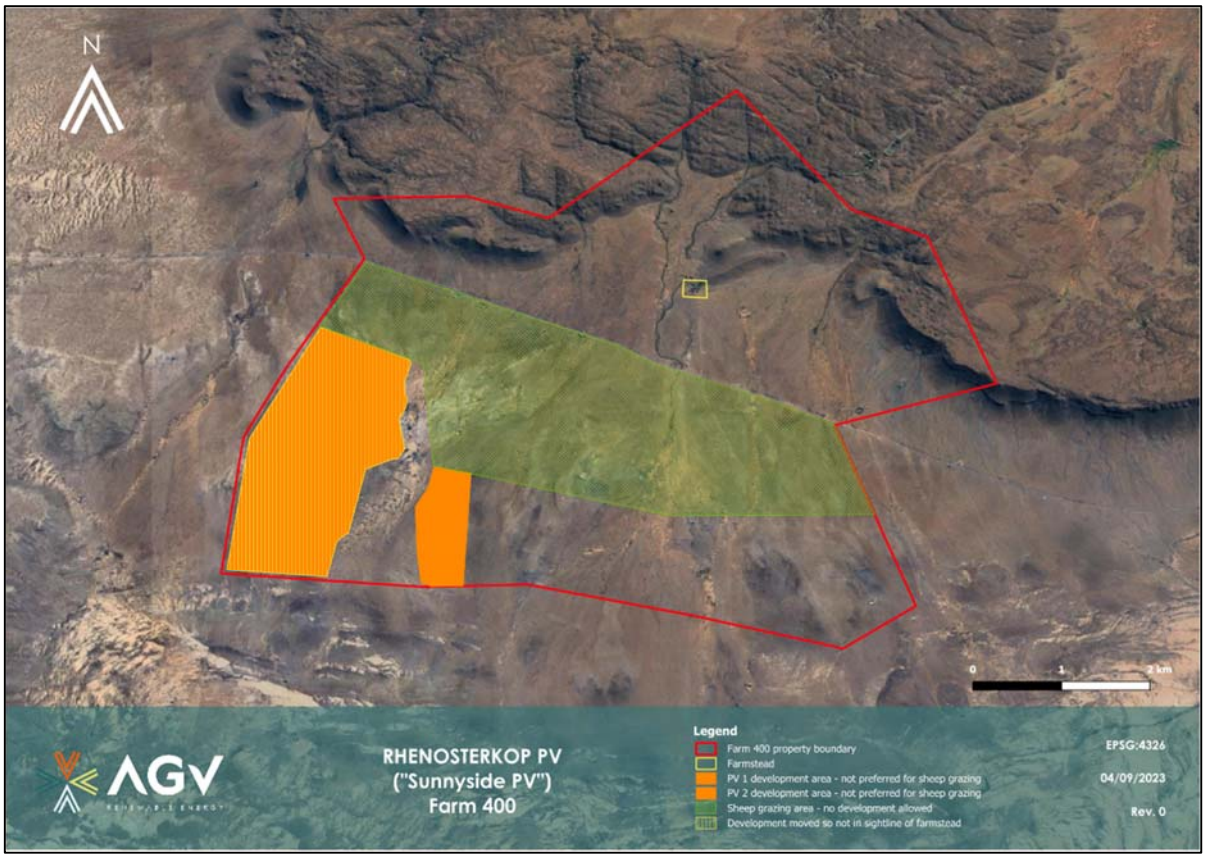

Figure 13-4: Sunnyside, original development area (green) versus agreed upon development area (orange)

The specialist constraints were considered in developing the proposed design and layout. This exercise also fed into the constraints mapping to identify the most suitable areas for the development of a solar PV facility which is envisaged to result in the least environmental and social impact.

In considering the specialist limitations identified in the screening phase, three no-go areas have been identified and excluded from the proposed development as restricted areas are not suitable for the installation of PV modules. The final available land area covers 1 080.15 ha.

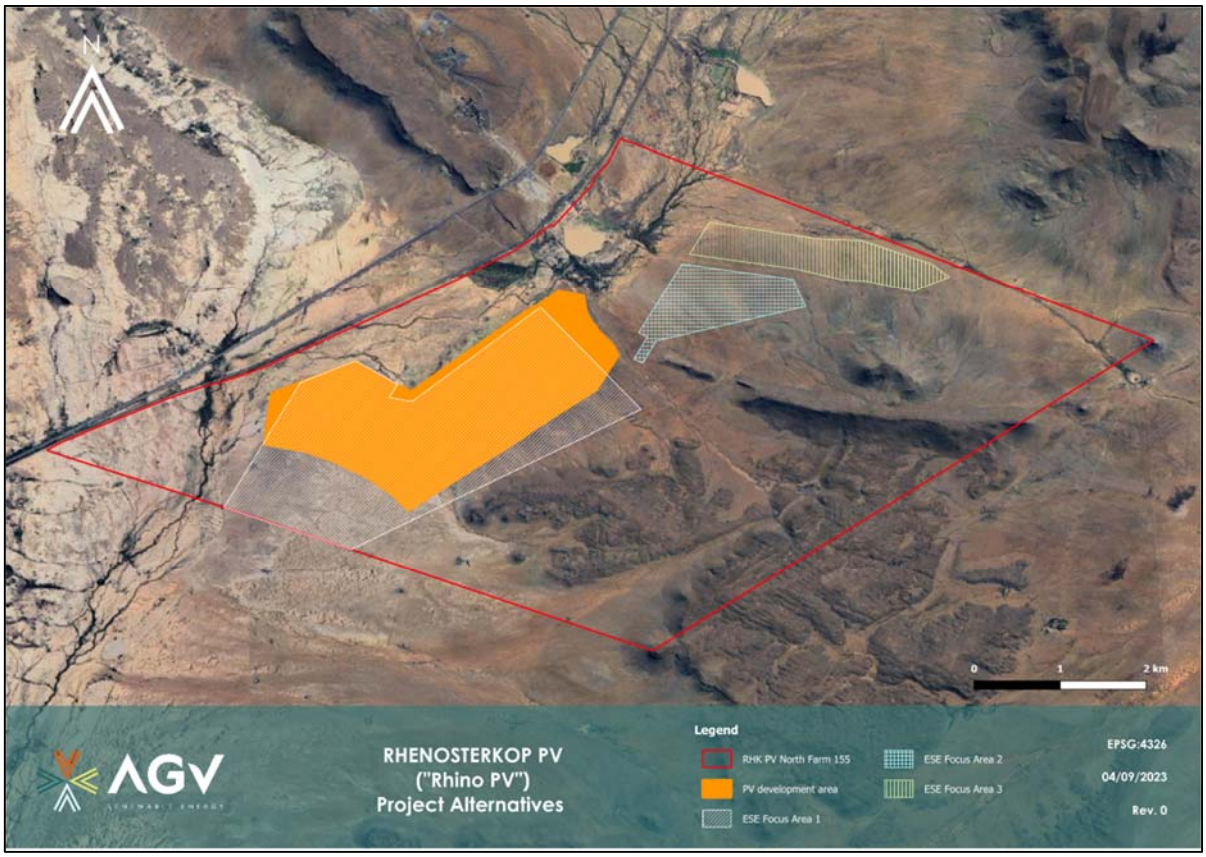

Figure 13-5: Rhino, original development area (white, blue and green) versus agreed upon development area (orange)

The mitigation hierarchy was followed to determine the preferred development footprint as per the following approach:

- Avoidance – All no-go areas have been avoided.
- Minimisation – The panels and infrastructure are located in areas that have been deemed acceptable by the specialists. Any residual impacts will be minimised as far as possible in accordance with the approved EMPr.
- Restoration – Where possible, disturbed areas will be rehabilitated.
- Offset – At this stage, none of the specialists have recommended that offsets be implemented.

The proposed final layout has, therefore, considered the sensitivities identified throughout the process and has informed the final proposed development footprint and layout put forward for authorisation. The mitigation

hierarchy has been followed in that the avoidance of all no-go areas has been implemented from project onset. The layout was designed as an iterative process in conjunction with a specialist team to avoid impacts as far as possible. All residual impacts will be minimized as far as possible in accordance with a well-designed layout as well as an EMPr.

No fatal flaws have been identified by any of the specialists and all impacts can be mitigated to acceptable levels. During the construction phase, almost all of the post-mitigation scores are low, with the exception of the terrestrial ecological as well as avifaunal impact of vegetation clearing/habitat loss which scored a negative medium impact post mitigation. In terms of terms of job creation and economic opportunities, a positive medium rating was identified from a social perspective during the construction phase.

14. DETAILS OF PROCESS FOLLOWED TO REACH THE PREFERRED OPTION

14.1 Details of Alternatives

As per Chapter 1 of the EIA Regulations, feasible and reasonable alternatives are required to be considered during the BA process. Alternatives are defined as "*different means of meeting the general purpose and requirements of the activity*". These alternatives may include the:

- property on which or location where it is proposed to undertake the activity;
- type of activity to be undertaken;
- design or layout of the activity;
- technology to be used in the activity;
- operational aspects of the activity; and
- option of not implementing the activity.

Each of these alternatives are discussed in relation to the proposed development in the sections to follow.

14.1.1 Location/ Site Alternatives

Originally, for the solar PV facility, the farm Rhenosterkop 155 was identified as most suitable from a topographic, local, and environmental perspective. However, due to an avifauna (Martial Eagle) perspective no-development buffer, the development area was reduced significantly. Furthermore, the landowner did not support solar PV facility development on some sections of the property due to (a) agriculture preference, and (b) the development's potential visual impact as the development would be within direct view of the guest house existing in the farm.

To ensure that the project remains feasible, alternative sites were identified to compensate for the 'lost' capacity. The landowners were consulted, and due to the discussions undertaken, agreed to the solar PV facility development under certain conditions.

Development proposed on Farm 400 needed to be located to the southwest of the property so that it is not visible from the farmstead. A layout was then developed and discussed with the landowner which was agreed upon. Presented with the proposed development area, the landowner noted their support of the development, and that development would be within an area that is not preferred by sheep for grazing that always migrate back to the preferred areas (green polygon) as shown in **Figure 13-4**.

For Farm Rhenosterkop 155, the development footprint was reduced to what is shown in **Figure 13-5**. The

layouts consider the ESE results, and the landowner's comments and recommendations.

Other alternative locations were identified and assessed from a development perspective. The alternative locations, including surrounding farms, are less desirable to develop due to increased distance from the cluster. From a financial and environmental perspective, the development of other properties would also require additional servitudes that may not be feasible from a cost perspective.

Considering the above, no further alternatives have been considered for the proposed solar PV facility. RE development in South Africa is highly desirable from a social, environmental and development point of view and a solar energy installation is more suitable for the site due to the high solar resource.

14.1.2 The type of activity to be undertaken

No other activity alternatives have been considered. RE developments in South Africa are highly desirable from a social, environmental and development perspectives respectively. The solar resource in this area along with the rapid advancements in solar energy technology efficiency serves as further motivations for the proposed development.

South Africa is under immense pressure to provide clean sources of electricity generating capacity in order to reduce the current electricity demand from aging and polluting coal-fired power stations. With the global focus on climate change, the government is under severe pressure to explore alternative energy sources in addition to coal-fired power stations. Although solar energy is not the only solution to solving the energy crisis in South Africa, it is a suitable sustainable solution to the energy crisis and this project could contribute to addressing the problem. This project will thus aid in achieving South Africa's goals in terms of sustainability, energy security, mitigating energy cost risks, local economic development and national job creation.

14.1.3 The technology to be used in the activity

The solar resource in this area advocates for the use of solar PV technology in order to generate energy (refer **Section 12**). Advancements in solar PV technology presents a renewable and sustainable way for countries like South Africa to generate low cost energy from a natural resource.

14.1.4 Design or Layout of the Activity

The specialist constraints were considered in developing the proposed design and layout. This exercise also fed into the constraints mapping to identify the most suitable areas for the development of a solar PV facility which is envisaged to result in the least environmental and social impact.

In considering the specialist limitations identified in the screening phase, three no-go areas have been identified and excluded from the proposed development as restricted areas are not suitable for the installation of PV modules. The final available land area covers 1 080.15 ha.

The proposed final layout has, therefore, considered the sensitivities identified throughout the process and has informed the final proposed development footprint and layout put forward for authorisation. The mitigation hierarchy has been followed in that the avoidance of all no-go areas has been implemented from project onset. The layout was designed as an iterative process in conjunction with a specialist team to avoid impacts as far as possible. All residual impacts will be minimized as far as possible in accordance with a well-designed layout as well as an EMPr.

14.1.5Comparative Assessment of Alternatives

Full site layout alternatives were not comparatively assessed, but rather a single layout was refined as additional information became available throughout the BA process (e.g., specialist input, additional site surveys, and ongoing stakeholder engagement) and is based on an avoidance approach. As a result, the layout provided was updated and assessed in the BA process.

14.1.6No – Go Option

The option of not implementing the activity, or the "no-go" alternative, has been investigated in the BA process, noting that the property does hold existing development rights (i.e., Agriculture) and so, not developing the proposed development does not necessarily mean that there would be no changes or impacts on the site. South Africa is under immense pressure to provide clean sources of electricity generating capacity in order to reduce the current electricity demand from aging and polluting coal-fired power stations. With the global focus on climate change, the government is under severe pressure to explore alternative energy sources in addition to coal-fired power stations. Although solar energy is not the only solution to solving the energy crisis in South Africa, not establishing the proposed SEF and associated infrastructure would be detrimental to the mandate that the government has set to promote the implementation of renewable energy. It is a suitable sustainable solution to the energy crisis and this project could contribute to addressing the problem. This project will thus aid in achieving South Africa's goals in terms of sustainability, energy security, mitigating energy cost risks, local economic development and national job creation.

The no-go alternative assumes that the proposed project will not go ahead i.e. it is the option of not developing the proposed Rhino and Sunnyside PV. This alternative would result in no environmental, social or economic impacts (positive or negative) from the proposed project on the site or surrounding local area.

The following implications could occur if the no-go alternative is implemented (i.e. the proposed project does not proceed):

- **Agricultural** - The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. There are no agricultural impacts of the no-go alternative. Even though the impacted land has insufficient agricultural production potential for cropping, and the impact of the development is low, its negative agricultural impact is marginally more significant than that of the no-go alternative, and so from an agricultural impact perspective, the no-go alternative is the preferred alternative. However, the no-go option would prevent the proposed development from contributing to the environmental, social, and economic benefits associated with the development of renewable energy in South Africa.
- **Avifaunal** - The no-go option will result in no additional impacts on avifauna, due to this project. This will result in the ecological status quo being maintained, which will be to the advantage of the avifauna. However, no fatal flaws were identified during the study as the SEF layouts have considered and avoided sensitive habitat that would likely support SCC.
- **Risk** - From a health and safety point of view and ignoring the fact that this project may help to mitigate possible adverse impacts of climate change, the no-go option will always be a preferred option since there are no health and safety risks associated with not doing a project.
- **Socio-Economic** - there will be no impact on the existing environmental baseline and no benefits to the local economy and affected communities. The no go alternative thus bears the opportunity cost of socioeconomic benefits to the local community that will go unrealised. Since the positive effects and impacts of an expanded energy system are expected to outweigh the negative effects, the construction

of the proposed development is preferred over the no go alternative.

- **Traffic** - The site is currently zoned for agricultural land uses. Should the proposed activity not proceed, the site will remain unchanged and will continue to be used for agricultural purposes. The potential opportunity costs in terms of alternative land use income through rental for energy facility and the supporting social and economic development in the area would be lost if the status quo persist.

15. DETAILS OF PUBLIC PARTICIPATION PROCESS UNDERTAKEN

Public participation is the cornerstone of any BA. The principles of the NEMA as well as the EIA Regulations govern the BA process, including PPP. These include provision of sufficient and transparent information on an ongoing basis to stakeholders to allow them to comment, and ensuring the participation of previously disadvantaged people, women and the youth. The documents relating to the PPP have been included in Appendix 5.

15.1 Public Participation Process completed for the Basic Assessment Process

One of the aims of the BA process is to collect the issues, concerns and queries of I&APs. Some of the objectives of the PPP are to:

- Inform the stakeholders about the proposed project and the BA process followed;
- Provide opportunity to all parties to exchange information and express their views and concerns;
- Obtain contributions from stakeholders (including the client, consultants, relevant authorities and the public) and ensure that all issues, concerns and queries raised are fully documented; and
- Evaluate the issues raised and identify the significant issues.

The comment period during the BA process was implemented according to the EIA Regulations as follows:

- A Register of I&APs was compiled, and is continuously updated, which includes affected landowners, adjacent landowners, occupiers of affected and adjacent land, other I&APs, key stakeholders and other surrounding project developers.
- Placement of site notices in English and Afrikaans (as per the EIA Regulations) were placed along the entrance road to the application site and around the site itself on **27 to 28 November 2023** (refer to Appendix 5).
- A Background Information Document was circulated to potential I&APs on **20 December 2023**.
- Issuing of the notifications and initial landowner consultation (circulated to potential I&APs and the local area in general). Proof is appended (Appendix 5).
- Public notification of the Draft BAR process was advertised in a local newspaper, namely **Die Courier** on **09 February 2024** as required according to Regulation 41(2)(c) of the EIA Regulations. Proof of advertisement will be included in this Final BAR. PPP is running from **14 February to 15 March 2024**.
- Notification letters were sent via e-mail or sms (where cell phone number/ email address was available) from **14 February 2024** regarding the Draft BAR (these will be appended to the Final BAR).
- All comments received from I&APs and the responses thereto were included in the CRR and Final BAR, which is submitted to DFFE for review and decision-making.
- The CRR was included in the Final BAR, which recorded the date that issues were raised, each issue, and the response of the team to address the issue.
- Registered I&APs will be notified via email, sms or fax after having received written notice from DFFE on the final decision of the application. These notifications will include the process required to lodge an

appeal, as well as the prescribed timeframes in which documentation should be submitted.

Availability of Draft Basic Report for Review:

- The Draft BAR was made available on SiVEST's website for download.
- Electronic copies were made available to parties via a secure digital link, upon request.
- CDs/ Flash drive were made available upon request.
- The Draft BAR was located and available for review at the Beaufort West Library, 15 Church Street, Beaufort West in the Western Cape Province.

Summary of issues raised:

Issues, comments and concerns raised during the PPP were captured in a CRR. The CRR provides the comments received and issues raised by I&APs and key stakeholders, as well as the responses provided. This information has been used/ fed into the evaluation of environmental and social impacts and has also been taken into consideration on compilation of this report. All comments received to date were included in the CRR.

16. IMPACT ASSESSMENT

16.1 Environmental Impact Assessment

The potential impacts for the identified environmental aspects have been assessed as per the methodology provided attached (**Appendix 9**) and mitigation measures identified below (refer to **Appendix 7** for further impact assessment rating). Except where specifically specified, the potential impacts apply to all the sites.

16.1.1 Planning

None identified.

16.1.2Construction

16.1.2.1 Rhino Solar PV Site

Table 16-1: Construction Potential Impacts

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Agricultural - none identified																				
Avifauna																				
Avifauna	Displacement of priority species due to disturbance associated with construction of the PV plants and associated infrastructure.	2	4	3	3	3	3	45	-	High	• An all-infrastructure exclusion zone should be implemented and maintained within 2.5 km of the identified Martial Eagle nest and within 1 km of the identified Verreaux's Eagle nests to avoid displacement due to disturbance. • A solar panel exclusion zone buffer should be implemented and maintained around all surface water features such as dams and reservoirs (200 m), as well as non-perennial drainage lines and associated herbaceous wetlands (150 m). • Activity should, as far as possible, be restricted to the footprint of the infrastructure. • Measures to control noise and dust should be applied according to current best practice in the industry. • The construction of new roads should be kept to a minimum as far as practical and maximum use should be made of existing access roads. • Access to the rest of the property must be restricted. • The recommendations of the Terrestrial Ecology specialist study must be strictly implemented, especially as far as limitation of the construction footprint is concerned.	1	4	2	3	1	2	22	-	Low
Geotechnical																				
Disturbance/ displacement/ removal of soil and rock	Ground disturbance during access road construction, foundation earthworks, platform earthworks	1	4	2	2	3	1	12	-	Low	• Design access roads and post locations to minimise earthworks and levelling based on high resolution ground contour information • Correct topsoil and spoil management	1	4	2	1	2	1	10	-	Low
Soil Erosion	Increased erosion due to vegetation clearing, alteration of natural drainage	1	3	2	2	3	1	11	-	Low	• Avoid development in preferential drainage paths • Appropriate engineering design of road drainage and watercourse crossings • Temporary berms and drainage channels to divert surface runoff where needed • Landscape and rehabilitate disturbed areas timeously (e.g. regressing) • Use designated access and laydown areas only to minimise disturbance to surrounding areas	1	2	1	1	2	1	7	-	Low
Heritage																				
Impacts to archaeological heritage resources	Construction activities that take place near to archaeological resources may result in their destruction	1	1	4	4	4	1	14	-	Low	• Should any previously unknown archaeological resources be impacted during construction, work must cease in the vicinity of the find and the relevant heritage authority must be contacted	1	1	4	4	4	1	14	-	Low
Impacts to palaeontological resources	Construction activities that take place near to palaeontological resources may result in their destruction	1	2	4	4	4	1	15	-	Low	• Implementation of the Chance Fossil • Finds Protocol	1	2	4	4	4	1	15	-	Low
Socio-economic																				
Increase in production	Expenditure associated with the construction of the proposed development will impact the production of the local economy.	3	4	3	1	1	4	48	+	High	• The project developer should use locally sourced products where feasible in order to maximize the benefit to the local economy. • Sub-contracting of local construction companies is encouraged as far as possible for the construction of facilities.	3	4	3	2	1	4	52	+	High
Increase on GDP	Temporary increase in country's GDP due to capital expenditure during the construction period	3	4	3	1	1	4	48	+	High	• The project developer is to use locally sourced inputs where feasible in order to maximize the benefit to the economy.	3	4	3	2	1	4	52	+	High

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Increase in Employment	The construction of the proposed development will positively impact the community and beyond by creating a number of job opportunities (albeit temporary).	3	4	2	1	1	4	44	+	High	• Organise local community meetings by appointing a Community Liaison Officer (CLO) to advise the local labour on the project that is planned to be established and the jobs that can potentially be applied for. • Where feasible, effort must be made to employ locally in order to create maximum benefit for the communities.	3	4	3	1	1	4	48	+	High
Skills development	Employees will develop and enhance skills thereby increasing experience and knowledge.	3	4	2	1	3	3	39	+	Medium	• In order to maximise the positive impact, it is suggested that the project company provide training courses for employees where feasible to ensure that employees gain as much as possible from the work experience. • Facilitate the transfer of knowledge between experienced employees and the staff. • Perform a skills audit to determine the potential skills that could be sourced in the area.	3	4	2	2	3	3	42	+	Medium
Increase in household earnings	Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	3	4	3	1	1	4	48	+	High	• Local employment will benefit local households and the local area.	3	4	4	1	1	4	52	+	High
Increase in government revenue	The investment in the facility will generate revenue for the government during the construction period through a combination of personal income tax, VAT, companies' tax etc.	2	4	3	2	2	3	39	+	Medium	N/A	2	4	3	2	2	3	39	+	Medium
Sense of place	Negative impact on sense of place (noise, dust and visual) for farmers where construction activities will take place	1	4	3	3	1	3	36	-	Medium	• Install screens around the construction site to reduce the visual impact of construction on surrounding properties • Site watering (or use of appropriate dust suppressant) from time to time to reduce dust emitting from the construction site • Also refer to visual specialist report for mitigation measures.	1	4	3	2	1	3	33	-	Medium
Safety and Security	Farmers might feel that the increase of accessibility will increase theft in the area	1	3	3	3	1	3	33	-	Medium	• Ensure proper 24/7 security is patrolling the construction sites, as well as controlled access	1	2	3	3	1	2	20	-	Low
Impact on agricultural operations	Loss of agricultural space	1	3	2	2	1	4	36	-	Medium	• Construct the solar panels and associated infrastructure on parts where the least arable land will be affected	1	3	3	3	1	3	33	-	Medium
Impacts on economic and social infrastructure	An increase in traffic due to construction vehicles and heavy vehicles could create short-term disruptions and safety hazards for current road users.	3	3	2	2	1	3	33	-	Medium	• It is encouraged that the contractor (and/or subcontractors) to provide transportation for workers to and from the site to reduce potential congestion in proximity to the site • Transportation contractors must adhere to the road rules and regulations • Utilise only designated access routes and entrance/ exits from the site • Implement appropriate signage and road safety measures at entrance/ exit to the site and on site	3	3	2	2	1	2	22	-	Low
Terrestrial Biodiversity																				
Habitat loss: the loss of natural habitat and SCC due to vegetation clearing	Habitat destruction, ecosystem fragmentation, habitat degradation	1	4	2	1	3	3	33	-	Medium	• All vegetation will be cleared for the development of the solar PV facility. • No sensitive areas containing SCC floral species were identified on site • Vegetation removal to be limited to the smallest possible footprint • Where possible use existing road infrastructure, additional road infrastructure to minimised (e.g., single road access) • An independent suitably qualified scientist is to be appointed as Environmental Control Officer (ECO) to oversee works. • Should any SCC be found on site these must be relocated to suitable habitat in the nearby environment	1	2	1	1	2	2	14	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Changes in soil characteristics: Vegetation clearing through the use of heavy machinery and increased vehicle movement	Exposure of soil to wind and rain could result in erosion and sedimentation into neighbouring habitat, leading to changes in habitat characteristics and modified habitats.	2	3	2	1	3	2	22	-	Low	• No stormwater management is being implemented on site. Due to the general nature of habitat within the site (low growing karoo scrub), this should be allowed to re-establish following the construction of the solar PV facility. This will allow for the stabilisation of soils. • Bulk of vegetation clearing and earthworks to be completed at the end of the dry season to reduce erosion from water runoff. • In PV areas, compacted soil to be ripped and tilled following construction to allow the regeneration of habitat.	1	2	2	1	2	1	8	-	Low
Faunal and floral mortality: increased vehicle access and increased construction personnel	Increase in construction personnel to the project site and heavy vehicle movement leading to increased poaching of animals or medicinal plants or destruction of protected species	1	2	4	1	1	2	18	-	Low	• An independent suitably qualified scientist to be appointed as ECO to oversee works especially when working in and around the site. • Implementation and enforcement of strict speed limits. • Working at night should be avoided. • Following construction, the site must be cleared of all possible polluting materials and all temporary structures must be removed and responsibly disposed of. • This must include environmental education on the "No Access" and sensitive areas as well as protected species. • No harvesting of plants, plant material, animal or surface water may be allowed.	1	1	4	1	1	2	16	-	Low
Increased noise: Construction of the solar PV facility	Increased noise during construction may affect behaviour and distribution of fauna	2	3	1	1	1	1	8	-	Low	• Noise generating activities will only take place during the construction phase • Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. • Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. • Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised; • The use of vehicle horns should be minimized where possible. • Restrict construction and operational activity to daylight working hours.	1	2	1	1	1	1	6	-	Low
Establishment, spread and propagation of AIP: Construction of the PV facility	Activities related to the construction of the solar PV facility can cause the spread and establishment of AIP	2	4	2	1	3	2	24	-	Medium	• An effective Alien Invasive Awareness and Management Programme should be established, focusing on the identification and removal of pervasive invasive species. • AIP material should be removed from the site to reduce the potential for re-establishment. • Ongoing management as part of the alien invasive management programme. • The Alien Invasive Management Plan will need to be applied broadly to the entire footprint to effectively reduce AIP and prevent their recolonisation of cleared areas.	1	2	2	1	3	1	9	-	Low
Soil contamination: Spillages and Leakage of harmful substances from heavy machinery and vehicle movement	Heavy machinery can result in spillages of harmful substances and potential contamination of soil with hydrocarbons	1	3	1	1	1	1	7	-	Low	• Vehicles to be adequately maintained and fitted with drip trays when left standing. • It is advisable that spill kits are available on site.	1	1	1	1	1	1	5	-	Low
Impeding faunal movement corridors	Loss of ecological connectivity and faunal movement corridor due to habitat fragmentation from fencing	2	3	1	1	3	2	20	-	Low	• It is foreseen that the entire site will be fenced off. This will isolate the site completely and will prohibit faunal movement through the site. • This can be mitigated by allowing for semi-permeable fencing options along the site borders. • This will maintain the connectivity between the site and adjacent external habitats.	2	2	1	1	3	1	9	-	Low
Transport																				

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Development traffic impact / related noise & dust pollution	Temporary increase in traffic due to construction vehicle trips on the external road network/ increase in noise and dust pollution levels during construction period/ possible damage to road surface of access routes	4	3	1	2	2	2	24	-	Medium	• Stagger component delivery to site; • Reduce the construction period if possible; • Stagger construction phase tasks; • make use of any quarries in the vicinity of the site to decrease the impact of development trips on the external roads; • staff and general trips should occur outside of peak traffic periods as much as possible; • monitor access routes for possible damage to mitigate early on, regular spraying of internal site roads with water.	4	2	1	2	2	1	11	-	Low
Visual																				
Altered Sense of Place and Visual Intrusion caused by Construction Activities	Dust generated during construction will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the construction site, during the construction period.	2	4	1	1	1	3	27	-	Medium	• Limit vegetation clearance and the footprint of construction to what is absolutely essential. • Consolidate the footprint of the construction camp to a functional minimum. • Avoid excavation, handling and transport of materials which may generate dust under very windy conditions. • Keep stockpiled aggregate and sand covered to minimise dust generation. • Keep construction site tidy.	2	3	1	1	1	2	16	-	Low
Risk																				
SSLB Energy Storage Systems																				
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Construction materials such as cement, paints, solvents, welding fumes, truck fumes etc. Consequences - Employee / contractor illness.	3	1	3		4	4	44	-	High	• The construction phase will be managed according to all the requirements of the OHSA specifically the Construction Regulations. • SHEQ policy in place. A detailed construction Risk Assessment prior to work. • SHE procedure in place. PPE to be specified. SHE appointees in place. • Contractor's safety files in place and up to date. All necessary health controls/ practices to be in place, e.g., ventilation of welding and painting areas. • SHE monitoring and reporting programs in place. • Emergency response plan to be in place prior to beginning construction and to include aspects such as appointment of emergency controller, provision of first aid, first responder contact numbers.	1	1	3		4	2	18	-	Low
Human Health - exposure to noise	Causes - Drilling, piling, generators, air compressors. Consequences - Adverse impact on hearing of workers. Possible nuisance factor in near-by areas.	3	1	5		5	4	56	-	High	• Health Risk Assessment to determine if equipment noise exceeds 85 decibel (dB) at workstation and 61 dB at boundary of the site. • OHSA Noise Induced hearing Loss Regulations Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.	2	1	5		5	2	26	-	Medium
Impact 3: Human Health - exposure to temperature extremes and/or humidity	Causes - Heat during the day. Cold in winter. Consequence - Heat stroke. Hypothermia.	3	2	3		1	2	18	-	Low	• Construction site facilities to comply with OHSA specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. • Adequate potable water for employees to be provided during all phases of the project. • Borehole, bowser and tank or small water treatment plant may be required to provide potable water for the BESS installation staff during all phases of the project.	2	2	3		1	1	8	-	Low
Human Health - exposure to psychological stress	Causes - Large projects bring many contractor workers into a small, isolated community. Consequences – Lack of sufficient accommodation, entertainment, etc. Increase in alcohol abuse, violence	2	3	3		2	2	20	-	Low	• Refer to Social Specialist Study for this project.	2	3	3		2	2	20	-	Low
Human Health - exposure to ergonomic stress	Causes - Lifting heavy equipment. Awkward angles during construction. Consequences - Back and other injuries.	4	1	3		2	3	30	-	Medium	• Training in lifting techniques. • Ensure that despite the isolated location all the necessary equipment is available (and well maintained) during construction. • Otherwise employees may revert to unsafe practices.	4	1	3		2	2	20	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
											• Isolated location, maintenance of construction equipment to ensure safe operation is critical. • Utilization of local service providers where possible. • Ensure this is in place prior to project beginning. • First aid provision on site.									
Human and Equipment Safety - exposure to fire radiation	Causes – Involvement in an external fire. Fire involving fuels used in construction vehicles or vehicles themselves (e.g., tyre fire). Fire due to uncontrolled welding or other hot-work Consequences - Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire.	4	2	3		5	4	56	-	High	• Fuels stored on site in dedicated, demarcated and bunded areas. • Suitable fire-fighting equipment on site near source of fuel, e.g., diesel tank, generators, mess, workshops etc. • The company responsible for the facility at this particular development stage is to have: o Emergency plan to be in place prior to commencement of construction. o Fuel spill containment procedures and equipment to be in place. o Hot-work permit and management system to be in place.	4	2	3		5	2	28	-	Medium
Human and Equipment Safety - exposure to fire radiation	Causes - Solid state battery containers damaged on route e.g., dropped in port (drops do happen about 1/2000 containers) and importing possibly < 30 containers for the site. With this it is possible, although unlikely, that one will be dropped, traffic accident on-route. Involvement in an external fire e.g., at the port or on route. Data indicates installed facility events are 0.001/year. Transport of 700 units per installation assumed to take 4 weeks each so f= 0.05 - once in 20 years so likelihood is moderate. Consequences – Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire (refer to noxious smoke in Appendix A of the Risk Assessment Report for the major impact).	5	2	5		5	4	68	-	High	• Solid state battery design includes abuse tests such as drop test, impact, rapid discharge etc. • Propagation tests for systems, e.g., heat insulating materials between cells/modules. • Factory acceptance test prior to prior to leaving manufacture. • Batteries are usually stored at 50% charge to prolong life but may be shipped fully discharged. • This level of detail should be understood so as to assess the risk during transport and storage. • The company responsible for the battery installation should ensure suitably competent transport companies are appointed. • The company responsible for transportation should ensure: o Compliance with NRTA Regulations Regulation 8 – dangerous goods. o Port Authorities should be alerted to the overall project and the hazardous nature of the contents of battery containers being imported. Note. If, as per one of the typical suppliers (Tesla) indications, the containers are classified as IMDG Class 9 – the containers will not receive any special care in the ports and may be stored next to flammables. o Port emergency response in particular need training on mitigating battery hazards. o Prior to bringing any containers into the country, the company responsible for the battery installation (possibly via appointed contractors) should ensure that an Emergency response plan is in place for the full route from the ship to the site. o Drivers trained in the hazards of containerized batteries. • The Emergency plan must determine and address: o What gases would be released in a fire and are there inhalation hazards. o Extinguishing has two important elements, put out fire and to provide cooling. o Different approaches may be needed for small fire, e.g., put out, and for large fires, e.g., cool with copious quantities of water. Note inert gases and foam may put out the initial fire but fail to control thermal runaway or to cool the batteries resulting in reignition. o What initial fire extinguishing medium should be used. o Whether there are any secondary gases or residues from use of extinguishers. o If water is appropriate, determine if the system needs outside connections to sprinklers inside the container. o First responders need to know what media to use, especially if water totally unsuitable and if there are no connection points for water etc. o Must the container be left unopened or opened.	5	2	5		5	1	17	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
											o PPE to be specified including possible exposure to chemicals and fumes as well as radiate heat. o Containment of residues/water/damaged equipment. o Suitable safe making and disposal plan for after the event i.e. how do responders deal with partially charged damage units, contaminated surfaces (e.g., HF residues).									
Human and Equipment Safety - exposure to explosion over pressures	Causes - With solid state lithium containers, flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces, static. Consequences - Potential fatalities amongst first responders. Damage to container, transport truck or other nearby items, e.g., other container in the port.	5	4	5		5	3	57	-	High	• During transport this is only likely to happen due to possible inappropriate emergency response, e.g., opening containers when they may be the type that should be left to burn out. • For simplicity one transport route would be preferable. • The route needs to be assessed in terms of responding local services, rest places for drivers, refuelling if required, break down services available etc. • Once an import route has been chosen, e.g., Richards Bay or Durban and along N2/ N3/ N11 etc., then the appointed transport company should ensure key emergency services on route could be given awareness training in battery fire/accident response. • Emergency response planning and training referred to above may be important for key locations such as the mountain passes/ tunnels.	5	4	5		5	1	19	-	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants. Consequences - Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc	4	2	3		2	3	33	-	Medium	• All necessary good hygiene practices to be in place, e.g., provision of toilets, eating areas, infectious disease controls. • Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. • Awareness training for persons on site, safety induction to include animal hazards. • First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. • Due to isolated locations some distance from town, ensure the ability to treat with anti-venom and extreme allergic reactions on site.	3	2	3		2	2	20	-	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes - Damaged solid-state batteries release fumes, leak electrolyte, are completely broken exposing hazardous chemicals. Thermal runaway and hazardous fumes released. Consequences - Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns or lung damage.	4	3	3		5	3	45	-	High	• Appointed transport company to ensure transport in accordance with Regulation 8 of the NRTA Regulations, Dangerous Goods. Not permitted to transport prescribed goods in manner not consistent with the prescriptions, e.g., consignor and consignee responsibilities. Prescription found in SANS 10228/29 and international codes for battery transport etc. • Transport in sealed packages that are kept upright, protected from movement damage etc. Also packaged to ensure no short-circuiting during transport. • Transport to prevent excessive vibration considerations as battery internal may be damaged leading to thermal run-away during commissioning. • Pre-assembled containers will most likely be supplied. • These will be fitted with the necessary protective measures by the supplier considering marine and road transport as well as lifting, setting down etc. • Route selection to consider possible incidents along the way and suitable response, e.g., satellite tracking, mobile communication, 24/7 helpline response. • Standard dangerous goods requirements for Hazmat labels, Trem cards, driver trained in the hazards of the load. Likelihood similar to fire above.	4	3	3		5	2	30	-	Medium
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Causes - Construction moving equipment, heavy loaded, elevated loads, working at heights Consequences - Injury or possibly fatality. Damage to equipment. Delays in starting the project, financial losses	5	1	5		5	4	64	-	High	• The construction phase will be managed according to all the requirements of the OHSA specifically the Construction Regulations. SHEQ policy in place. • A detailed construction Risk Assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractors safety files in place and up to date. • SHE monitoring and reporting programs in place. • Standard construction site rules regarding traffic, reversing sirens, rigging controls, cordoning off excavations etc.	5	1	5		5	1	16	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
											• Civil and building structures to National Building Regulations and building Standards Act, 1977 (Act 103 of 1977) as amended (NBRBSA), SANS 10400 and other relevant codes. • Other constructions such as roads, sewers, etc. also to relevant SANS standards. • All normal procedures for working at heights, hot work permits, confined space entry, cordon off excavations etc. to be in place before construction begins. • Emergency response plan to be in place before construction begins.									
Human and Equipment Safety - exposure to electromagnetic waves	Causes - Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences - Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	5	2	5		5	3	51	-	High	• Standard maintenance of condition of electrical equipment and safe operating instructions. • Ability to shut off power to systems in use on site. • If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. • Lightning strike rate in the study area is high. • Outside work must be stopped during thunderstorms. Lighting conductors may be required for the final installation, to be confirmed during design phase.	5	2	5		5	1	17	-	Low
Environment - emissions to air	Causes - Dust from construction and generally hot dry area. Consequences - Adverse impact on employee health.	3	2	1		1	4	28	-	Medium	• May need to use dampening on roads etc. as per normal construction practices. • May need PPE (dust masks) for specific construction workers.	2	2	1		1	2	12	-	Low
Environment - emissions to water	Causes - Diesel for equipment, paints and solvents. Transformer oil spills. Sewage and kitchen/ mess area wastewater. Consequences – Environmental damage, particularly to the surface and underground water in the area.	2	2	3		2	3	27	-	Medium	• Normal construction site practices for preventing and containing fuels/ paint/ oil, etc. spills. • Bunding under any temporary tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important. • Spill clean-up procedures to be in place before commencing construction. • Sewage and any kitchen liquids - containment and suitable treatment/ disposal.	2	2	3		2	2	18	-	Low
Environment - emissions to earth	Causes - Mess area and other solid waste. Consequences – Environmental damage.	2	2	3		3	3	30	-	Medium	• There will be packaging materials that will need to be disposed of after the entire system is connected and commissioned as well as after regular maintenance. • There will need to be waste segregation (e.g., electronic equipment, chemicals) and management on the site.	2	2	3		2	2	18	-	Low
Environment - waste of resources e.g., water, power etc	Causes - Water usage not controlled. Battery containers damaged. Consequences - Delays.	1	1	1		2	4	20	-	Low	• Water usage to be monitored on site during construction. • Handling protocols to be provided by battery supplier. • End of Life plan needs to be in place before any battery containers enter the country as there may be damaged battery unit from day 1. • Water management plan and spill containment plans to be in place.	1	1	1		2	2	10	-	Low
Public - Aesthetics	Causes - Bright surfaces reflecting light. Tall structures in a flat area. Consequences - Irritation	2	2	3		3	3	30	-	Medium	• Refer to visual impact assessment.	2	2	3		3	3	30	-	Medium
Investors - Financial	Causes - Defective technology. Extreme project delays. Consequences - Financial loss	5	1	3		4	3	39	-	Medium	• Design by experienced contractors using internationally recognized and proven technology. • Project management with deviation monitoring.	3	1	3		4	2	22	-	Low
Employees and investors - Security	Causes - On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees.	4	1	3		2	4	40	-	Medium	• Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. • The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs. • Isolated location both helps and hinders security. Night lighting to be provided both indoors and outdoors where necessary.	3	1	3		2	3	27	-	Medium

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
	Consequences - Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.																			
Emergencies	Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/ structural collapse. Inadequate emergency response to small event leads to escalation. Consequences - Injuries turn to fatalities, small losses become extended down time.	4	2	3		5	4	56	-	High	• Emergency procedures need to be practiced prior to commencement of construction. • If batteries are stored at 50% charge, thermal run away can happen while in storage on site waiting for installation. • In addition, if involved in an external fire thermal run away can happen even with uncharged batteries. • Except during shipping, ideally the units should not be stored any closer to each other than they would be in the final installation so that propagation is prevented, i.e., laydown area needs to be considered. • The company in charge of the containers at each stage in the transport process needs to be very clear so that responsibility for the integrity of the load and protection of the persons involved in transfer and coordination of emergency response on-route. • E.g., if purchased from Tesla where does hand over occur to the South African contractor/ owner, at the factory door in United States of America (USA), at the port in the Republic of South Africa (RSA), at the site fence. • For example, who will be accountable if there's thermal runway event on a truck with a container that stops in a small town for driver refreshments	4	2	3		5	2	28	-	Medium
Investors - Legal	Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences - Unknown hazards manifest due to using "cheaper supplier or less developed technology".	3	1	3		3	4	40	-	Medium	• Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing. • Ensure only state of the art battery systems are used and not old technologies prone to fires/explosions, etc.	2	1	3		3	2	18	-	Low
VRFB Energy Storage Systems																				
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Construction materials such as cement, paints, solvents, welding fumes, truck fumes, etc. Consequences - Employee / contractor illness.	-	1	3		4	4	44	-	High	• The construction phase will be managed according to all the requirements of the OHSA specifically the Construction Regulations. • SHEQ policy in place. • A detailed construction Risk Assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractor's safety files in place and up to date. • All necessary health controls/ practices to be in place, e.g., ventilation of welding and painting areas. • SHE monitoring and reporting programs in place. • Emergency response plan to be in place prior to beginning construction and to include aspects such as appointment of emergency controller, provision of first aid, first responder contact numbers.	1	1	3		4	2	18	-	Low
Human Health - exposure to noise	Causes - Drilling, piling, generators, air compressors. Consequences – Adverse impact on hearing of workers. Possible nuisance factor in near-by areas.	3	1	5		5	4	56	-	High	• Health Risk Assessment to determine if equipment noise exceeds 85 dB at workstation and 61 dB at boundary of the site. • OHSA Noise Induced hearing Loss Regulations. • Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.	2	1	5		5	2	26	-	Medium
Human Health - exposure to temperature extremes and/or humidity	Causes - Heat during the day. Cold in winter. Consequence - Heat stroke. Hypothermia.	3	2	3		1	2	18	-	Low	• Construction site facilities to comply with OHSA specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. • Adequate potable water to be provided during all phases of the project. • Borehole, bowser and tank or small water treatment plant may be required to provide potable water for the employees during all phases of the project.	2	2	3		1	1	8	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I/M	Total	Status (+ or -)	S
Human Health - exposure to psychological stress	Causes - Large projects bring many contractor workers into a small, isolated community. Consequences – Lack of sufficient accommodation, entertainment etc. Increase in alcohol abuse, violence	2	3	3		2	2	20	-	Low	• Refer to Social Specialist Studies for this project.	2	3	3		2	2	20	-	Low
Human Health - exposure to ergonomic stress	Causes - Lifting heavy equipment. Awkward angles during construction. Consequences - Back and other injuries.	4	1	3		2	3	30	-	Medium	• Training in lifting techniques. • Ensure that despite the isolated location all the necessary equipment is available (and well maintained) during construction. • Otherwise employees may revert to unsafe practices. • Isolated location, maintenance of construction equipment to ensure safe operation is critical. • Utilization of local service providers where possible. • Ensure this is in place prior to project beginning. • First aid provision on site.	4	1	3		2	2	20	-	Low
Human and Equipment Safety - exposure to fire radiation	Causes – Involvement in an external fire. Fire involving fuels used in construction vehicles or vehicles themselves (e.g., tyre fire). Fire due to uncontrolled welding or other hot-work Consequences - Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire.	4	2	3		5	4	56	-	High	• Fuels stored on site in dedicated, demarcated and bunded areas. • Suitable fire-fighting equipment on site near source of fuel, e.g., diesel tank, generators, mess, workshops etc.	4	2	3		5	2	28	-	Medium
Human and Equipment Safety - exposure to explosion over pressures	No credible causes	1	1	1		1	1	4	-	N/A	• No credible causes, hence no mitigation necessary.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants. Consequences - Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc	4	2	3		2	3	33	-	Medium	• All necessary good hygiene practices to be in place, e.g., provision of toilets, eating areas, infectious disease controls. • Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. • Awareness training for persons on site, safety induction to include animal hazards. • First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. • Due to isolated locations some distance from town, ensure the ability to treat with anti-venom and extreme allergic reactions on site.	3	2	3		2	2	20	-	Low
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Causes - Construction moving equipment, heavy loaded, elevated loads, working at heights Consequences - Injury or possibly fatality. Damage to equipment. Delays in starting the project, financial losses	5	1	5		5	4	64	-	High	• The construction phase will be managed according to all the requirements of the OHSA specifically the Construction Regulations. • SHEQ policy in place. • A detailed construction Risk Assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractors safety files in place and up to date. • SHE monitoring and reporting programs in place.	5	1	5		5	1	16	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
											• Standard construction site rules regarding traffic, reversing sirens, rigging controls, cordoning off excavations etc. • Civil and building structures to NBRBSA SANS 10400 and other relevant codes. • Other constructions such as roads, sewers, etc. also to relevant SANS standards. • All normal procedures for working at heights, hot work permits, confined space entry, cordon off excavations etc to be in place before construction begins. • Emergency response plan to be in place before construction begins.									
Human and Equipment Safety - exposure to electromagnetic waves	Causes - Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences - Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	5	2	5		5	3	51	-	High	• Standard maintenance of condition of electrical equipment and safe operating instructions. • Ability to shut off power to systems in use on site. • If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. • Lightning strike rate in the study area is high. • Outside work must be stopped during thunderstorms. • Lighting conductors may be required for the final installation, to be confirmed during design phase.	5	2	5		5	1	17	-	Low
Environment - emissions to air	Causes - Dust from construction and generally hot dry area. Consequences - Adverse impact on employee health.	3	2	1		1	4	28	-	Medium	• May need to use dampening on roads etc. as per normal construction practices. • May need PPE (dust masks) for specific construction workers.	2	2	1		1	2	12	-	Low
Environment - emissions to water	Causes - Diesel for equipment, paints and solvents. Transformer oil spills. Sewage and kitchen/mess area wastewater. Consequences - Environmental damage, particularly to the surface and underground water in the area.	2	2	3		2	3	27	-	Medium	• Normal construction site practices for preventing and containing fuels/ paint/ oil, etc. spills. • Bunding under any temporary tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important. • Spill clean-up procedures to be in place before commencing construction. • Sewage and any kitchen liquids - containment and suitable treatment/ disposal.	2	2	3		2	2	18	-	Low
Environment - emissions to earth	Causes - Mess area and other solid waste. Consequences - Environmental damage.	2	2	3		3	3	30	-	Medium	• There will be packaging materials that will need to be disposed of after the entire system is connected and commissioned as well as after regular maintenance. • There will need to be waste segregation (e.g., electronic equipment, chemicals) and management on the site.	1	2	3		3	2	18	-	Low
Environment - waste of resources e.g., water, power etc	Causes - Water usage not controlled. Battery equipment damaged. Consequences - Delays.	1	1	1		2	4	20	-	Low	• Water usage to be monitored on site during construction. • Handling protocols to be provided by battery supplier. • Water management plan and spill containment plans to be in place.	1	1	1		2	2	10	-	Low
Public - Aesthetics	Causes - Bright surfaces reflecting light. Tall structures in a flat area. Consequences - Irritation.	3	2	3		4	4	48	-	High	• Visual impact assessment to include BESS installation when design details become available. • Confirm any height limitations for VRFB BESS building (if utility scale)	1	2	3		4	2	20	-	Low
Investors - Financial	Causes - Defective technology. Extreme project delays. Consequences - Financial loss	5	1	3		4	3	39	-	Medium	• Design by experienced contractors using internationally recognized and proven technology. • Project management with deviation monitoring.	3	1	3		4	2	22	-	Low
Employees and investors - Security	Causes - On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees.	4	1	3		2	4	40	-	Medium	• Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. • The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs. • Isolated location both helps and hinders security. • Night lighting to be provided both indoors and outdoors where necessary.	3	1	3		2	3	27	-	Medium

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
	Consequences - Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.																			
Emergencies	Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/ structural collapse. Inadequate emergency response to small event leads to escalation. Consequences - Injuries turn to fatalities, small losses become extended down time.	4	2	3		4	3	39	-	Medium	• Emergency procedures need to be practiced prior to commencement of construction.	4	2	3		4	2	26	-	Medium
Investors - Legal	Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences - Unknown hazards manifest due to using “cheaper supplier or less developed technology”.	3	1	3		3	4	40	-	Medium	• Use only internationally reputable battery suppliers who comply with all known regulations/ guideline at the time of purchasing. • Ensure only state of the art battery systems are used and not old technologies prone to fires/ explosions, etc.	2	1	3		3	2	18	-	Low

16.1.2.2 Sunnyside Solar PV Site

Table 16-2: Construction Potential Impacts

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ Or -)	S
Agricultural - none identified																				
Avifauna																				
Avifauna	Displacement of priority species due to disturbance associated with construction of the PV plants and associated infrastructure.	2	4	3	3	3	3	45	-	High	• An all-infrastructure exclusion zone should be implemented and maintained within 2.5 km of the identified Martial Eagle nest and within 1 km of the identified Verreaux’s Eagle nests to avoid displacement due to disturbance. • A solar panel exclusion zone buffer should be implemented and maintained around all surface water features such as dams and reservoirs (200 m), as well as non-perennial drainage lines and associated herbaceous wetlands (150 m). • Activity should, as far as possible, be restricted to the footprint of the infrastructure. • Measures to control noise and dust should be applied according to current best practice in the industry. • The construction of new roads should be kept to a minimum as far as practical and maximum use should be made of existing access roads. • Access to the rest of the property must be restricted. • The recommendations of the Terrestrial Ecology specialist study must be strictly implemented, especially as far as limitation of the construction footprint is concerned.	1	4	2	3	1	2	22	-	Low
Geotechnical																				
Disturbance/ displacement/	Ground disturbance during access road construction, foundation earthworks, platform earthworks	1	4	2	2	3	1	12	-	Low	• Design access roads and post locations to minimise earthworks and levelling based on high resolution ground contour information • Correct topsoil and spoil management	1	4	2	1	2	1	10	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ Or -)	S
removal of soil and rock																				
Soil Erosion	Increased erosion due to vegetation clearing, alteration of natural drainage	1	3	2	2	3	1	11	-	Low	• Avoid development in preferential drainage paths • Appropriate engineering design of road drainage and watercourse crossings • Temporary berms and drainage channels to divert surface runoff where needed • Landscape and rehabilitate disturbed areas timeously (e.g. regressing) • Use designated access and laydown areas only to minimise disturbance to surrounding areas	1	2	1	1	2	1	7	-	Low
Heritage																				
Impacts to archaeological heritage resources	Construction activities that take place near to archaeological resources may result in their destruction	1	1	4	4	4	1	14	-	Low	• No development activities within the high archaeological sensitivity area identified • Should any previously unknown archaeological resources be impacted during construction, work must cease in the vicinity of the find and the relevant heritage authority must be contacted	1	1	4	4	4	1	14	-	Low
Impacts to palaeontological resources	Construction activities that take place near to palaeontological resources may result in their destruction	1	2	4	4	4	1	15	-	Low	• Implementation of the Chance Fossil Finds Protocol	1	2	4	4	4	1	15	-	Low
Socio-economic																				
Increase in production	Expenditure associated with the construction of the proposed development will impact the production of the local economy.	3	4	3	1	1	4	48	+	High	• The project developer should use locally sourced products where feasible in order to maximize the benefit to the local economy. • Sub-contracting of local construction companies is encouraged as far as possible for the construction of facilities.	3	4	3	2	1	4	52	+	High
Increase on GDP	Temporary increase in country's GDP due to capital expenditure during the construction period	3	4	3	1	1	4	48	+	High	• The project developer is to use locally sourced inputs where feasible in order to maximize the benefit to the economy.	3	4	3	2	1	4	52	+	High
Increase in Employment	The construction of the proposed development will positively impact the community and beyond by creating a number of job opportunities (albeit temporary).	3	4	2	1	1	4	44	+	High	• Organise local community meetings by appointing a CLO to advise the local labour on the project that is planned to be established and the jobs that can potentially be applied for. • Where feasible, effort must be made to employ locally in order to create maximum benefit for the communities.	3	4	3	1	1	4	48	+	High
Skills development	Employees will develop and enhance skills thereby increasing experience and knowledge.	3	4	2	1	3	3	39	+	Medium	• In order to maximise the positive impact, it is suggested that the project company provide training courses for employees where feasible to ensure that employees gain as much as possible from the work experience. • Facilitate the transfer of knowledge between experienced employees and the staff. Perform a skills audit to determine the potential skills that could be sourced in the area.	3	4	2	2	3	3	42	+	Medium
Increase in household earnings	Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	3	4	3	1	1	4	48	+	High	• Local employment will benefit local households and the local area.	3	4	4	1	1	4	52	+	High
Increase in government revenue	The investment in the facility will generate revenue for the government during the construction period through a combination of personal income tax, VAT, companies' tax etc.	2	4	3	2	2	3	39	+	Medium	• N/A	2	4	3	2	2	3	39	+	Medium
Sense of place	Negative impact on sense of place (noise, dust and visual) for farmers where construction activities will take place	1	4	3	3	1	3	36	-	Medium	• Install screens around the construction site to reduce the visual impact of construction on surrounding properties • Site watering (or use of appropriate dust suppressant) from time to time to reduce dust emitting from the construction site • Also refer to visual specialist report for mitigation measures.	1	4	3	2	1	3	33	-	Medium

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ Or -)	S
Safety and Security	Farmers might feel that the increase of accessibility will increase theft in the area	1	3	3	3	1	3	33	-	Medium	• Ensure proper 24/7 security is patrolling the construction sites, as well as controlled access	1	2	3	3	1	2	20	-	Low
Impact on agricultural operations	Loss of agricultural space	1	3	2	2	1	4	36	-	Medium	• Construct the solar panels and associated infrastructure on parts where the least arable land will be affected	1	3	3	3	1	3	33	-	Medium
Impacts on economic and social infrastructure	An increase in traffic due to construction vehicles and heavy vehicles could create short-term disruptions and safety hazards for current road users.	3	3	2	2	1	3	33	-	Medium	• It is encouraged that the contractor (and/or subcontractors) to provide transportation for workers to and from the site to reduce potential congestion in proximity to the site • Transportation contractors must adhere to the road rules and regulations • Utilise only designated access routes and entrance/ exits from the site • Implement appropriate signage and road safety measures at entrance/ exit to the site and on site	3	3	2	2	1	2	22	-	Low
Terrestrial Biodiversity																				
Habitat loss: the loss of natural habitat and SCC due to vegetation clearing	Habitat destruction, ecosystem fragmentation, habitat degradation	1	4	2	1	3	3	33	-	Medium	• All vegetation will be cleared for the development of the solar PV facility. • No sensitive areas containing SCC floral species were identified on site • Vegetation removal to be limited to the smallest possible footprint • Where possible use existing road infrastructure, additional road infrastructure to minimised (e.g. single road access) • An independent suitably qualified scientist is to be appointed as ECO to oversee works. • Should any SCC be found on site these must be relocated to suitable habitat in the nearby environment	1	2	1	1	2	2	14	-	Low
Changes in soil characteristics: Vegetation clearing through the use of heavy machinery and increased vehicle movement	Exposure of soil to wind and rain could result in erosion and sedimentation into neighbouring habitat, leading to changes in habitat characteristics and modified habitats.	2	3	2	1	3	2	22	-	Low	• No stormwater management is being implemented on site. • Due to the general nature of habitat within the site (low growing karoo scrub), this should be allowed to re-establish following the construction of the solar PV facility. • This will allow for the stabilisation of soils. • Bulk of vegetation clearing and earthworks to be completed at the end of the dry season to reduce erosion from water runoff. • In PV areas, compacted soil to be ripped and tilled following construction to allow the regeneration of habitat.	1	2	2	1	2	1	8	-	Low
Faunal and floral mortality: increased vehicle access and increased construction personnel	Increase in construction personnel to the project site and heavy vehicle movement leading to increased poaching of animals or medicinal plants or destruction of protected species	1	2	4	1	1	2	18	-	Low	• An independent suitably qualified scientist to be appointed as ECO to oversee works especially when working in and around the site. • Implementation and enforcement of strict speed limits. • Working at night should be avoided. • Following construction, the site must be cleared of all possible polluting materials and all temporary structures must be removed and responsibly disposed of. • This must include environmental education on the "No Access" and sensitive areas as well as protected species. • No harvesting of plants, plant material, animal or surface water may be allowed.	1	1	4	1	1	2	16	-	Low
Increased noise: Construction of the solar PV facility	Increased noise during construction may affect behaviour and distribution of fauna	2	3	1	1	1	1	8	-	Low	• Noise generating activities will only take place during the construction phase • Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. • Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. • Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised; • The use of vehicle horns should be minimized where possible. • Restrict construction and operational activity to daylight working hours.	1	2	1	1	1	1	6	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ Or -)	S
Establishment, spread and propagation of AIP: Construction of the PV facility	Activities related to the construction of the solar PV facility can cause the spread and establishment of AIP	2	4	2	1	3	2	24	-	Medium	• An effective Alien Invasive Awareness and Management Programme should be established, focusing on the identification and removal of pervasive invasive species. • AIP material should be removed from the site to reduce the potential for re-establishment. • Ongoing management as part of the alien invasive management programme. • The Alien Invasive Management Plan will need to be applied broadly to the entire footprint to effectively reduce AIP and prevent their recolonisation of cleared areas.	1	2	2	1	3	1	9	-	Low
Soil contamination: Spillages and Leakage of harmful substances from heavy machinery and vehicle movement	Heavy machinery can result in spillages of harmful substances and potential contamination of soil with hydrocarbons	1	3	1	1	1	1	7	-	Low	• Vehicles to be adequately maintained and fitted with drip trays when left standing. • It is advisable that spill kits are available on site.	1	1	1	1	1	1	5	-	Low
Impeding faunal movement corridors	Loss of ecological connectivity and faunal movement corridor due to habitat fragmentation from fencing	2	3	1	1	3	2	20	-	Low	• It is foreseen that the entire site will be fenced off. This will isolate the site completely and will prohibit faunal movement through the site. • This can be mitigated by allowing for semi-permeable fencing options along the site borders. • This will maintain the connectivity between the site and adjacent external habitats.	2	2	1	1	3	1	9	-	Low
Transport																				
Development traffic impact / related noise & dust pollution	Temporary increase in traffic due to construction vehicle trips on the external road network /increase in noise and dust pollution levels during construction period /possible damage to road surface of access routes	4	3	1	2	2	2	24	-	Medium	• Stagger component delivery to site; • Reduce the construction period if possible; • Stagger construction phase tasks; • make use of any quarries in the vicinity of the site to decrease the impact of development trips on the external roads; • staff and general trips should occur outside of peak traffic periods as much as possible; • monitor access routes for possible damage to mitigate early on, regular spraying of internal site roads with water.	4	2	1	2	2	1	11	-	Low
Visual																				
Altered Sense of Place and Visual Intrusion caused by Construction Activities	Dust generated during construction will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the construction site, during the construction period.	2	4	1	1	1	3	27	-	Medium	• Limit vegetation clearance and the footprint of construction to what is absolutely essential. • Consolidate the footprint of the construction camp to a functional minimum. • Avoid excavation, handling and transport of materials which may generate dust under very windy conditions. • Keep stockpiled aggregate and sand covered to minimise dust generation. • Keep construction site tidy.	2	3	1	1	1	2	16	-	Low
Risk																				
SSLB Energy Storage Systems																				
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Construction materials such as cement, paints, solvents, welding fumes, truck fumes etc. Consequences - Employee/ contractor illness.	3	1	3		4	4	44	-	High	• The construction phase will be managed according to all the requirements of the OHSA specifically the Construction Regulations. • SHEQ policy in place. A detailed construction Risk Assessment prior to work. • SHE procedure in place. PPE to be specified. SHE appointees in place. • Contractor's safety files in place and up to date. All necessary health controls/ practices to be in place, e.g., ventilation of welding and painting areas. • SHE monitoring and reporting programs in place. • Emergency response plan to be in place prior to beginning construction and to include aspects such as appointment of emergency controller, provision of first aid, first responder contact numbers.	1	1	3		4	2	18	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ Or -)	S
Human Health - exposure to noise	Causes - Drilling, piling, generators, air compressors. Consequences - Adverse impact on hearing of workers. Possible nuisance factor in near-by areas.	3	1	5		5	4	56	-	High	• Health Risk Assessment to determine if equipment noise exceeds 85 decibel (dB) at workstation and 61 dB at boundary of the site. • OHSA Noise Induced hearing Loss Regulations Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.	2	1	5		5	2	26	-	Medium
Impact 3: Human Health - exposure to temperature extremes and/or humidity	Causes - Heat during the day. Cold in winter. Consequence - Heat stroke. Hypothermia.	3	2	3		1	2	18	-	Low	• Construction site facilities to comply with OHSA specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. • Adequate potable water for employees to be provided during all phases of the project. • Borehole, bowser and tank or small water treatment plant may be required to provide potable water for the BESS installation staff during all phases of the project.	2	2	3		1	1	8	-	Low
Human Health - exposure to psychological stress	Causes - Large projects bring many contractor workers into a small, isolated community. Consequences – Lack of sufficient accommodation, entertainment etc. Increase in alcohol abuse, violence	2	3	3		2	2	20	-	Low	• Refer to Social Specialist Study for this project.	2	3	3		2	2	20	-	Low
Human Health - exposure to ergonomic stress	Causes - Lifting heavy equipment. Awkward angles during construction. Consequences - Back and other injuries.	4	1	3		2	3	30	-	Medium	• Training in lifting techniques. • Ensure that despite the isolated location all the necessary equipment is available (and well maintained) during construction. • Otherwise employees may revert to unsafe practices. • Isolated location, maintenance of construction equipment to ensure safe operation is critical. • Utilization of local service providers where possible. • Ensure this is in place prior to project beginning. • First aid provision on site.	4	1	3		2	2	20	-	Low
Human and Equipment Safety - exposure to fire radiation	Causes – Involvement in an external fire. Fire involving fuels used in construction vehicles or vehicles themselves (e.g., tyre fire). Fire due to uncontrolled welding or other hot-work Consequences - Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire.	4	2	3		5	4	56	-	High	• Fuels stored on site in dedicated, demarcated and bunded areas. • Suitable fire-fighting equipment on site near source of fuel, e.g., diesel tank, generators, mess, workshops etc. • The company responsible for the facility at this particular development stage is to have: o Emergency plan to be in place prior to commencement of construction. o Fuel spill containment procedures and equipment to be in place. o Hot-work permit and management system to be in place.	4	2	3		5	2	28	-	Medium
Human and Equipment Safety - exposure to fire radiation	Causes - Solid state battery containers damaged on route e.g., dropped in port (drops do happen about 1/2000 containers) and importing possibly < 30 containers for the site. With this it is possible, although unlikely, that one will be dropped, traffic accident on-route. Involvement in an external fire e.g., at the port or on route. Data indicates installed facility events are 0.001/year. Transport of 700 units per installation assumed to take 4 weeks each so f= 0.05 - once in 20 years so likelihood is moderate.	5	2	5		5	4	68	-	High	• Solid state battery design includes abuse tests such as drop test, impact, rapid discharge etc. • Propagation tests for systems, e.g., heat insulating materials between cells/modules. • Factory acceptance test prior to prior to leaving manufacture. • Batteries are usually stored at 50% charge to prolong life but may be shipped fully discharged. • This level of detail should be understood so as to assess the risk during transport and storage. • The company responsible for the battery installation should ensure suitably competent transport companies are appointed. • The company responsible for transportation should ensure: o Compliance with NRTA Regulations Regulation 8 – dangerous goods. o Port Authorities should be alerted to the overall project and the hazardous nature of the contents of battery containers being imported. Note. If, as per one of the typical	5	2	5		5	1	17	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ Or -)	S
	Consequences – Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire (refer to noxious smoke in Appendix A of the Risk Assessment Report for the major impact).										suppliers (Tesla) indications, the containers are classified as IMDG Class 9 – the containers will not receive any special care in the ports and may be stored next to flammables. o Port emergency response in particular need training on mitigating battery hazards. o Prior to bringing any containers into the country, the company responsible for the battery installation (possibly via appointed contractors) should ensure that an Emergency response plan is in place for the full route from the ship to the site. o Drivers trained in the hazards of containerized batteries. • The Emergency plan must determine and address: o What gases would be released in a fire and are there inhalation hazards. o Extinguishing has two important elements, put out fire and to provide cooling. o Different approaches may be needed for small fire, e.g., put out, and for large fires, e.g., cool with copious quantities of water. Note inert gases and foam may put out the initial fire but fail to control thermal runaway or to cool the batteries resulting in reignition. o What initial fire extinguishing medium should be used. o Whether there are any secondary gases or residues from use of extinguishers. o If water is appropriate, determine if the system needs outside connections to sprinklers inside the container. o First responders need to know what media to use, especially if water totally unsuitable and if there are no connection points for water etc. o Must the container be left unopened or opened. o PPE to be specified including possible exposure to chemicals and fumes as well as radiate heat. o Containment of residues/water/damaged equipment. o Suitable safe making and disposal plan for after the event i.e. how do responders deal with partially charged damage units, contaminated surfaces (e.g., HF residues).									
Human and Equipment Safety - exposure to explosion over pressures	Causes - With solid state lithium containers, flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces, static. Consequences - Potential fatalities amongst first responders. Damage to container, transport truck or other nearby items, e.g., other container in the port.	5	4	5		5	3	57	-	High	• During transport this is only likely to happen due to possible inappropriate emergency response, e.g., opening containers when they may be the type that should be left to burn out. • For simplicity one transport route would be preferable. • The route needs to be assessed in terms of responding local services, rest places for drivers, refuelling if required, break down services available etc. • Once an import route has been chosen, e.g., Richards Bay or Durban and along N2/ N3/ N11 etc., then the appointed transport company should ensure key emergency services on route could be given awareness training in battery fire/accident response. • Emergency response planning and training referred to above may be important for key locations such as the mountain passes/ tunnels.	5	4	5		5	1	19	-	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants. Consequences - Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms, etc	4	2	3		2	3	33	-	Medium	• All necessary good hygiene practices to be in place, e.g., provision of toilets, eating areas, infectious disease controls. • Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. • Awareness training for persons on site, safety induction to include animal hazards. • First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. • Due to isolated locations some distance from town, ensure the ability to treat with anti-venom and extreme allergic reactions on site.	3	2	3		2	2	20	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ Or -)	S
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes - Damaged solid-state batteries release fumes, leak electrolyte, are completely broken exposing hazardous chemicals. Thermal runaway and hazardous fumes released. Consequences - Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns or lung damage.	4	3	3		5	3	45	-	High	• Appointed transport company to ensure transport in accordance with Regulation 8 of the NRTA Regulations, Dangerous Goods. Not permitted to transport prescribed goods in manner not consistent with the prescriptions, e.g., consignor and consignee responsibilities. Prescription found in SANS 10228/29 and international codes for battery transport etc. • Transport in sealed packages that are kept upright, protected from movement damage etc. Also packaged to ensure no short-circuiting during transport. • Transport to prevent excessive vibration considerations as battery internal may be damaged leading to thermal run-away during commissioning. • Pre-assembled containers will most likely be supplied. • These will be fitted with the necessary protective measures by the supplier considering marine and road transport as well as lifting, setting down etc. • Route selection to consider possible incidents along the way and suitable response, e.g., satellite tracking, mobile communication, 24/7 helpline response. • Standard dangerous goods requirements for Hazmat labels, Trem cards, driver trained in the hazards of the load. Likelihood similar to fire above.	4	3	3		5	2	30	-	Medium
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Causes - Construction moving equipment, heavy loaded, elevated loads, working at heights Consequences - Injury or possibly fatality. Damage to equipment. Delays in starting the project, financial losses	5	1	5		5	4	64	-	High	• The construction phase will be managed according to all the requirements of the OHSA specifically the Construction Regulations. SHEQ policy in place. • A detailed construction Risk Assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractors safety files in place and up to date. • SHE monitoring and reporting programs in place. • Standard construction site rules regarding traffic, reversing sirens, rigging controls, cordoning off excavations etc. • Civil and building structures to National Building Regulations and building Standards Act, 1977 (Act 103 of 1977) as amended (NBRBSA), SANS 10400 and other relevant codes. • Other constructions such as roads, sewers, etc. also to relevant SANS standards. • All normal procedures for working at heights, hot work permits, confined space entry, cordon off excavations etc. to be in place before construction begins. • Emergency response plan to be in place before construction begins.	5	1	5		5	1	16	-	Low
Human and Equipment Safety - exposure to electromagnetic waves	Causes - Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences - Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	5	2	5		5	3	51	-	High	• Standard maintenance of condition of electrical equipment and safe operating instructions. • Ability to shut off power to systems in use on site. • If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. • Lightning strike rate in the study area is high. • Outside work must be stopped during thunderstorms. Lighting conductors may be required for the final installation, to be confirmed during design phase.	5	2	5		5	1	17	-	Low
Environment - emissions to air	Causes - Dust from construction and generally hot dry area. Consequences - Adverse impact on employee health.	3	2	1		1	4	28	-	Medium	• May need to use dampening on roads etc. as per normal construction practices. • May need PPE (dust masks) for specific construction workers.	2	2	1		1	2	12	-	Low
Environment - emissions to water	Causes - Diesel for equipment, paints and solvents. Transformer oil spills. Sewage and kitchen/ mess area wastewater. Consequences - Environmental	2	2	3		2	3	27	-	Medium	• Normal construction site practices for preventing and containing fuels/ paint/ oil, etc. spills. • Bunding under any temporary tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important. • Spill clean-up procedures to be in place before commencing construction. • Sewage and any kitchen liquids - containment and suitable treatment/ disposal.	2	2	3		2	2	18	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I / M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ Or -)	S
	damage, particularly to the surface and underground water in the area.																			
Environment - emissions to earth	Causes - Mess area and other solid waste. Consequences - Environmental damage.	2	2	3		3	3	30	-	Medium	• There will be packaging materials that will need to be disposed of after the entire system is connected and commissioned as well as after regular maintenance. • There will need to be waste segregation (e.g., electronic equipment, chemicals) and management on the site.	2	2	3		2	2	18	-	Low
Environment - waste of resources e.g., water, power etc	Causes - Water usage not controlled. Battery containers damaged. Consequences - Delays.	1	1	1		2	4	20	-	Low	• Water usage to be monitored on site during construction. • Handling protocols to be provided by battery supplier. • End of Life plan needs to be in place before any battery containers enter the country as there may be damaged battery unit from day 1. • Water management plan and spill containment plans to be in place.	1	1	1		2	2	10	-	Low
Public - Aesthetics	Causes - Bright surfaces reflecting light. Tall structures in a flat area. Consequences - Irritation	2	2	3		3	3	30	-	Medium	• Refer to visual impact assessment.	2	2	3		3	3	30	-	Medium
Investors - Financial	Causes - Defective technology. Extreme project delays. Consequences - Financial loss	5	1	3		4	3	39	-	Medium	• Design by experienced contractors using internationally recognized and proven technology. • Project management with deviation monitoring.	3	1	3		4	2	22	-	Low
Employees and investors - Security	Causes - On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences - Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.	4	1	3		2	4	40	-	Medium	• Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. • The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs. • Isolated location both helps and hinders security. Night lighting to be provided both indoors and outdoors where necessary.	3	1	3		2	3	27	-	Medium
Emergencies	Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse. Inadequate emergency response to small event leads to escalation. Consequences - Injuries turn to fatalities, small losses become extended down time.	4	2	3		5	4	56	-	High	• Emergency procedures need to be practiced prior to commencement of construction. • If batteries are stored at 50% charge, thermal run away can happen while in storage on site waiting for installation. • In addition, if involved in an external fire thermal run away can happen even with uncharged batteries. • Except during shipping, ideally the units should not be stored any closer to each other than they would be in the final installation so that propagation is prevented, i.e., laydown area needs to be considered. • The company in charge of the containers at each stage in the transport process needs to be very clear so that responsibility for the integrity of the load and protection of the persons involved in transfer and coordination of emergency response on-route. • E.g., if purchased from Tesla where does hand over occur to the South African contractor/ owner, at the factory door in USA, at the port in RSA, at the site fence. • For example, who will be accountable if there's thermal runway event on a truck with a container that stops in a small town for driver refreshments	4	2	3		5	2	28	-	Medium
Investors - Legal	Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences - Unknown hazards manifest due to using "cheaper supplier or less developed technology".	3	1	3		3	4	40	-	Medium	• Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing. • Ensure only state of the art battery systems are used and not old technologies prone to fires/explosions, etc.	2	1	3		3	2	18	-	Low
VRFB Energy Storage Systems																				

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ Or -)	S
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Construction materials such as cement, paints, solvents, welding fumes, truck fumes etc. Consequences - Employee / contractor illness.	-	1	3		4	4	44	-	High	• The construction phase will be managed according to all the requirements of the OHSA specifically the Construction Regulations. • SHEQ policy in place. • A detailed construction Risk Assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractor's safety files in place and up to date. • All necessary health controls/ practices to be in place, e.g., ventilation of welding and painting areas. • SHE monitoring and reporting programs in place. • Emergency response plan to be in place prior to beginning construction and to include aspects such as appointment of emergency controller, provision of first aid, first responder contact numbers.	1	1	3		4	2	18	-	Low
Human Health - exposure to noise	Causes - Drilling, piling, generators, air compressors. Consequences - Adverse impact on hearing of workers. Possible nuisance factor in near-by areas.	3	1	5		5	4	56	-	High	• Health Risk Assessment to determine if equipment noise exceeds 85 dB at workstation and 61 dB at boundary of the site. • OHSA Noise Induced hearing Loss Regulations. • Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.	2	1	5		5	2	26	-	Medium
Human Health - exposure to temperature extremes and/or humidity	Causes - Heat during the day. Cold in winter. Consequence - Heat stroke. Hypothermia.	3	2	3		1	2	18	-	Low	• Construction site facilities to comply with OHSA specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. • Adequate potable water to be provided during all phases of the project. • Borehole, bowser and tank or small water treatment plant may be required to provide potable water for the employees during all phases of the project.	2	2	3		1	1	8	-	Low
Human Health - exposure to psychological stress	Causes - Large projects bring many contractor workers into a small, isolated community. Consequences – Lack of sufficient accommodation, entertainment etc. Increase in alcohol abuse, violence	2	3	3		2	2	20	-	Low	• Refer to Social Specialist Studies for this project.	2	3	3		2	2	20	-	Low
Human Health - exposure to ergonomic stress	Causes - Lifting heavy equipment. Awkward angles during construction. Consequences - Back and other injuries.	4	1	3		2	3	30	-	Medium	• Training in lifting techniques. • Ensure that despite the isolated location all the necessary equipment is available (and well maintained) during construction. • Otherwise employees may revert to unsafe practices. • Isolated location, maintenance of construction equipment to ensure safe operation is critical. • Utilization of local service providers where possible. • Ensure this is in place prior to project beginning. • First aid provision on site.	4	1	3		2	2	20	-	Low
Human and Equipment Safety - exposure to fire radiation	Causes – Involvement in an external fire. Fire involving fuels used in construction vehicles or vehicles themselves (e.g., tyre fire). Fire due to uncontrolled welding or other hot-work Consequences - Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire.	4	2	3		5	4	56	-	High	• Fuels stored on site in dedicated, demarcated and bunded areas. • Suitable fire-fighting equipment on site near source of fuel, e.g., diesel tank, generators, mess, workshops etc.	4	2	3		5	2	28	-	Medium

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/ M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ Or -)	S
Human and Equipment Safety - exposure to explosion over pressures	No credible causes	1	1	1		1	1	4	-	N/A	• No credible causes, hence no mitigation necessary.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants. Consequences - Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc	4	2	3		2	3	33	-	Medium	• All necessary good hygiene practices to be in place, e.g., provision of toilets, eating areas, infectious disease controls. • Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. • Awareness training for persons on site, safety induction to include animal hazards. • First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. • Due to isolated locations some distance from town, ensure the ability to treat with anti-venom and extreme allergic reactions on site.	3	2	3		2	2	20	-	Low
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Causes - Construction moving equipment, heavy loaded, elevated loads, working at heights Consequences - Injury or possibly fatality. Damage to equipment. Delays in starting the project, financial losses	5	1	5		5	4	64	-	High	• The construction phase will be managed according to all the requirements of the OHSA specifically the Construction Regulations. • SHEQ policy in place. • A detailed construction Risk Assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractors safety files in place and up to date. • SHE monitoring and reporting programs in place. • Standard construction site rules regarding traffic, reversing sirens, rigging controls, cordoning off excavations etc. • Civil and building structures to NBRBSA SANS 10400 and other relevant codes. • Other constructions such as roads, sewers, etc. also to relevant SANS standards. • All normal procedures for working at heights, hot work permits, confined space entry, cordon off excavations etc to be in place before construction begins. • Emergency response plan to be in place before construction begins.	5	1	5		5	1	16	-	Low
Human and Equipment Safety - exposure to electromagnetic waves	Causes - Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences - Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	5	2	5		5	3	51	-	High	• Standard maintenance of condition of electrical equipment and safe operating instructions. • Ability to shut off power to systems in use on site. • If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. • Lightning strike rate in the study area is high. • Outside work must be stopped during thunderstorms. • Lighting conductors may be required for the final installation, to be confirmed during design phase.	5	2	5		5	1	17	-	Low
Environment - emissions to air	Causes - Dust from construction and generally hot dry area. Consequences - Adverse impact on employee health.	3	2	1		1	4	28	-	Medium	• May need to use dampening on roads etc. as per normal construction practices. • May need PPE (dust masks) for specific construction workers.	2	2	1		1	2	12	-	Low
Environment - emissions to water	Causes - Diesel for equipment, paints and solvents. Transformer oil spills. Sewage and kitchen/mess area wastewater.	2	2	3		2	3	27	-	Medium	• Normal construction site practices for preventing and containing fuels/ paint/ oil, etc. spills. • Bunding under any temporary tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important. • Spill clean-up procedures to be in place before commencing construction. • Sewage and any kitchen liquids - containment and suitable treatment/ disposal.	2	2	3		2	2	18	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I/M	Total	Status (+ Or -)	S
	Consequences - Environmental damage, particularly to the surface and underground water in the area.																			
Environment - emissions to earth	Causes - Mess area and other solid waste. Consequences - Environmental damage.	2	2	3		3	3	30	-	Medium	• There will be packaging materials that will need to be disposed of after the entire system is connected and commissioned as well as after regular maintenance. • There will need to be waste segregation (e.g., electronic equipment, chemicals) and management on the site.	1	2	3		3	2	18	-	Low
Environment - waste of resources e.g., water, power etc	Causes - Water usage not controlled. Battery equipment damaged. Consequences - Delays.	1	1	1		2	4	20	-	Low	• Water usage to be monitored on site during construction. • Handling protocols to be provided by battery supplier. • Water management plan and spill containment plans to be in place.	1	1	1		2	2	10	-	Low
Public - Aesthetics	Causes - Bright surfaces reflecting light. Tall structures in a flat area. Consequences - Irritation.	3	2	3		4	4	48	-	High	• Visual impact assessment to include BESS installation when design details become available. • Confirm any height limitations for VRFB BESS building (if utility scale)	1	2	3		4	2	20	-	Low
Investors - Financial	Causes - Defective technology. Extreme project delays. Consequences - Financial loss	5	1	3		4	3	39	-	Medium	• Design by experienced contractors using internationally recognized and proven technology. • Project management with deviation monitoring.	3	1	3		4	2	22	-	Low
Employees and investors - Security	Causes - On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences - Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.	4	1	3		2	4	40	-	Medium	• Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. • The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs. • Isolated location both helps and hinders security. • Night lighting to be provided both indoors and outdoors where necessary.	3	1	3		2	3	27	-	Medium
Emergencies	Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse. Inadequate emergency response to small event leads to escalation. Consequences - Injuries turn to fatalities, small losses become extended down time.	4	2	3		4	3	39	-	Medium	• Emergency procedures need to be practiced prior to commencement of construction.	4	2	3		4	2	26	-	Medium
Investors - Legal	Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences - Unknown hazards manifest due to using “cheaper supplier or less developed technology”.	3	1	3		3	4	40	-	Medium	• Use only internationally reputable battery suppliers who comply with all known regulations/ guideline at the time of purchasing. • Ensure only state of the art battery systems are used and not old technologies prone to fires/ explosions, etc.	2	1	3		3	2	18	-	Low

16.1.3 Operational

16.1.3.1 Rhino Solar PV Site

Table 16-3: Operational Potential Impacts

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Agricultural - none identified																				
Avifauna																				
Avifauna	Displacement of priority species due to habitat transformation associated with the presence of the PV plants and associated infrastructure	2	4	3	3	3	3	45	-	High	• An all-infrastructure exclusion zone should be implemented and maintained within 2.5 km of the identified Martial Eagle nest and within 1 km of the identified Verreaux's Eagle nests. • A solar panel exclusion zone buffer should be implemented and maintained around all surface water features such as dams and reservoirs (200 m), as well as non-perennial drainage lines and associated herbaceous wetlands (150 m). • Access to the rest of the property must be restricted during maintenance activities. • The recommendations of the Terrestrial Biodiversity and Botanical Specialist Study must be strictly implemented, especially as far as site rehabilitation is concerned.	1	4	2	3	1	3	33	-	Medium
Avifauna	Mortality of priority species due to collisions with the solar panels.	1	4	1	2	1	2	18	-	Low	• No mitigation is required due to the low significance of this impact	1	3	1	2	1	2	16	-	Low
Avifauna	Entanglement/ entrapment of birds in the perimeter fence.	1	4	2	3	1	3	33	-	Medium	• Replace at least the top two barbed strands with smooth wire to eliminate the risk of entanglement. • Increasing the spacing between at least the top two wires (to a minimum of 30 cm) and ensuring they are correctly tensioned will also reduce the entanglement risk. • A single (instead of double) perimeter fence should be used if possible.	1	3	1	2	1	2	16	-	Low
Avifauna	Electrocution of priority species on the 33 kV power line network and in the on-site substations.	2	3	1	3	3	2	24	-	Medium	• The cables must be placed underground as much as practically possible. The final pole design must be developed in consultation with the avifaunal specialist to ensure that a bird friendly design is employed. The avifaunal specialist should provide input and approve on the final pole design. • Due to the complicated design of the substation hardware, pro-active mitigation is not a practical option. Instead, the situation must be monitored, and should electrocutions of priority species be recorded, reactive mitigation could be applied in the form of insulation of live components.	2	2	1	2	3	1	10	-	Low
Avifauna	Mortality due to collisions with the overhead sections of the internal 33 kV cables.	2	3	2	3	3	2	26	-	Medium	• Bird flight diverters should be installed on all the overhead line sections for the full span length according to the applicable Eskom standard at the time. • The final pole design must be developed in consultation with the avifaunal specialist to ensure that a bird friendly design is employed.	2	1	1	2	3	1	9	-	Low
Geotechnical																				
Soil Erosion	Increased erosion due to alteration of natural drainage	1	2	1	1	2	1	7	-	Low	• Maintain access roads including drainage features • Monitor for erosion and remediate and rehabilitate timeously	1	1	1	1	2	1	6	-	Low
Heritage																				
Impacts to archaeological heritage resources	Operational activities that take place near to archaeological resources may result in their destruction	1	1	4	1	4	1	11	-	Low	• Should any previously unknown archaeological resources be impacted during construction, work must cease in the vicinity of the find and the relevant heritage authority must be contacted	1	1	4	1	4	1	11	-	Low
Impacts to palaeontological resources	Operational activities that take place near to palaeontological resources may result in their destruction	1	1	4	1	4	3	33	-	Medium	• Implementation of the Chance Fossil Finds Protocol	1	1	4	1	4	1	11	-	Low
Socio-economic																				

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Increase in production	Expenditure associated with the operations of the proposed development will impact the production of the local economy.	3	3	2	1	3	3	36	+	Medium	• The project developer should make effort to use locally sourced inputs where feasible in order to maximize the benefit to the local economy. • Local Small and Medium Enterprises are to be approached to investigate the opportunities for supplying inputs required for the maintenance and operation of the facility, as far as feasible.	3	3	2	2	3	3	39	+	Medium
Increase on GDP	Temporary increase in country's GDP due to operational expenditure	3	3	2	1	3	3	36	+	Medium	• The project developer is to try to use locally sourced inputs where feasible in order to maximize the benefit to the local economy. • Local Small and Medium Enterprises are to be approached to investigate the opportunities for supplying inputs required for the maintenance and operation of the facility, as far as feasible.	3	3	2	2	3	3	39	+	Medium
Increase in Employment	The operation of the proposed development will positively impact the community and beyond by creating a number of job opportunities.	2	3	3	3	3	2	28	+	Medium	• Where feasible, effort must be made to employ locally in order to create maximum benefit for the communities.	2	4	3	3	3	2	30	+	Medium
Increase in household earnings	Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	3	3	1	1	3	3	33	+	Medium	• Employing locally will increase benefit to local households and the local area	3	3	1	2	3	3	36	+	Medium
Increase in government revenue	The investment in the facility will generate revenue for the government during the construction period through a combination of personal income tax, VAT, companies' tax etc.	3	3	2	3	3	3	42	+	Medium	• N/A	3	3	2	3	3	3	42	+	Medium
Rental revenue for landowners	The landowners will receive monthly/ annual compensation for the solar panels situated on their farms, this will help to increase the landowner's revenue to ensure sustainability on the farms.	1	3	2	3	3	3	36	+	Medium	• N/A	1	3	2	3	3	3	36	+	Medium
Sustainable increase in electricity	The additional electricity that will be generated will increase electricity supply in the country.	4	4	3	2	3	3	48	+	High	• N/A	4	4	3	2	3	3	48	+	High
Sense of place	Negative impact on sense of place (noise and visual) for farmers where solar panels and associated infrastructure will be located.	1	3	2	2	3	3	33	-	Medium	• Refer to visual specialist report for mitigation measures.	1	3	2	2	3	3	33	-	Medium
Impact on agricultural operations	Loss of agricultural space	1	4	3	3	3	3	42	-	Medium	• Construct the solar panels on parts where the least arable land will be affected	1	3	3	3	3	3	39	-	Medium
Terrestrial Biodiversity																				
Changes to soil characteristics: PV maintenance and erosion from panel washing	Washing of panels could contribute to the erosion and sedimentation of neighbouring habitats	1	1	2	1	1	1	6	-	Low	• Unlikely to have significant impact as the volume of water required, that will runoff, will likely quickly seep into soil and/evaporate • Frequency of panel washing to be minimised	1	1	2	1	1	1	6	-	Low

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Visual impact: solar PV facility operations	Operation of solar PV facility, the reflective surfaces and operational light pollution may cause disorientation affecting the behaviour and distribution of fauna	2	3	1	1	3	2	20	-	Low	• Light pollution from safety and security lighting infrastructure creates glare off panels and increased light pollution, disrupting nocturnal species' behavior and natural rhythms, such as migration patterns or hunting behavior. • The need for artificial lighting should be minimised. • Should it be necessary, lighting at the solar PV facility should have appropriate shielding or make use of downward directional fixures with low intensity lighting. • Illumination of adjacent habitats should be avoided.	2	2	1	1	3	2	18	-	Low
Establishment, spread and propagation of AIP: Maintenance of the solar PV facility	Activities related to the maintenance of the solar PV facility can cause the spread and establishment of AIP	2	4	2	1	3	2	24	-	Medium	• An effective Alien Invasive Awareness and Management Programme should be established, focusing on the identification and removal of pervasive invasive species. • AIP material should be removed from the site to reduce the potential for re-establishment. • Ongoing management as part of the alien invasive management programme. • The Alien Invasive Management Plan will need to be applied broadly to the entire footprint to effectively reduce AIP and prevent their recolonisation of cleared areas.	1	2	2	1	3	1	9	-	Low
Soil contamination: Spillages and Leakage of harmful substances from heavy machinery and vehicle movement	Heavy machinery can result in spillages of harmful substances and potential contamination of soil with hydrocarbons	1	3	1	1	1	1	7	-	Low	• Vehicles to be adequately maintained and fitted with drip trays when left standing. • It is advisable that spill kits are available on site.	1	1	1	1	1	1	5	-	Low
Transport																				
Traffic Impact due to maintenance and permanent site staff trips / periodical trips to site for transport of water.	Slight increase of vehicle trips due to permanent staff traveling to site, periodically (bi-annual) trips to site for transport of water and irregular maintenance trips	2	3	1	1	3	1	10	-	Low	• Source on-site water supply as far as possible; • Utilise cleaning systems for panels needing less vehicles trips; • Schedule trips for the provision of water for the cleaning of panels outside peak traffic periods as much as possible.	2	2	1	1	3	1	9	-	Low
Visual impact																				
Altered Sense of Place and Visual Intrusion caused by the SEF	The development of this PV array may be perceived as conflicting with the current undeveloped, largely deserted inhospitable agricultural landscape. The proposed SEF is anticipated to interrupt and/or degrade views, affecting the sense of place and presenting as a visual intrusion across the landscape.	2	3	1	1	3	3	30	-	Medium	• Ensure that the roof colour of the proposed buildings blends into the landscape. • Install the powerlines underground, where possible. • Fence the perimeter of the site with green or black fencing.	2	3	1	1	3	2	20	-	Low
Altered Visual Quality caused by Light Pollution at Night	The installation of lighting on the site perimeter and / or around the BESS is anticipated to generate nightglow which currently does not emanate from the natural, undeveloped site. The introduction of lighting on the site will alter the sense of place and visual quality to surrounding receptors.	2	4	1	1	3	2	22	-	Low	• Reduce the height of lighting masts to a workable minimum. • Direct lighting inwards and downwards to limit light pollution.	2	3	1	1	3	2	20	-	Low

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Risk																				
SSLB Energy Storage Systems																				
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Operation and maintenance materials spare parts, paints, solvents, welding fumes, transformers oils, lubricating oils and greases etc. Consequences - Occupational illness.	2	1	3		4	5	50	-	High	• The operation and maintenance phase will be managed according to all the requirements of the OHSA. • SHEQ policy in place. • A detailed Risk Assessment of all normal operating and maintenance activities on site to be compiled, and form the basis of operating instructions, prior to commencing commissioning. • SHE procedure in place, e.g., PPE specified, management of change, integrity monitoring. • SHE appointees in place. • Training of staff in general hazards on site. • All necessary health controls/ practices to be in place, e.g., ventilation of confined areas, occupational health monitoring if required and reporting programs in place. • Emergency response plan for full operation and maintenance phase to be in place prior to beginning commissioning and to include aspects such as: o appointment of emergency controller, o emergency isolation systems for electricity, o emergency isolation and containment systems for electrolyte, o provision of PPE for hazardous materials response, o provision of emergency facilities for staff at the main office building, o provision of first aid facilities, o first responder contact numbers etc.	1	1	3		4	2	18	-	Low
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Compromised battery compartments vapours accumulate in the containers, solids/liquids on surfaces. Maintenance of battery components, corrosive and mildly toxic liquid on surfaces. Consequences - Dermatitis, skin /eye/lung irritation.	3	1	3		5	4	48	-	High	• Solid state batteries sealed, individual batteries in modules which are also sealed, pre-packed in the container. • Maintenance procedures will be in place should equipment need to be opened, e.g., pumps drained and decontaminated prior to repair in workshop, etc. • PPE will be specified for handling battery parts and other equipment on site. • Training of staff in hazards of chemicals on site. • Possible detectors with local alarms if regulated occupational exposure limits are exceeded etc prior to entry for inspection of battery containers. • Labelling of all equipment. • Confined space entry procedures if entering tanks. • There needs to be careful thought given to procedures to be adopted before entering into the BESS or a container particularly after a BMS shut down where there may be flammable or toxic gases present, a fire etc. • Safety Data Sheets (SDSs) to be available on site. • Operating manuals to be provided including start-up, shut-down, steady state, monitoring requirements. • Maintenance manuals with make safe, decontamination and repair procedures. • Proposed maintenance schedules e.g., checklists for weekly, monthly, annual etc. • Provided portable equipment for calibration and for testing/verification of defective equipment, e.g., volt/current meters, infrared camera	1	1	3		5	2	20	-	Low
Human Health - exposure to noise	Causes - Moving parts inside containers, buildings, pumps, compressors, cooling systems etc. Consequences - Adverse impact on hearing of workers. Nuisance factor at near -by residences or other activities.	2	1	5		5	4	52	-	High	• Design to ensure continuous noise does not exceed 85 dB within the facilities or at any other location on site or 61 dB at the site boundary, e.g., emergency generator, air compressor etc. • OHSA Noise Induced hearing Loss Regulations Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.	2	1	5		5	2	26	-	Medium

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Human Health - exposure to temperature extremes and/or humidity	Causes - Heat during the day. Batteries generate heat within enclosed building / containers. Cold in winter. Night work requires lighting. Consequences - Heat stroke. Hypothermia.	4	2	3		1	2	20	-	Low	• Building and container facilities to comply with OHSA specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. • Ensure containers are temperature controlled as required to remain within the optimal battery operating temperature range. • Lighting to be provided inside any buildings, inside the containers, possibly linked to the door opening and outdoors where necessary. • Adequate potable water to be provided during all phases of the project. • Suitable lighting to be provided including emergency lighting for safe building exit in the event of power failure. • PPE for operations and maintenance staff to be suitable for the weather conditions.	3	2	3		1	1	9	-	Low
Human Health - exposure to psychological stress	Causes - Isolated workstation and monotonous repetitive work. Consequences - Low performance, system productivity suffers.	2	3	3		2	2	20	-	Low	• Staff rotation to other activities within the site may be necessary. • Performance monitoring of inspections/ maintenance tasks in particular will be necessary.	1	3	3		2	1	9	-	Low
Human Health - exposure to ergonomic stress	Causes - Lifting heavy equipment. Awkward angles during maintenance, stretching reaching to high level and bending to low level. Working at height if equipment located on top of roofs or elevated electrical equipment (e.g., pylons). Consequences - Back and other injuries.	5	1	3		2	3	33	-	Medium	• Training in lifting techniques. • Training in working at heights. • If equipment is at height (see OHSA General Safety Regulation 6), ensure suitable safe (electrically and physically) ladders/ harnesses, etc. are available. • Working at height procedure to be in place.	4	1	3		2	2	20	-	Low

Human and Equipment Safety - exposure to fire radiation	Causes – Involvement in an external fire e.g., veld fire, maintenance vehicle fire, electrical systems fire. Manufacturing defects or damage to battery leading to shorting and heating. High humidity condensation of water or ingress of water or flooding leading to shorting. Dust accumulation on electrical parts leading to overheating. Excessive electrical loads - surges Operator abuse BMS failure or software failure. Incorrect extinguishing medium, escalate the fire. Consequences - Contaminated run off. Radiation burns unlikely to be severe as no highly flammable materials on site. Damaged equipment. Fire spreads to other units or offsite if grass/vegetation not controlled.	5	1	5		5	4	64	-	High	• Grass cutting and fire breaks around the BESS installations to prevent veld fires. • No combustible materials to be stored in or near the batteries or electrical infrastructure. • Separation of site diesel tank, transformers from BESS and vice versa. • There are BESS design codes from the USA and standards of practice that can be used e.g., UL9540, NFPA 855 and DNV GL RP 43. • Detailed FMEA/ Hazop/ Bowtie to done during design at the component level and system levels. • Safety integrity level rating of equipment (failure probably) with suitable redundancy if required. • Site Acceptance Testing as part of commissioning of each unit and the overall system. Abuse tests conducted by supplier. • BMS should be checking individual cell voltage as well as stack, module, container, system voltages/current etc. • BMS tripping the cell and possibly the stack/ building unit or module/rack/container, if variations in voltage. • Diagnostics easily accessible. • Diagnostics able to distinguish cell from stack or cell from module faults. • Protective systems are only as good as their reliability and functionality testing is important, e.g., testing that all battery trips actually work. • Fire resistant barrier between the batteries and the power conservation system (PCS) side if in the same container, or separate containers. • Suitable ingress protection level provided for electrical equipment, e.g., IP55 - 66. • If air cooling into container, suitable dust filters to be provided. • Smoke detectors linked to BMS & alerts in control room. • Effects of battery aging to be considered. • Solid state battery life starts to be impacted above 40 deg C and significant impacts above 50 deg C with thermal run away starting at 65-70 deg C. • BMS trips system at 50 deg C. • Temperature monitoring to be in place. • Regular infrared scanning. • Data needs to be stored for trend analysis. • Data indicates an event frequency of 0.001 per installation and with 700 units this would mean an event once 2 years, i.e. a high probability event. • Most events will be small not resulting in injuries, but this is possible if the event is not controlled. • Prior to commencement of cold commissioning, emergency plan from transport and construction phase to be extended to operational phase and to include the hazards of the electrically live system. • Procedure to address solid state container fires - extinguishing, ventilating, entering as appropriate or not. PPE for container firefighting include fire retardant, chemically resistant, nitrile gloves, antistatic acid resistant boots, fill face shields, BA sets. • A planned fire response to prevent escalation to an explosion or an environmental event. • Suitable supply of fire extinguishing medium and cooling medium. • Consider fire water for cooling adjacent equipment – BESS units. • Can use fogging nozzles to direct smoke. • Ensure procedures in place for clean up after event Lingering HF and other toxic residues in the soil and on adjacent structures. • Procedures to be in place for IR scanning (or other suitable method) to determine if batteries are still smouldering/ are sufficient cooled to handle as batteries may still be active some weeks after an event. • Smoke or gas detector systems that are not part of the original battery container package, need to be linked to the main control panel for the entire system so that issues can be detected and responded to rapidly.	5	1	5		5	1	16	-	Low
Human and Equipment Safety - exposure to fire radiation	Causes – PCS (DC to AC) cooling failure electrical fire. Consequences - Fire starts in PCS or another section or room and spreads to battery area.	5	2	5		5	4	68	-	High	• Modern lithium container design put the PCS in another part of the container with a fire rated wall separating it from the battery. Alternately the PCS is another container altogether.	5	2	5		5	1	17	-	Low

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Human and Equipment Safety - exposure to explosion over pressures	Cause 1 - Transformer shorting / overheating / explosion. Cause 2 - Flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces, static. Lithium Cobalt Oxide generates O2 during decomposition – escalation. Consequences - Potential fatalities amongst first responders. Damage to container or other nearby items, e.g., other container.	5	1	5		5	2	32	-	Medium	• Electrical equipment will be specified to suit application. • Emergency response plan and employee training referred to above is to be in place. • This is only really likely to happen due to possible inappropriate emergency response, e.g., opening containers when they may be the type that should be left to burn out. • Modern state of the art containers have ventilation systems for vapours. • Undertake a hazardous area classification of the inside of the container to confirm the rating of electrical equipment, due to possible leaks of electrolyte or generation of flammable gases under thermal run away. • Emergency response plan and employee training referred to above is critical. • Suitable training of selected emergency responders who may be called out to the facilities is critical. • Refer to Appendix A of the Risk Assessment Report for an initial approximation of worst-case possible explosion impact zones.	5	1	5		5	1	16	-	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants. Consequences - Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc	4	1	3		2	3	30	-	Medium	• All necessary good hygiene practices to be in place, e.g., provision of toilets, eating areas, infectious disease controls. • Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. • Awareness training for persons on site, safety induction to include animal hazards. • First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. • Due to isolated locations some distance from town, ensure the ability to treat with anti-venom and extreme allergic reactions on site.	3	1	2		2	2	16	-	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes - Damaged batteries components, leak electrolyte, are completely broken exposing hazardous chemicals. Hazardous fumes released on thermal run away see fire above. Consequences - Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns for large exposure. In the case of toxic fumes, serious lung damage.	4	3	3		5	3	45	-	High	• Acid resistant PPE (e.g., overalls, gloves, eyeglasses) to be specified for all operations in electrolyte areas. • PPE to be increased (e.g., full-face shield, aprons, chemical suits) for operations that involve opening equipment and potential exposure, e.g., sampling, maintenance. • All operators/ maintenance staff trained in the hazards of chemicals on site. • Batteries contained, modules contained and all inside a container that acts as bund. • Refer to fire above as all the protective measures apply to prevent toxic smoke. • Refer to fire above as all the measures apply to mitigate toxic smoke. • 24/7 helpline response. • Standard dangerous goods requirements for Hazmat labels. • All operators/maintenance staff trained in the hazards. • Refer to Appendix A of the Risk Assessment Report for an initial approximation of worst case possible noxious smoke impact zones.	3	3	3		5	2	28	-	Medium
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Causes - Moving equipment, pumps, heavy equipment at elevation, nip points, working at heights. Traffic accidents. Earthquake / tremor. Consequences - Injury. Fatality in unlikely worst case, e.g., traffic accidents or fall from heights. Damage to equipment, spills, environment pollution	5	1	5		5	3	48	-	High	• Apart from pumps, no major moving parts during operation. • Maintenance equipment to be serviced and personnel suitably trained in the use thereof. • Normally just small vehicles on site, bakkies, grass cutting, cherry-pickers etc. • Possibly large cranes if large equipment or elevated structure removed/ replaced. • Traffic signs, rules etc in place on site. • All normal working at heights, hot work permits, confined space entry, cordon off unsafe areas/ works, etc to be in place. • Emergency response plan. • Civil design to take seismic activity into account.	5	1	5		5	1	16	-	Low

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Human and Equipment Safety - exposure to electromagnetic waves	Causes - Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences - Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	5	2	5		5	3	51	-	High	• Codes and guidelines for electrical insulation. Suitable PPE to be specified. • Low voltage equipment (e.g., batteries) separated from high voltage (e.g., transmission to grid). • Ensure trained personnel and refer to guideline – IEE 1657 – 2018. • Ensure compliance with Eskom Operating Regulations for high voltage systems including access control, permit to work, safe work procedures, live work, abnormal and emergency situations, keeping records. • Electromagnetic fields, impact on other equipment e.g., testing devices, mobile phones – malfunction, permanent damage. • Software also need to be kept as update to date as reasonably practicable. • Consider suitably located Emergency stop buttons for the facility and the other equipment on site. • PPE to consider static accumulation for entering the facility, and particularly the battery containers especially after a high temperature shut down where there could possibly be flammable materials. • The procedures for responding to alarm and auto shut down on containers, needs to consider that there may be a dangerous environment inside and how to protect personnel who may enter to respond. • Lightning strike rate in proposed development area is high. • All outside work must be stopped during thunder storms. Lighting conductors may be required for the installation, to be confirmed during design	5	2	5		5	1	17	-	Low
Environment - emissions to air	Not expected on a normal basis. Refrigerant may be an asphyxiant if accidentally released indoors it can accumulate and displace oxygen.	3	1	1		1	3	18	-	Low	• Especially after any warning alarms have gone off, but possibly even normally the container could be treated as entering a confined space and similar procedures could be in place, e.g., do not enter alone, gas testing prior to entering, ensure adequate ventilation	3	1	1		1	1	6	-	Low
Environment - emissions to water	Causes - Cooling water blow-down. Laboratory waste (if included in the design). Maintenance waste, e.g., oils. Spills from batteries, coolant system, diesel trucks, transformers. Parked vehicles – oil drips. Fire water runoff control. Kitchen waste and sewage. Refrigerant release. Consequences - Pollution if not contained. Excessive disposal costs if emissions not limited.	2	2	3		2	3	27	-	Medium	• Bunding under any outdoors tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important. • Sewage and any kitchen liquids - containment and suitable treatment/ disposal. • Procedures for dealing with damaged/leaking equipment as well as clean-up of spills. • Normal site practices for preventing and containing diesel/paint etc spills. • Waste management plan to be in place e.g., liquid waste treatment or suitable removal and disposal will be provided. • Spill clean-up procedures to be in place before bringing container on site, including spill kits – non-combustible materials, hazmat disposal. • The NEMA has a list of substances with Reportable spill Quantities, ensure compliance with this.	2	2	3		2	2	18	-	Low
Environment - emissions to earth	Causes - Mess area and other solid waste. Disposal of solid-state batteries. Consequences - Environmental damage.	2	2	3		3	3	30	-	Medium	• Implement waste segregation (e.g., electronic equipment, chemicals, domestic) and management on the site.	2	2	3		3	1	10	-	Low
Environment - waste of resources e.g., water, power etc	Causes - Similar to construction phase. Disposal of batteries or components. Disposal of containers. Water usage not controlled. Consequences - Delays. Excessive costs and disposal of large volumes of hazardous waste.	1	1	1		2	4	20	-	Low	• Water usage to be monitored on site. • Handling protocols to be provided by supplier of batteries. • Water management plan and spill containment plans to be in place. Investigate end of Life plan for solid state batteries - reuse/ recovery/ reconditioning. • Similarly, for decommissioned containers – reuse/ recovery/ repurpose	1	1	1		2	2	10	-	Low

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Public - Aesthetics	Causes - Bright surfaces reflecting light. Tall structures in a flat area. Consequences - Irritation.	1	2	4		4	2	22	-	Low	• Refer to Visual Impact Assessment which is to include the BESS installation once design details are available	3	1	3		4	2	22	-	Low
Investors - Financial	Causes - Defective technology. Extreme project delays. Consequences - Financial loss	5	1	3		4	3	39	-	Medium	• Design by experienced contractors using internationally recognized and proven technology. Project management with deviation monitoring.	3	1	3		4	2	22	-	Low
Employees and investors - Security	Causes - On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences - Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.	3	1	3		2	4	36	-	Medium	• Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. • Consider motion detection lights and CCTV. • The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs. • Isolated location both helps and hinders security. • Night lighting to be provided both indoors and outdoors where necessary.	3	1	3		2	2	18	-	Low
Employees and investors - Security	Causes - Cyber security attacks aimed at the National Electricity Grid. Consequences - Ransom of the National Electricity Grid.	4	4	3		1	4	48	-	High	• Cyber security needs monitoring. • Remote access to system needs to be negotiated and controlled. • Password controls, levels of authority etc. • Protection of the National Electricity Grid from Cyber-attacks accessing through the BESS. • Cyber emergency procedures – should be in place prior to commissioning.	4	4	3		1	2	24	-	Medium
Emergencies	Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse. Inadequate emergency response to small event leads to escalation. Consequences - Injuries turn to fatalities, small losses become extended down time.	4	2	3		4	3	39	-	Medium	• Emergency procedures need to be practiced prior to commencement of operations. • Escape doors should swing open outwards and not into the container. • Doors should be able to be hooked open when persons are inside the container, i.e. they should not be automatically self-closing. More than one exit from buildings. • Storage of spare batteries (e.g., in stores on site or Emergency procedures need to be practiced prior to commencement of operations. • Escape doors should swing open outwards and not into the container. • Doors should be able to be hooked open when persons are inside the container, i.e. they should not be automatically self-closing. More than one exit from buildings. • Storage of spare batteries (e.g., in stores on site or	4	2	3		4	2	26	-	Medium
Investors - Legal	Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences - Unknown hazards manifest due to using “cheaper supplier or less developed technology”.	3	1	3		3	4	40	-	Medium	• Use only internationally reputable battery suppliers who comply with all known regulations/ guideline at the time of purchasing. • Ensure only state of the art battery systems are used and not old technologies prone to fires/explosions etc.	3	1	3		3	2	20	-	Low
VRFB Energy Storage Systems																				
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Construction materials such as cement, paints, solvents, welding fumes, truck fumes etc. Consequences - Employee / contractor illness.	-	1	3		4	4	44	-	High	• The construction phase will be managed according to all the requirements of the OHSA specifically the Construction Regulations. • SHEQ policy in place. • A detailed construction Risk Assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractor’s safety files in place and up to date. • All necessary health controls/ practices to be in place, e.g., ventilation of welding and painting areas. • SHE monitoring and reporting programs in place. Emergency response plan to be in place	1	1	3		4	2	18	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
											prior to beginning construction and to include aspects such as appointment of emergency controller, provision of first aid, first responder contact numbers.									
Human Health - exposure to noise	Causes - Drilling, piling, generators, air compressors. Consequences - Adverse impact on hearing of workers. Possible nuisance factor in near-by areas.	3	1	5		5	4	56	-	High	• Health Risk Assessment to determine if equipment noise exceeds 85 dB at workstation and 61 dB at boundary of the site. • OHSA Noise Induced hearing Loss Regulations. • Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.	2	1	5		5	2	26	-	Medium
Human Health - exposure to temperature extremes and/or humidity	Causes - Heat during the day. Cold in winter. Consequence - Heat stroke. Hypothermia.	3	2	3		1	2	18	-	Low	• Construction site facilities to comply with OHSA specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. • Adequate potable water to be provided during all phases of the project. • Borehole, bowser and tank or small water treatment plant may be required to provide potable water for the employees during all phases of the project.	2	2	3		1	1	8	-	Low
Human Health - exposure to psychological stress	Causes - Large projects bring many contractor workers into a small, isolated community. Consequences – Lack of sufficient accommodation, entertainment etc. Increase in alcohol abuse, violence	2	3	3		2	2	20	-	Low	• Refer to Social Specialist Studies for this project.	2	3	3		2	2	20	-	Low
Human Health - exposure to ergonomic stress	Causes - Lifting heavy equipment. Awkward angles during construction. Consequences - Back and other injuries.	4	1	3		2	3	30	-	Medium	• Training in lifting techniques. • Ensure that despite the isolated location all the necessary equipment is available (and well maintained) during construction. • Otherwise employees may revert to unsafe practices. Isolated location, maintenance of construction equipment to ensure safe operation is critical. • Utilization of local service providers where possible. • Ensure this is in place prior to project beginning. • First aid provision on site.	4	1	3		2	2	20	-	Low
Human and Equipment Safety - exposure to fire radiation	Causes – Involvement in an external fire. Fire involving fuels used in construction vehicles or vehicles themselves (e.g., tyre fire). Fire due to uncontrolled welding or other hot-work Consequences - Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire.	4	2	3		5	4	56	-	High	• Fuels stored on site in dedicated, demarcated and bunded areas. • Suitable fire-fighting equipment on site near source of fuel, e.g., diesel tank, generators, mess, workshops etc. • The company responsible for the facility at this stage is to have: o Emergency plan to be in place prior to commencement of construction. o Fuel spill containment procedures and equipment to be in place. o Hot-work permit and management system to be in place.	4	2	3		5	2	28	-	Medium
Human and Equipment Safety - exposure to explosion over pressures	No credible causes	1	1	1		1	1	4	-	N/A	• No credible causes, hence no mitigation necessary.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to acute toxic	Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants.	4	2	3		2	3	33	-	Medium	• All necessary good hygiene practices to be in place, e.g., provision of toilets, eating areas, infectious disease controls. • Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. • Awareness training for persons on site, safety induction to include animal hazards. • First aid and emergency response to consider the necessary anti-venom, anti-histamines,	3	2	3		2	2	20	-	Low

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		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
chemical and biological agents	Consequences - Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc										• topical medicines etc. • Due to isolated locations some distance from town, ensure the ability to treat with anti-venom and extreme allergic reactions on site.									
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Causes - Construction moving equipment, heavy loaded, elevated loads, working at heights. Consequences - Injury or possibly fatality. Damage to equipment. Delays in starting the project, financial losses	5	1	5		5	4	64	-	High	• The construction phase will be managed according to all the requirements of the OHSA specifically the Construction Regulations. • SHEQ policy in place. • A detailed construction Risk Assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractors safety files in place and up to date. • SHE monitoring and reporting programs in place. • Standard construction site rules regarding traffic, reversing sirens, rigging controls, cordoning off excavations etc. • Civil and building structures to NBRBSA, SANS 10400 and other relevant codes. • Other constructions such as roads, sewers etc also to relevant SANS standards. • All normal procedures for working at heights, hot work permits, confined space entry, cordon off excavations etc to be in place before construction begins. • Emergency response plan to be in place before construction begins.	5	1	5		5	1	16	-	Low
Human and Equipment Safety - exposure to electromagnetic waves	Causes - Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences - Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	5	2	5		5	3	51	-	High	• Standard maintenance of condition of electrical equipment and safe operating instructions. • Ability to shut off power to systems in use on site. • If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. • Lightning strike rate in the study area is high. • Outside work must be stopped during thunderstorms. • Lighting conductors may be required for the final installation, to be confirmed during design phase.	5	2	5		5	1	17	-	Low
Environment - emissions to air	Causes - Dust from construction and generally hot dry area. Consequences - Adverse impact on employee health.	3	2	1		1	4	28	-	Medium	• May need to use dampening on roads etc. as per normal construction practices. • May need PPE (dust masks) for specific construction workers.	2	2	1		1	2	12	-	Low
Environment - emissions to water	Causes - Diesel for equipment, paints and solvents. Transformer oil spills. Sewage and kitchen/mess area wastewater. Consequences - Environmental damage, particularly to the surface and underground water in the area.	2	2	3		2	3	27	-	Medium	• Normal construction site practices for preventing and containing fuels/ paint/ oil, etc spills. • Bunding under any temporary tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important. • Spill clean-up procedures to be in place before commencing construction. • Sewage and any kitchen liquids - containment and suitable treatment/ disposal	2	2	3		2	2	18	-	Low
Environment - emissions to earth	Causes - Mess area and other solid waste. Consequences - Environmental damage.	2	2	3		3	3	30	-	Medium	• There will be packaging materials that will need to be disposed of after the entire system is connected and commissioned as well as after regular maintenance. • There will need to be waste segregation (e.g., electronic equipment, chemicals) and management on the site.	1	2	3		3	2	18	-	Low
Environment - waste of	Causes - Water usage not controlled. Battery equipment damaged.	1	1	1		2	4	20	-	Low	• Water usage to be monitored on site during construction. • Handling protocols to be provided by battery supplier. • Water management plan and spill containment plans to be in place.	1	1	1		2	2	10	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
resources e.g., water, power etc	Consequences - Delays.																			
Public - Aesthetics	Causes - Bright surfaces reflecting light. Tall structures in a flat area. Consequences - Irritation.	3	2	3		4	4	48	-	High	• Visual impact assessment to include BESS installation when design details become available. Confirm any height limitations for VRFB BESS building (if utility scale)	1	2	3		4	2	20	-	Low
Investors - Financial	Causes - Defective technology. Extreme project delays. Consequences - Financial loss	5	1	3		4	3	39	-	Medium	• Design by experienced contractors using internationally recognized and proven technology. Project management with deviation monitoring.	3	1	3		4	2	22	-	Low
Employees and investors - Security	Causes - On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences - Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.	4	1	3		2	4	40	-	Medium	• Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. • The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs. • Isolated location both helps and hinders security. • Night lighting to be provided both indoors and outdoors where necessary.	3	1	3		2	3	27	-	Medium
Emergencies	Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse. Inadequate emergency response to small event leads to escalation. Consequences - Injuries turn to fatalities, small losses become extended down time.	4	2	3		4	3	39	-	Medium	• Emergency procedures need to be practiced prior to commencement of construction.	4	2	3		4	2	26	-	Medium
Investors - Legal	Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences - Unknown hazards manifest due to using “cheaper supplier or less developed technology”.	3	1	3		3	4	40	-	Medium	• Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing. • Ensure only state of the art battery systems are used and not old technologies prone to fires/explosions etc.	2	1	3		3	2	18	-	Low

16.1.3.2 Sunnyside Solar PV Site

Table 16-4: Operational Potential Impacts

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Agricultural - none identified																				
Avifauna																				

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Avifauna	Displacement of priority species due to habitat transformation associated with the presence of the PV plants and associated infrastructure	2	4	3	3	3	3	45	-	High	• An all-infrastructure exclusion zone should be implemented and maintained within 2.5 km of the identified Martial Eagle nest and within 1 km of the identified Verreaux's Eagle nests. • A solar panel exclusion zone buffer should be implemented and maintained around all surface water features such as dams and reservoirs (200 m), as well as non-perennial drainage lines and associated herbaceous wetlands (150 m). • Access to the rest of the property must be restricted during maintenance activities. • The recommendations of the Terrestrial Biodiversity and Botanical Specialist Study must be strictly implemented, especially as far as site rehabilitation is concerned.	1	4	2	3	1	3	33	-	Medium
Avifauna	Mortality of priority species due to collisions with the solar panels.	1	4	1	2	1	2	18	-	Low	• No mitigation is required due to the low significance of this impact	1	3	1	2	1	2	16	-	Low
Avifauna	Entanglement/entrapment of birds in the perimeter fence.	1	4	2	3	1	3	33	-	Medium	• Replace at least the top two barbed strands with smooth wire to eliminate the risk of entanglement. • Increasing the spacing between at least the top two wires (to a minimum of 30 cm) and ensuring they are correctly tensioned will also reduce the entanglement risk. • A single (instead of double) perimeter fence should be used if possible.	1	3	1	2	1	2	16	-	Low
Avifauna	Electrocution of priority species on the 33 kV power line network and in the on-site substations.	2	3	1	3	3	2	24	-	Medium	• The cables must be placed underground as much as practically possible. The final pole design must be developed in consultation with the avifaunal specialist to ensure that a bird friendly design is employed. The avifaunal specialist should provide input and approve on the final pole design. • Due to the complicated design of the substation hardware, pro-active mitigation is not a practical option. Instead, the situation must be monitored, and should electrocutions of priority species be recorded, reactive mitigation could be applied in the form of insulation of live components.	2	2	1	2	3	1	10	-	Low
Avifauna	Mortality due to collisions with the overhead sections of the internal 33 kV cables.	2	3	2	3	3	2	26	-	Medium	• Bird flight diverters should be installed on all the overhead line sections for the full span length according to the applicable Eskom standard at the time. • The final pole design must be developed in consultation with the avifaunal specialist to ensure that a bird friendly design is employed.	2	1	1	2	3	1	9	-	Low
Geotechnical																				
Soil Erosion	Increased erosion due to alteration of natural drainage	1	2	1	1	2	1	7	-	Low	• Maintain access roads including drainage features • Monitor for erosion and remediate and rehabilitate timeously	1	1	1	1	2	1	6	-	Low
Heritage																				
Impacts to archaeological heritage resources	Operational activities that take place near to archaeological resources may result in their destruction	1	1	4	1	4	1	11	-	Low	• No development activities within the high archaeological sensitivity area identified • Should any previously unknown archaeological resources be impacted during construction, work must cease in the vicinity of the find and the relevant heritage authority must be contacted	1	1	4	1	4	1	11	-	Low
Impacts to palaeontological resources	Operational activities that take place near to palaeontological resources may result in their destruction	1	1	4	1	4	3	33	-	Medium	• Implementation of the Chance Fossil Finds Protocol	1	1	4	1	4	1	11	-	Low
Socio-economic																				
Increase in production	Expenditure associated with the operations of the proposed development will impact the production of the local economy.	3	3	2	1	3	3	36	+	Medium	• The project developer should make effort to use locally sourced inputs where feasible in order to maximize the benefit to the local economy. • Local Small and Medium Enterprises are to be approached to investigate the opportunities for supplying inputs required for the maintenance and operation of the facility, as far as feasible.	3	3	2	2	3	3	39	+	Medium
Increase on GDP	Temporary increase in country's GDP due to operational expenditure	3	3	2	1	3	3	36	+	Medium	• The project developer is to try to use locally sourced inputs where feasible in order to maximize the benefit to the local economy. • Local Small and Medium Enterprises are to be approached to investigate the opportunities for supplying inputs required for the maintenance and operation of the facility, as far as feasible.	3	3	2	2	3	3	39	+	Medium

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Increase in Employment	The operation of the proposed development will positively impact the community and beyond by creating a number of job opportunities.	2	3	3	3	3	2	28	+	Medium	• Where feasible, effort must be made to employ locally in order to create maximum benefit for the communities.	2	4	3	3	3	2	30	+	Medium
Increase in household earnings	Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	3	3	1	1	3	3	33	+	Medium	• Employing locally will increase benefit to local households and the local area	3	3	1	2	3	3	36	+	Medium
Increase in government revenue	The investment in the facility will generate revenue for the government during the construction period through a combination of personal income tax, VAT, companies' tax, etc.	3	3	2	3	3	3	42	+	Medium	• N/A	3	3	2	3	3	3	42	+	Medium
Rental revenue for landowners	The landowners will receive monthly/ annual compensation for the solar panels situated on their farms, this will help to increase the landowner's revenue to ensure sustainability on the farms.	1	3	2	3	3	3	36	+	Medium	• N/A	1	3	2	3	3	3	36	+	Medium
Sustainable increase in electricity	The additional electricity that will be generated will increase electricity supply in the country.	4	4	3	2	3	3	48	+	High	• N/A	4	4	3	2	3	3	48	+	High
Sense of place	Negative impact on sense of place (noise and visual) for farmers where solar panels and associated infrastructure will be located.	1	3	2	2	3	2	22	-	Low	• Refer to visual specialist report for mitigation measures.	1	3	2	2	3	2	22	-	Low
Impact on agricultural operations	Loss of agricultural space	1	4	3	3	3	3	42	-	Medium	• Construct the solar panels on parts where the least arable land will be affected	1	3	2	2	3	2	22	-	Low
Terrestrial Biodiversity																				
Changes to soil characteristics: PV maintenance and erosion from panel washing	Washing of panels could contribute to the erosion and sedimentation of neighbouring habitats	1	1	2	1	1	1	6	-	Low	• Unlikely to have significant impact as the volume of water required, that will runoff, will likely quickly seep into soil and/ evaporate • Frequency of panel washing to be minimised	1	1	2	1	1	1	6	-	Low
Visual impact: solar PV facility operations	Operation of solar PV facility, the reflective surfaces and operational light pollution may cause disorientation affecting the behaviour and distribution of fauna	2	3	1	1	3	2	20	-	Low	• Light pollution from safety and security lighting infrastructure creates glare off panels and increased light pollution, disrupting nocturnal species' behaviour and natural rhythms, such as migration patterns or hunting behaviour. • The need for artificial lighting should be minimised. • Should it be necessary, lighting at the solar PV facility should have appropriate shielding or make use of downward directional fixtures with low intensity lighting. • Illumination of adjacent habitats should be avoided.	2	2	1	1	3	2	18	-	Low
Establishment, spread and propagation of alien invasive species: Maintenance of	Activities related to the maintenance of the solar PV facility can cause the spread and establishment of alien invasive species	2	4	2	1	3	2	24	-	Medium	• An effective Alien Invasive Awareness and Management Programme should be established, focusing on the identification and removal of pervasive invasive species. • AIP material should be removed from the site to reduce the potential for re-establishment. • Ongoing management as part of the alien invasive management programme. • The Alien Invasive Management Plan will need to be applied broadly to the entire footprint to effectively reduce alien invasive species and prevent their recolonisation of cleared areas.	1	2	2	1	3	1	9	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
the solar PV facility																				
Soil contamination: Spillages and Leakage of harmful substances from heavy machinery and vehicle movement	Heavy machinery can result in spillages of harmful substances and potential contamination of soil with hydrocarbons	1	3	1	1	1	1	7	-	Low	• Vehicles to be adequately maintained and fitted with drip trays when left standing. • It is advisable that spill kits are available on site.	1	1	1	1	1	1	5	-	Low
Transport																				
Traffic Impact due to maintenance and permanent site staff trips / periodical trips to site for transport of water.	Slight increase of vehicle trips due to permanent staff traveling to site, periodically (bi-annual) trips to site for transport of water and irregular maintenance trips	2	3	1	1	3	1	10	-	Low	• Source on-site water supply as far as possible; • Utilise cleaning systems for panels needing less vehicles trips; • Schedule trips for the provision of water for the cleaning of panels outside peak traffic periods as much as possible.	2	2	1	1	3	1	9	-	Low
Visual impact																				
Altered Sense of Place and Visual Intrusion caused by the SEF	The development of this PV array may be perceived as conflicting with the current undeveloped, largely deserted inhospitable agricultural landscape. The proposed SEF is anticipated to interrupt and/or degrade views, affecting the sense of place and presenting as a visual intrusion across the landscape.	2	3	1	1	3	3	30	-	Medium	• Ensure that the roof colour of the proposed buildings blends into the landscape. • Install the powerlines underground, where possible. • Fence the perimeter of the site with green or black fencing.	2	3	1	1	3	2	20	-	Low
Visual Discomfort and Impaired Visibility caused by Glint and Glare	The glare analysis indicated that no glare will be experienced at the Ops modelled, however a short duration of glare will be experienced along the gravel road route.	2	3	1	1	3	2	20	-	Low	• Retain vegetation and corpses of trees between the PV array and the (main) gravel road.	2	2	1	1	3	1	9	-	Low
Altered Visual Quality caused by Light Pollution at Night	The installation of lighting on the site perimeter and / or around the BESS is anticipated to generate nightglow which currently does not emanate from the natural, undeveloped site. The introduction of lighting on the site will alter the sense of place and visual quality to surrounding receptors.	2	4	1	1	3	2	22	-	Low	• Reduce the height of lighting masts to a workable minimum. • Direct lighting inwards and downwards to limit light pollution.	2	3	1	1	3	2	20	-	Low
Risk																				
SSLB Energy Storage Systems																				

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Operation and maintenance materials spare parts, paints, solvents, welding fumes, transformers oils, lubricating oils and greases etc. Consequences - Occupational illness.	2	1	3		4	5	50	-	High	• The operation and maintenance phase will be managed according to all the requirements of the OHSA. • SHEQ policy in place. • A detailed Risk Assessment of all normal operating and maintenance activities on site to be compiled, and form the basis of operating instructions, prior to commencing commissioning. • SHE procedure in place, e.g., PPE specified, management of change, integrity monitoring. • SHE appointees in place. • Training of staff in general hazards on site. All necessary health controls/ practices to be in place, e.g., ventilation of confined areas, occupational health monitoring if required and reporting programs in place. • Emergency response plan for full operation and maintenance phase to be in place prior to beginning commissioning and to include aspects such as: o appointment of emergency controller, o emergency isolation systems for electricity, o emergency isolation and containment systems for electrolyte, o provision of PPE for hazardous materials response, o provision of emergency facilities for staff at the main office building, o provision of first aid facilities, o first responder contact numbers, etc.	1	1	3		4	2	18	-	Low
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Compromised battery compartments vapours accumulate in the containers, solids/liquids on surfaces. Maintenance of battery components, corrosive and mildly toxic liquid on surfaces. Consequences - Dermatitis, skin /eye/lung irritation.	3	1	3		5	4	48	-	High	• Solid state batteries sealed, individual batteries in modules which are also sealed, pre-packed in the container. • Maintenance procedures will be in place should equipment need to be opened, e.g., pumps drained and decontaminated prior to repair in workshop, etc. • PPE will be specified for handling battery parts and other equipment on site. • Training of staff in hazards of chemicals on site. • Possible detectors with local alarms if regulated occupational exposure limits are exceeded etc prior to entry for inspection of battery containers. • Labelling of all equipment. • Confined space entry procedures if entering tanks. • There needs to be careful thought given to procedures to be adopted before entering into the BESS or a container particularly after a BMS shut down where there may be flammable or toxic gases present, a fire, etc. • SDSs to be available on site. • Operating manuals to be provided including start-up, shut-down, steady state, monitoring requirements. • Maintenance manuals with make safe, decontamination and repair procedures. • Proposed maintenance schedules e.g., checklists for weekly, monthly, annual etc. • Provided portable equipment for calibration and for testing/ verification of defective equipment, e.g., volt/ current meters, infrared camera	1	1	3		5	2	20	-	Low
Human Health - exposure to noise	Causes - Moving parts inside containers, buildings, pumps, compressors, cooling systems etc. Consequences - Adverse impact on hearing of workers. Nuisance factor at near -by residences or other activities.	2	1	5		5	4	52	-	High	• Design to ensure continuous noise does not exceed 85 dB within the facilities or at any other location on site or 61 dB at the site boundary, e.g., emergency generator, air compressor etc. • OHSA Noise Induced hearing Loss Regulations Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.	2	1	5		5	2	26	-	Medium

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Human Health - exposure to temperature extremes and/or humidity	Causes - Heat during the day. Batteries generate heat within enclosed building / containers. Cold in winter. Night work requires lighting. Consequences - Heat stroke. Hypothermia.	4	2	3		1	2	20	-	Low	• Building and container facilities to comply with OHSA specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. • Ensure containers are temperature controlled as required to remain within the optimal battery operating temperature range. • Lighting to be provided inside any buildings, inside the containers, possibly linked to the door opening and outdoors where necessary. • Adequate potable water to be provided during all phases of the project. • Suitable lighting to be provided including emergency lighting for safe building exit in the event of power failure. • PPE for operations and maintenance staff to be suitable for the weather conditions.	3	2	3		1	1	9	-	Low
Human Health - exposure to psychological stress	Causes - Isolated workstation and monotonous repetitive work. Consequences - Low performance, system productivity suffers.	2	3	3		2	2	20	-	Low	• Staff rotation to other activities within the site may be necessary. • Performance monitoring of inspections/ maintenance tasks in particular will be necessary.	1	3	3		2	1	9	-	Low
Human Health - exposure to ergonomic stress	Causes - Lifting heavy equipment. Awkward angles during maintenance, stretching reaching to high level and bending to low level. Working at height if equipment located on top of roofs or elevated electrical equipment (e.g., pylons). Consequences - Back and other injuries.	5	1	3		2	3	33	-	Medium	• Training in lifting techniques. • Training in working at heights. • If equipment is at height (see OHSA General Safety Regulation 6), ensure suitable safe (electrically and physically) ladders/ harnesses, etc. are available. • Working at height procedure to be in place.	4	1	3		2	2	20	-	Low
Human and Equipment Safety - exposure to fire radiation	Causes – Involvement in an external fire e.g., veld fire, maintenance vehicle fire, electrical systems fire. Manufacturing defects or damage to battery leading to shorting and heating. High humidity condensation of water or ingress of water or flooding leading to shorting. Dust accumulation on electrical parts leading to overheating. Excessive electrical loads - surges Operator abuse BMS failure or software failure. Incorrect extinguishing medium, escalate the fire. Consequences - Contaminated run off. Radiation burns unlikely to be severe as no highly flammable materials on site. Damaged equipment. Fire spreads to other units or offsite if grass/ vegetation not controlled.	5	1	5		5	4	64	-	High	• Grass cutting and fire breaks around the BESS installations to prevent veld fires. • No combustible materials to be stored in or near the batteries or electrical infrastructure. • Separation of site diesel tank, transformers from BESS and vice versa. • There are BESS design codes from the USA and standards of practice that can be used e.g., UL9540, NFPA 855 and DNV GL RP 43. • Detailed FMEA/ Hazop/ Bowtie to done during design at the component level and system levels. • Safety integrity level rating of equipment (failure probably) with suitable redundancy if required. • Site Acceptance Testing as part of commissioning of each unit and the overall system. • Abuse tests conducted by supplier. • BMS should be checking individual cell voltage as well as stack, module, container, system voltages/ current etc. • BMS tripping the cell and possibly the stack/ building unit or module/ rack/ container, if variations in voltage. • Diagnostics easily accessible. • Diagnostics able to distinguish cell from stack or cell from module faults. • Protective systems are only as good as their reliability and functionality testing is important, e.g., testing that all battery trips actually work. • Fire resistant barrier between the batteries and the PCS side if in the same container, or separate containers. • Suitable ingress protection level provided for electrical equipment, e.g., IP55 - 66. • If air cooling into container, suitable dust filters to be provided. • Smoke detectors linked to BMS & alerts in control room. • Effects of battery aging to be considered. • Solid state battery life starts to be impacted above 40 deg C and significant impacts	5	1	5		5	1	16	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
											above 50 deg C with thermal run away starting at 65-70 deg C. • BMS trips system at 50 deg C. • Temperature monitoring to be in place. • Regular infrared scanning. • Data needs to be stored for trend analysis. • Data indicates an event frequency of 0.001 per installation and with 700 units this would mean an event once 2 years, i.e. a high probability event. • Most events will be small not resulting in injuries, but this is possible if the event is not controlled. • Prior to commencement of cold commissioning, emergency plan from transport and construction phase to be extended to operational phase and to include the hazards of the electrically live system. • Procedure to address solid state container fires - extinguishing, ventilating, entering as appropriate or not. • PPE for container firefighting include fire retardant, chemically resistant, nitrile gloves, antistatic acid resistant boots, fill face shields, BA sets. • A planned fire response to prevent escalation to an explosion or an environmental event. • Suitable supply of fire extinguishing medium and cooling medium • Consider fire water for cooling adjacent equipment – BESS units. Can use fogging nozzles to direct smoke. • Ensure procedures in place for clean up after event Lingering HF and other toxic residues in the soil and on adjacent structures. • Procedures to be in place for IR scanning (or other suitable method) to determine if batteries are still smouldering/ are sufficient cooled to handle as batteries may still be active some weeks after an event. • Smoke or gas detector systems that are not part of the original battery container package, need to be linked to the main control panel for the entire system so that issues can be detected and responded to rapidly.									
Human and Equipment Safety - exposure to fire radiation	Causes - PCS (DC to AC) cooling failure electrical fire. Consequences - Fire starts in PCS or another section or room and spreads to battery area.	5	2	5		5	4	68	-	High	• Modern lithium container design put the PCS in another part of the container with a fire rated wall separating it from the battery. • Alternately the PCS is another container altogether.	5	2	5		5	1	17	-	Low
Human and Equipment Safety - exposure to explosion over pressures	Cause 1 - Transformer shorting / overheating / explosion. Cause 2 - Flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces, static. Lithium Cobalt Oxide generates O2 during decomposition – escalation. Consequences - Potential fatalities amongst first responders. Damage to container or other nearby items, e.g., other container.	5	1	5		5	2	32	-	Medium	• Electrical equipment will be specified to suit application. • Emergency response plan and employee training referred to above is to be in place. • This is only really likely to happen due to possible inappropriate emergency response, e.g., opening containers when they may be the type that should be left to burn out. • Modern state of the art containers have ventilation systems for vapours. • Undertake a hazardous area classification of the inside of the container to confirm the rating of electrical equipment, due to possible leaks of electrolyte or generation of flammable gases under thermal run away. • Emergency response plan and employee training referred to above is critical. • Suitable training of selected emergency responders who may be called out to the facilities is critical. • Refer to Appendix A of the Risk Assessment Report for an initial approximation of worst-case possible explosion impact zones.	5	1	5		5	1	16	-	Low
Human and Equipment Safety - exposure to acute toxic	Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants.	4	1	3		2	3	30	-	Medium	• All necessary good hygiene practices to be in place, e.g., provision of toilets, eating areas, infectious disease controls. • Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. • Awareness training for persons on site, safety induction to include animal hazards.	3	1	2		2	2	16	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
chemical and biological agents	Consequences - Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc										• First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. • Due to isolated locations some distance from town, ensure the ability to treat with anti-venom and extreme allergic reactions on site.									
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes - Damaged batteries components, leak electrolyte, are completely broken exposing hazardous chemicals. Hazardous fumes released on thermal run away see fire above. Consequences - Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns for large exposure. In the case of toxic fumes, serious lung damage.	4	3	3		5	3	45	-	High	• Acid resistant PPE (e.g., overalls, gloves, eyeglasses) to be specified for all operations in electrolyte areas. • PPE to be increased (e.g., full-face shield, aprons, chemical suits) for operations that involve opening equipment and potential exposure, e.g., sampling, maintenance. • All operators/maintenance staff trained in the hazards of chemicals on site. • Batteries contained, modules contained and all inside a container that acts as bund. • Refer to fire above as all the protective measures apply to prevent toxic smoke. • Refer to fire above as all the measures apply to mitigate toxic smoke. • 24/7 helpline response. • Standard dangerous goods requirements for Hazmat labels. • All operators/maintenance staff trained in the hazards. • Refer to Appendix A of the Risk Assessment Report for an initial approximation of worst case possible noxious smoke impact zones.	3	3	3		5	2	28	-	Medium
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Causes - Moving equipment, pumps, heavy equipment at elevation, nip points, working at heights. Traffic accidents. Earthquake / tremor. Consequences - Injury. Fatality in unlikely worst case, e.g., traffic accidents or fall from heights. Damage to equipment, spills, environment pollution	5	1	5		5	3	48	-	High	• Apart from pumps, no major moving parts during operation. • Maintenance equipment to be serviced and personnel suitably trained in the use thereof. • Normally just small vehicles on site, bakkies, grass cutting, cherry-pickers etc. • Possibly large cranes if large equipment or elevated structure removed/replaced. • Traffic signs, rules etc in place on site. • All normal working at heights, hot work permits, confined space entry, cordon off unsafe areas/ works, etc. to be in place. • Emergency response plan. • Civil design to take seismic activity into account.	5	1	5		5	1	16	-	Low
Human and Equipment Safety - exposure to electromagnetic waves	Causes - Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences - Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	5	2	5		5	3	51	-	High	• Codes and guidelines for electrical insulation. • Suitable PPE to be specified. • Low voltage equipment (e.g., batteries) separated from high voltage (e.g., transmission to grid). • Ensure trained personnel and refer to guideline – IEE 1657 – 2018. • Ensure compliance with Eskom Operating Regulations for high voltage systems including access control, permit to work, safe work procedures, live work, abnormal and emergency situations, keeping records. • Electromagnetic fields, impact on other equipment, e.g., testing devices, mobile phones – malfunction, permanent damage. • Software also need to be kept as update to date as reasonably practicable. • Consider suitably located Emergency stop buttons for the facility and the other equipment on site. • PPE to consider static accumulation for entering the facility, and particularly the battery containers especially after a high temperature shut down where there could possibly be flammable materials. • The procedures for responding to alarm and auto shut down on containers, needs to consider that there may be a dangerous environment inside and how to protect personnel who may enter to respond. • Lightning strike rate in proposed development area is high. • All outside work must be stopped during thunder storms. • Lighting conductors may be required for the installation, to be confirmed during design	5	2	5		5	1	17	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Environment - emissions to air	Not expected on a normal basis. Refrigerant may be an asphyxiant if accidentally released indoors it can accumulate and displace oxygen.	3	1	1		1	3	18	-	Low	• Especially after any warning alarms have gone off, but possibly even normally the container could be treated as entering a confined space and similar procedures could be in place, e.g., do not enter alone, gas testing prior to entering, ensure adequate ventilation	3	1	1		1	1	6	-	Low
Environment - emissions to water	Causes - Cooling water blow-down. Laboratory waste (if included in the design). Maintenance waste, e.g., oils. Spills from batteries, coolant system, diesel trucks, transformers. Parked vehicles – oil drips. Fire water runoff control. Kitchen waste and sewage. Refrigerant release. Consequences - Pollution if not contained. Excessive disposal costs if emissions not limited.	2	2	3		2	3	27	-	Medium	• Bunding under any outdoors tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important. • Sewage and any kitchen liquids - containment and suitable treatment/disposal. • Procedures for dealing with damaged/leaking equipment as well as clean-up of spills. • Normal site practices for preventing and containing diesel/ paint, etc. spills. • Waste management plan to be in place, e.g., liquid waste treatment or suitable removal and disposal will be provided. • Spill clean-up procedures to be in place before bringing container on site, including spill kits – non-combustible materials, hazmat disposal. • The NEMA has a list of substances with Reportable spill Quantities, ensure compliance with this.	2	2	3		2	2	18	-	Low
Environment - emissions to earth	Causes - Mess area and other solid waste. Disposal of solid-state batteries. Consequences - Environmental damage.	2	2	3		3	3	30	-	Medium	• Implement waste segregation (e.g., electronic equipment, chemicals, domestic) and management on the site.	2	2	3		3	1	10	-	Low
Environment - waste of resources e.g., water, power etc	Causes - Similar to construction phase. Disposal of batteries or components. Disposal of containers. Water usage not controlled. Consequences - Delays. Excessive costs and disposal of large volumes of hazardous waste.	1	1	1		2	4	20	-	Low	• Water usage to be monitored on site. • Handling protocols to be provided by supplier of batteries. • Water management plan and spill containment plans to be in place. • Investigate end of Life plan for solid state batteries - reuse/ recovery/ reconditioning. • Similarly, for decommissioned containers – reuse/ recovery/ repurpose	1	1	1		2	2	10	-	Low
Public - Aesthetics	Causes - Bright surfaces reflecting light. Tall structures in a flat area. Consequences - Irritation.	1	2	4		4	2	22	-	Low	• Refer to Visual Impact Assessment which is to include the BESS installation once design details are available	3	1	3		4	2	22	-	Low
Investors - Financial	Causes - Defective technology. Extreme project delays. Consequences - Financial loss	5	1	3		4	3	39	-	Medium	• Design by experienced contractors using internationally recognized and proven technology. • Project management with deviation monitoring.	3	1	3		4	2	22	-	Low
Employees and investors - Security	Causes - On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences - Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.	3	1	3		2	4	36	-	Medium	• Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. • Consider motion detection lights and CCTV. • The hazardous nature of the electrical and battery equipment should be clearly indicated, e.g., Skull and Cross Bones or other signs. • Isolated location both helps and hinders security. • Night lighting to be provided both indoors and outdoors where necessary.	3	1	3		2	2	18	-	Low
Employees and investors - Security	Causes - Cyber security attacks aimed at the National Electricity Grid. Consequences - Ransom of the National Electricity Grid.	4	4	3		1	4	48	-	High	• Cyber security needs monitoring. • Remote access to system needs to be negotiated and controlled. • Password controls, levels of authority, etc. • Protection of the National Electricity Grid from Cyber-attacks accessing through the BESS. • Cyber emergency procedures – should be in place prior to commissioning.	4	4	3		1	2	24	-	Medium

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Emergencies	Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse. Inadequate emergency response to small event leads to escalation. Consequences - Injuries turn to fatalities, small losses become extended down time.	4	2	3		4	3	39	-	Medium	• Emergency procedures need to be practiced prior to commencement of operations. • Escape doors should swing open outwards and not into the container. • Doors should be able to be hooked open when persons are inside the container, i.e. they should not be automatically self-closing. • More than one exit from buildings. Storage of spare batteries (e.g., in stores on site or Emergency procedures need to be practiced prior to commencement of operations. • Escape doors should swing open outwards and not into the container. • Doors should be able to be hooked open when persons are inside the container, i.e. they should not be automatically self-closing. • More than one exit from buildings. Storage of spare batteries (e.g., in stores on site)	4	2	3		4	2	26	-	Medium
Investors - Legal	Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences - Unknown hazards manifest due to using "cheaper supplier or less developed technology".	3	1	3		3	4	40	-	Medium	• Use only internationally reputable battery suppliers who comply with all known regulations/ guideline at the time of purchasing. • Ensure only state of the art battery systems are used and not old technologies prone to fires/ explosions, etc.	3	1	3		3	2	20	-	Low
VRFB Energy Storage Systems																				
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Construction materials such as cement, paints, solvents, welding fumes, truck fumes, etc. Consequences - Employee / contractor illness.	-	1	3		4	4	44	-	High	• The construction phase will be managed according to all the requirements of the OHSA specifically the Construction Regulations. • SHEQ policy in place. • A detailed construction Risk Assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractor's safety files in place and up to date. • All necessary health controls/ practices to be in place, e.g., ventilation of welding and painting areas. • SHE monitoring and reporting programs in place. • Emergency response plan to be in place prior to beginning construction and to include aspects such as appointment of emergency controller, provision of first aid, first responder contact numbers.	1	1	3		4	2	18	-	Low
Human Health - exposure to noise	Causes - Drilling, piling, generators, air compressors. Consequences - Adverse impact on hearing of workers. Possible nuisance factor in near-by areas.	3	1	5		5	4	56	-	High	• Health Risk Assessment to determine if equipment noise exceeds 85 dB at workstation and 61 dB at boundary of the site. • OHSA Noise Induced hearing Loss Regulations. • Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.	2	1	5		5	2	26	-	Medium
Human Health - exposure to temperature extremes and/or humidity	Causes - Heat during the day. Cold in winter. Consequence - Heat stroke. Hypothermia.	3	2	3		1	2	18	-	Low	• Construction site facilities to comply with OHSA specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. • Adequate potable water to be provided during all phases of the project. • Borehole, bowser and tank or small water treatment plant may be required to provide potable water for the employees during all phases of the project.	2	2	3		1	1	8	-	Low
Human Health - exposure to psychological stress	Causes - Large projects bring many contractor workers into a small, isolated community. Consequences – Lack of sufficient accommodation, entertainment etc. Increase in alcohol abuse, violence	2	3	3		2	2	20	-	Low	• Refer to Social Specialist Studies for this project.	2	3	3		2	2	20	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Human Health - exposure to ergonomic stress	Causes - Lifting heavy equipment. Awkward angles during construction. Consequences - Back and other injuries.	4	1	3		2	3	30	-	Medium	• Training in lifting techniques. • Ensure that despite the isolated location all the necessary equipment is available (and well maintained) during construction. • Otherwise employees may revert to unsafe practices. • Isolated location, maintenance of construction equipment to ensure safe operation is critical. • Utilization of local service providers where possible. • Ensure this is in place prior to project beginning. • First aid provision on site.	4	1	3		2	2	20	-	Low
Human and Equipment Safety - exposure to fire radiation	Causes – Involvement in an external fire. Fire involving fuels used in construction vehicles or vehicles themselves (e.g., tyre fire). Fire due to uncontrolled welding or other hot-work Consequences - Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire.	4	2	3		5	4	56	-	High	• Fuels stored on site in dedicated, demarcated and bunded areas. • Suitable fire-fighting equipment on site near source of fuel, e.g., diesel tank, generators, mess, workshops, etc. • The company responsible for the facility at this stage is to have: o Emergency plan to be in place prior to commencement of construction. o Fuel spill containment procedures and equipment to be in place. o Hot-work permit and management system to be in place.	4	2	3		5	2	28	-	Medium
Human and Equipment Safety - exposure to explosion over pressures	No credible causes	1	1	1		1	1	4	-	N/A	• No credible causes, hence no mitigation necessary.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants. Consequences - Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms, etc.	4	2	3		2	3	33	-	Medium	• All necessary good hygiene practices to be in place, e.g., provision of toilets, eating areas, infectious disease controls. • Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. • Awareness training for persons on site, safety induction to include animal hazards. • First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines, etc. • Due to isolated locations some distance from town, ensure the ability to treat with anti-venom and extreme allergic reactions on site.	3	2	3		2	2	20	-	Low
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Causes - Construction moving equipment, heavy loaded, elevated loads, working at heights Consequences - Injury or possibly fatality. Damage to equipment. Delays in starting the project, financial losses	5	1	5		5	4	64	-	High	• The construction phase will be managed according to all the requirements of the OHSA specifically the Construction Regulations. • SHEQ policy in place. • A detailed construction Risk Assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractors safety files in place and up to date. • SHE monitoring and reporting programs in place. • Standard construction site rules regarding traffic, reversing sirens, rigging controls, cordoning off excavations, etc. • Civil and building structures to NBRBSA, SANS 10400 and other relevant codes. • Other constructions such as roads, sewers, etc. also to relevant SANS standards. • All normal procedures for working at heights, hot work permits, confined space entry, cordon off excavations etc to be in place before construction begins. • Emergency response plan to be in place before construction begins.	5	1	5		5	1	16	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Human and Equipment Safety - exposure to electromagnetic waves	Causes - Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences - Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	5	2	5		5	3	51	-	High	• Standard maintenance of condition of electrical equipment and safe operating instructions. • Ability to shut off power to systems in use on site. • If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. • Lightning strike rate in the study area is high. • Outside work must be stopped during thunderstorms. • Lighting conductors may be required for the final installation, to be confirmed during design phase.	5	2	5		5	1	17	-	Low
Environment - emissions to air	Causes - Dust from construction and generally hot dry area. Consequences - Adverse impact on employee health.	3	2	1		1	4	28	-	Medium	• May need to use dampening on roads etc. as per normal construction practices. • May need PPE (dust masks) for specific construction workers.	2	2	1		1	2	12	-	Low
Environment - emissions to water	Causes - Diesel for equipment, paints and solvents. Transformer oil spills. Sewage and kitchen/mess area wastewater. Consequences - Environmental damage, particularly to the surface and underground water in the area.	2	2	3		2	3	27	-	Medium	• Normal construction site practices for preventing and containing fuels/ paint/ oil, etc spills. • Bunding under any temporary tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important. • Spill clean-up procedures to be in place before commencing construction. • Sewage and any kitchen liquids - containment and suitable treatment/disposal	2	2	3		2	2	18	-	Low
Environment - emissions to earth	Causes - Mess area and other solid waste. Consequences - Environmental damage.	2	2	3		3	3	30	-	Medium	• There will be packaging materials that will need to be disposed of after the entire system is connected and commissioned as well as after regular maintenance. • There will need to be waste segregation (e.g., electronic equipment, chemicals) and management on the site.	1	2	3		3	2	18	-	Low
Environment - waste of resources e.g., water, power etc	Causes - Water usage not controlled. Battery equipment damaged. Consequences - Delays.	1	1	1		2	4	20	-	Low	• Water usage to be monitored on site during construction. • Handling protocols to be provided by battery supplier. • Water management plan and spill containment plans to be in place.	1	1	1		2	2	10	-	Low
Public - Aesthetics	Causes - Bright surfaces reflecting light. Tall structures in a flat area. Consequences - Irritation.	3	2	3		4	4	48	-	High	• Visual impact assessment to include BESS installation when design details become available. • Confirm any height limitations for VRFB BESS building (if utility scale)	1	2	3		4	2	20	-	Low
Investors - Financial	Causes - Defective technology. Extreme project delays. Consequences - Financial loss	5	1	3		4	3	39	-	Medium	• Design by experienced contractors using internationally recognized and proven technology. • Project management with deviation monitoring.	3	1	3		4	2	22	-	Low
Employees and investors - Security	Causes - On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences - Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.	4	1	3		2	4	40	-	Medium	• Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. • The hazardous nature of the electrical and battery equipment should be clearly indicated, e.g., Skull and Cross Bones or other signs. • Isolated location both helps and hinders security. • Night lighting to be provided both indoors and outdoors where necessary.	3	1	3		2	3	27	-	Medium

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Emergencies	Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/ structural collapse. Inadequate emergency response to small event leads to escalation. Consequences - Injuries turn to fatalities, small losses become extended down time.	4	2	3		4	3	39	-	Medium	• Emergency procedures need to be practiced prior to commencement of construction.	4	2	3		4	2	26	-	Medium
Investors - Legal	Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences - Unknown hazards manifest due to using "cheaper supplier or less developed technology".	3	1	3		3	4	40	-	Medium	• Use only internationally reputable battery suppliers who comply with all known regulations/ guideline at the time of purchasing. • Ensure only state of the art battery systems are used and not old technologies prone to fires/ explosions, etc.	2	1	3		3	2	18	-	Low

16.1.4 Decommissioning

16.1.4.1 Rhino Solar PV Site

Table 16-5: Decommissioning Potential Impacts

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Agricultural - none identified																				
Avifauna																				
Avifauna	Displacement of priority species due to disturbance associated with decommissioning of the PV facilities and associated infrastructure	1	4	2	3	1	3	33	-	Medium	• Dismantling activity should be restricted to the immediate footprint of the infrastructure as far as possible. Access to the remainder of the area should be strictly controlled to prevent unnecessary disturbance of priority species. • Measures to control noise and dust should be applied according to current best practice in the industry.	1	4	2	3	1	2	22	-	Low
Geotechnical																				
Disturbance/ displacement/ removal of soil and rock	Ground disturbance during access road construction, foundation earthworks, platform earthworks	1	4	2	2	2	1	11	-	Low	• Restore natural site topography • Landscape and rehabilitate access roads and disturbed areas timeously (e.g. regressing)	1	4	2	1	2	1	10	-	Low
Soil Erosion	Increased erosion due to vegetation clearing, alteration of natural drainage	1	2	2	2	2	1	9	-	Low	• Temporary berms and drainage channels to divert surface runoff where needed • Restore natural site topography • Use designated access and laydown areas only to minimise disturbance to surrounding areas	1	1	1	1	2	1	6	-	Low
Heritage																				

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Impacts to archaeological heritage resources	Decommissioning activities that take place near to archaeological resources may result in their destruction	1	1	4	4	4	1	14	-	Low	• Should any previously unknown archaeological resources be impacted during construction, work must cease in the vicinity of the find and the relevant heritage authority must be contacted	1	1	4	4	4	1	14	-	Low
Impacts to palaeontological resources	Decommissioning activities that take place near to palaeontological resources may result in their destruction	1	2	4	4	4	1	15	-	Low	• Implementation of the Chance Fossil Finds Protocol	1	2	4	4	4	1	15	-	Low
Socio-economic																				
Temporary Increase in production	Expenditure associated with the decommissioning of the proposed development will impact the production of the local economy.	3	4	3	1	1	3	36	+	Medium	• The project developer should use locally sourced inputs where feasible in order to maximize the benefit to the local economy.	3	4	4	1	1	3	39	+	Medium
Temporary Increase on GDP	Temporary increase in country's GDP due to capital expenditure during the decommissioning period	3	4	3	1	1	3	36	+	Medium	• The project developer is to use locally sourced inputs where feasible in order to maximize the benefit to the economy.	3	4	4	1	1	3	39	+	Medium
Temporary Increase in Employment	The decommissioning of the proposed development will positively impact the community and beyond by creating a number of job opportunities (albeit temporary).	3	3	3	1	1	3	33	+	Medium	• Where feasible, effort must be made to employ locally in order to create maximum benefit for the communities.	3	3	4	1	1	3	36	+	Medium
Increase in household earnings	Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	3	3	3	1	1	3	33	+	Medium	• Local employment will benefit local households and the local area.	3	3	4	1	1	3	36	+	Medium
Land Restoration	After decommissioning, the land can be restored and repurposed for other uses, potentially increasing its economic value for activities like agriculture, real estate development, or recreation.	1	4	2	2	1	3	30	+	Medium	• N/A	1	4	2	2	1	3	30	-	Medium
Reduced Tax Revenue	SEFs contribute to local tax revenues. Decommissioning can lead to a reduction in tax income for municipalities and regions, impacting their ability to fund public services.	1	3	3	3	1	3	33	-	Medium	• N/A	1	3	3	3	1	3	33	-	Medium
Cost Burden	Decommissioning can be expensive, and the financial responsibility often falls on the facility owner or local government. These costs can strain budgets and resources.	1	3	2	3	1	3	30	-	Medium	• Recommissioning a solar facility is essential to harness sustainable energy sources, reduce carbon emissions, and ensure long-term environmental and economic benefits, making it a sensible choice over decommissioning.	1	3	2	3	1	3	30	-	Medium
Loss of Energy Production	Decommissioning means the loss of renewable energy production, which can affect the availability of energy resources in the region.	2	3	3	3	3	3	42	-	Medium	• Recommissioning a solar facility is essential to harness sustainable energy sources, reduce carbon emissions, and ensure long-term environmental and economic benefits, making it a sensible choice over decommissioning.	2	3	3	3	2	3	39	-	Medium

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Waste management	Effective waste management during the decommissioning phase of a solar farm is crucial for minimizing environmental impact, ensuring safe disposal of materials, and complying with regulations; however, it is costly due to specialized handling requirements and proper disposal methods.	2	3	3	1	1	3	30	-	Medium	• N/A	2	3	3	1	1	3	30	+	Medium
Loss of employment	Should the facility be decommissioned, jobs would be lost.	2	3	2	1	2	1	10	-	Low	• Recommissioning a solar facility is essential to harness sustainable energy sources, reduce carbon emissions, and ensure long-term environmental and economic benefits, making it a sensible choice over decommissioning.	2	3	2	1	2	1	10	-	Low
Terrestrial Biodiversity-none identified																				
Transport																				
Development traffic impact / related noise & dust pollution	Temporary increase in traffic due to construction vehicle trips on the external road network/ increase in noise and dust pollution levels during construction period/ possible damage to road surface of access routes	4	3	1	2	2	2	24	-	Medium	• Stagger component delivery to site; • Reduce the construction period if possible; • Stagger construction phase tasks; • make use of any quarries in the vicinity of the site to decrease the impact of development trips on the external roads; • staff and general trips should occur outside of peak traffic periods as much as possible; monitor access routes for possible damage to mitigate early on, regular spraying of internal site roads with water.	4	2	1	2	2	1	11	-	Low
Visual																				
Altered Sense of Place caused by the decommissioning activities	Dust generated during decommissioning activities will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the site, during the decommissioning period.	2	4	1	1	1	3	27	-	Medium	• Limit vegetation clearance and the footprint of decommissioning to what is absolutely essential. • Avoid excavation, handling and transport of materials which may generate dust under very windy conditions. • Keep stockpiled aggregate and sand covered to minimise dust generation. • Keep site tidy.	2	3	1	1	1	2	16	-	Low
Risk																				
Human Health - chronic exposure to toxic chemical or biological agents	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to noise	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to temperature extremes and/or humidity	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to psychological stress	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Human Health - exposure to ergonomic stress	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to explosion over pressures	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to electromagnetic waves	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Environment - emissions to air	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Environment - emissions to water	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Environment - emissions to earth	Causes - Batteries / electrolyte / equipment reached end of life and may leak. Consequences - Environment damage from heavy metal ions.	4	3	3		5	4	60	-	Medium	• End of Life shutdown procedure including a Risk Assessment of the specific activities involved. • Where possible re-purpose the solid-state batteries/ containers and equipment with associated Environmental impact considered. • Disposal according to local regulations and other directives such as the European Batteries Directive. • End of life, which is affected by temperature and time, cycles etc, should be predefined and the monitoring should be in place to determine if it has been reached.	4	3	3		5	2	30	-	Low
Environment - waste of resources e.g., water, power etc	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Public - Aesthetics	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Investors - Financial	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Emergencies	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Investors - Legal	Disposal of hazardous “waste” is rife with difficulties and numerous regulations that need to be complied with.	3	1	3		3	4	40	-	Medium	• Applicants should seek the opinion from a waste consultant on how to correctly dispose of hazardous waste.	3	1	3		3	3	30	-	Low
VRFB Energy Storage Systems																				
Human Health - chronic exposure to toxic chemical or biological agents	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to noise	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to temperature extremes and/or humidity	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to psychological stress	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to ergonomic stress	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to fire radiation	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to explosion over pressures	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Human and Equipment Safety - exposure to electromagnetic waves	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Environment - emissions to air	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Environment - emissions to water	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Environment - emissions to earth	Causes - Batteries/ electrolyte/ equipment reached end of life and may leak. Consequences - Environment damage from heavy metal ions.	4	3	3		5	4	60	-	Medium	• End of Life shutdown procedure including a Risk Assessment of the specific activities involved. • Where possible re-purpose the solid-state batteries/ containers and equipment with associated Environmental impact considered. • Disposal according to local regulations and other directives such as the European Batteries Directive. • End of life, which is affected by temperature and time, cycles etc, should be predefined and the monitoring should be in place to determine if it has been reached.	4	3	3		5	2	30	-	Low
Environment - waste of resources e.g., water, power etc	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Public - Aesthetics	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Investors - Financial	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Employees and investors - Security	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Emergencies	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Investors - Legal	Disposal of hazardous “waste” is rife with difficulties and numerous regulations that need to be complied with.	3	1	3		3	4	40	-	Medium	• Applicants should seek the opinion from a waste consultant on how to correctly dispose of hazardous waste.	3	1	3		3	3	30	-	Low

16.1.4.2 Sunnyside Solar PV Site

Table 16-6: Decommissioning Potential Impacts

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ OR -)	S
Agricultural - none identified																				
Avifauna																				

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ OR -)	S
Avifauna	Displacement of priority species due to disturbance associated with decommissioning of the PV facilities and associated infrastructure	1	4	2	3	1	3	33	-	Medium	• Dismantling activity should be restricted to the immediate footprint of the infrastructure as far as possible. Access to the remainder of the area should be strictly controlled to prevent unnecessary disturbance of priority species. • Measures to control noise and dust should be applied according to current best practice in the industry.	1	4	2	3	1	2	22	-	Low
Geotechnical																				
Disturbance/ displacement/ removal of soil and rock	Ground disturbance during access road construction, foundation earthworks, platform earthworks	1	4	2	2	2	1	11	-	Low	• Restore natural site topography • Landscape and rehabilitate access roads and disturbed areas timeously (e.g. regressing)	1	4	2	1	2	1	10	-	Low
Soil Erosion	Increased erosion due to vegetation clearing, alteration of natural drainage	1	2	2	2	2	1	9	-	Low	• Temporary berms and drainage channels to divert surface runoff where needed • Restore natural site topography • Use designated access and laydown areas only to minimise disturbance to surrounding areas	1	1	1	1	2	1	6	-	Low
Heritage																				
Impacts to archaeological heritage resources	Decommissioning activities that take place near to archaeological resources may result in their destruction	1	1	4	4	4	1	14	-	Low	• No development activities within the high archaeological sensitivity area identified • Should any previously unknown archaeological resources be impacted during construction, work must cease in the vicinity of the find and the relevant heritage authority must be contacted	1	1	4	4	4	1	14	-	Low
Impacts to palaeontological resources	Decommissioning activities that take place near to palaeontological resources may result in their destruction	1	2	4	4	4	1	15	-	Low	• Implementation of the Chance Fossil Finds Protocol	1	2	4	4	4	1	15	-	Low
Socio-economic																				
Temporary Increase in production	Expenditure associated with the decommissioning of the proposed development will impact the production of the local economy.	3	4	3	1	1	3	36	+	Medium	• The project developer should use locally sourced inputs where feasible in order to maximize the benefit to the local economy.	3	4	4	1	1	3	39	+	Medium
Temporary Increase on GDP	Temporary increase in country's GDP due to capital expenditure during the decommissioning period	3	4	3	1	1	3	36	+	Medium	• The project developer is to use locally sourced inputs where feasible in order to maximize the benefit to the economy.	3	4	4	1	1	3	39	+	Medium
Temporary Increase in Employment	The decommissioning of the proposed development will positively impact the community and beyond by creating a number of job opportunities (albeit temporary).	3	3	3	1	1	3	33	+	Medium	• Where feasible, effort must be made to employ locally in order to create maximum benefit for the communities.	3	3	4	1	1	3	36	+	Medium
Increase in household earnings	Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	3	3	3	1	1	3	33	+	Medium	• Local employment will benefit local households and the local area.	3	3	4	1	1	3	36	+	Medium
Land Restoration	After decommissioning, the land can be restored and repurposed for other uses, potentially increasing its economic value for activities like agriculture, real estate development, or recreation.	1	4	2	2	1	3	30	+	Medium	N/A	1	4	2	2	1	3	30	-	Medium
Reduced Tax Revenue	SEFs contribute to local tax revenues. Decommissioning can lead to a reduction in tax income for municipalities and regions, impacting their ability to fund public services.	1	3	3	3	1	3	33	-	Medium	N/A	1	3	3	3	1	3	33	-	Medium

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ OR -)	S
Cost Burden	Decommissioning can be expensive, and the financial responsibility often falls on the facility owner or local government. These costs can strain budgets and resources.	1	3	2	3	1	3	30	-	Medium	• Recommissioning a solar facility is essential to harness sustainable energy sources, reduce carbon emissions, and ensure long-term environmental and economic benefits, making it a sensible choice over decommissioning.	1	3	2	3	1	3	30	-	Medium
Loss of Energy Production	Decommissioning means the loss of renewable energy production, which can affect the availability of energy resources in the region.	2	3	3	3	3	3	42	-	Medium	• Recommissioning a solar facility is essential to harness sustainable energy sources, reduce carbon emissions, and ensure long-term environmental and economic benefits, making it a sensible choice over decommissioning.	2	3	3	3	2	3	39	-	Medium
Waste management	Effective waste management during the decommissioning phase of a solar farm is crucial for minimizing environmental impact, ensuring safe disposal of materials, and complying with regulations; however, it is costly due to specialized handling requirements and proper disposal methods.	2	3	3	1	1	3	30	-	Medium	N/A	2	3	3	1	1	3	30	+	Medium
Loss of employment	Should the facility be decommissioned, jobs would be lost.	2	3	2	1	2	1	10	-	Low	• Recommissioning a solar facility is essential to harness sustainable energy sources, reduce carbon emissions, and ensure long-term environmental and economic benefits, making it a sensible choice over decommissioning.	2	3	2	1	2	1	10	-	Low
Terrestrial Biodiversity-none identified																				
Transport																				
Development traffic impact / related noise & dust pollution	Temporary increase in traffic due to construction vehicle trips on the external road network/ increase in noise and dust pollution levels during construction period/ possible damage to road surface of access routes	4	3	1	2	2	2	24	-	Medium	• Stagger component delivery to site; • Reduce the construction period if possible; • Stagger construction phase tasks; • make use of any quarries in the vicinity of the site to decrease the impact of development trips on the external roads; • staff and general trips should occur outside of peak traffic periods as much as possible; monitor access routes for possible damage to mitigate early on, regular spraying of internal site roads with water.	4	2	1	2	2	1	11	-	Low
Visual																				
Altered Sense of Place caused by the decommissioning activities	Dust generated during decommissioning activities will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the site, during the decommissioning period.	2	4	1	1	1	3	27	-	Medium	• Limit vegetation clearance and the footprint of decommissioning to what is absolutely essential. • Avoid excavation, handling and transport of materials which may generate dust under very windy conditions. • Keep stockpiled aggregate and sand covered to minimise dust generation. • Keep site tidy.	2	3	1	1	1	2	16	-	Low
Risk																				
Human Health - chronic exposure to toxic chemical or biological agents	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to noise	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ OR -)	S
Human Health - exposure to temperature extremes and/or humidity	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to psychological stress	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to ergonomic stress	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to explosion over pressures	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to electromagnetic waves	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Environment - emissions to air	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Environment - emissions to water	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Environment - emissions to earth	Causes - Batteries / electrolyte / equipment reached end of life and may leak. Consequences - Environment damage from heavy metal ions.	4	3	3		5	4	60	-	Medium	• End of Life shutdown procedure including a Risk Assessment of the specific activities involved. • Where possible re-purpose the solid-state batteries/ containers and equipment with associated Environmental impact considered. • Disposal according to local regulations and other directives such as the European Batteries Directive. End of life, which is affected by temperature and time, cycles etc, should be predefined and the monitoring should be in place to determine if it has been reached.	4	3	3		5	2	30	-	Low

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ OR -)	S
Environment - waste of resources e.g., water, power etc	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Public - Aesthetics	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Investors - Financial	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Emergencies	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Investors - Legal	Disposal of hazardous “waste” is rife with difficulties and numerous regulations that need to be complied with.	3	1	3		3	4	40	-	Medium	• Applicants should seek the opinion from a waste consultant on how to correctly dispose of hazardous waste.	3	1	3		3	3	30	-	Low
VRFB Energy Storage Systems																				
Human Health - chronic exposure to toxic chemical or biological agents	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to noise	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to temperature extremes and/or humidity	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to psychological stress	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human Health - exposure to ergonomic stress	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to fire radiation	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to explosion over pressures	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to acute toxic	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ OR -)	S
chemical and biological agents																				
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Human and Equipment Safety - exposure to electromagnetic waves	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Environment - emissions to air	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Environment - emissions to water	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Environment - emissions to earth	Causes - Batteries / electrolyte / equipment reached end of life and may leak. Consequences - Environment damage from heavy metal ions.	4	3	3		5	4	60	-	Medium	• End of Life shutdown procedure including a Risk Assessment of the specific activities involved. • Where possible re-purpose the solid-state batteries/ containers and equipment with associated Environmental impact considered. • Disposal according to local regulations and other directives such as the European Batteries Directive. • End of life, which is affected by temperature and time, cycles etc, should be predefined and the monitoring should be in place to determine if it has been reached.	4	3	3		5	2	30	-	Low
Environment - waste of resources e.g., water, power etc	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Public - Aesthetics	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Investors - Financial	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Employees and investors - Security	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Emergencies	Similar to the construction and operational phases - no new hazards.	1	1	1		1	1	4	-	N/A	As per construction and operational phases.	1	1	1		1	1	4	-	N/A
Investors - Legal	Disposal of hazardous “waste” is rife with difficulties and numerous regulations that need to be complied with.	3	1	3		3	4	40	-	MEDIUM	• Applicants should seek the opinion from a waste consultant on how to correctly dispose of hazardous waste.	3	1	3		3	3	30	-	Low

16.1.5Cumulative

The proposed SEF is located adjacent to several other SEFs within 35 km. SiVEST undertook every effort to obtain the information (including specialist studies, BA/ S&EIR and EMPrs) for other surrounding developments. The information

that could be obtained for the surrounding planned RE developments was taken into account as part of the cumulative impact assessment.

In addition to the infrastructure associated with the approved renewable energy facilities, a mining permit for a 5 ha dolerite quarry approximately 2.5 km east of Rhino PV was granted in 2023. The site of the quarry is located on the slope of the ridgeline extending along the eastern boundary of remainder of Farm Rhenosterkop 155. This quarry, as per the visual specialist, may be visible in the background to receptors and appear as a scar \tarnishing the ridgeline.

The SEFs that were considered are indicated in **Table 16-7** and **Figure 16-1**:

Table 16-7: SEF within 35 km radius

DFFE Ref No	Project Title	Technology	Megawatt	Status
14/12/16/3/3/1/2517	The construction of a 120 MW PV solar energy facility (Known as the Bulkskop PV) located on the remaining extent (portion 0) OF FARM 423 approximately 12 KM South-EAST of Beaufort West in the Beaufort West Local Municipality, Western Cape Province	PV	120	Approved
14/12/16/3/3/1/2518	The construction of a 120 MW PV solar energy facility (Known as the Gamka PV) located on the remaining extent (portion 0) of farm 423 approximately 12KM South-East of Beaufort west in the Beaufort West Local Municipality, Western Cape Province	PV	120	Approved
14/12/16/3/3/1/2519	The construction of 120 MW photovoltaic (PV) solar energy facility (known as the Hardeveld PV) located on the remaining extent (portion 0) of farm 423, Western Cape Province	PV	120	Approved
14/12/16/3/3/1/2520	The construction of a 120MW PV solar energy facility (Known as Hoodia PV) in the Beaufort West Local Municipality, Western Cape Province	PV	120	Approved
14/12/16/3/3/1/2521	The construction of a 120 MW photovoltaic (PV) solar energy facility (known as the Rosenia PV), Western Cape Province	PV	120	Approved
12/12/20/2133	Proposed Construction of19MW Photovoltaic Solar Facility Proposed By Lurama 214 Pty Ltd On Portion 1 Of The Farm Steenrotsfontein 168, Beaufort West, Western Cape Province	PV	19	Approved
12/12/20/2133/A1	Proposed Construction of19MW Photovoltaic Solar Facility Proposed By Lurama 214 Pty Ltd On Portion 1 Of The Farm Steenrotsfontein 168, Beaufort West, Western Cape Province	PV	0	Approved
12/12/20/2133/AM3	Proposed Construction of19MW Photovoltaic Solar Facility Proposed By Lurama 214 Pty Ltd On Portion 1 Of The Farm Steenrotsfontein 168, Beaufort West, Western Cape Province	PV	0	Approved
12/12/20/2133/AM4	Proposed Construction of19MW Photovoltaic Solar Facility Proposed By Lurama 214 (Pty) Ltd On Portion 1 Of The Farm Steenrotsfontein 168, Beaufort West, Western Cape Province	PV	0	Approved
12/12/20/2133/AM5	Proposed Construction of19MW Photovoltaic Solar Facility Proposed By Lurama 214 (Pty) Ltd On Portion 1 Of The Farm Steenrotsfontein 168, Beaufort West, Western Cape Province	PV	0	Approved
12/12/20/2286	The Proposed Beaufort West Photovoltaic Park On Portion9 Of The Farm 161 Kuilspoort in The Western Cape Province	PV	85	Approved
12/12/20/2286/AM4	The Proposed Beaufort West Photovoltaic Park On Portion9 Of The Farm 161 Kuilspoort in The Western Cape Province	PV	0	Approved
14/12/16/3/3/1/2332	Proposed 75MW Beaufort West Photovoltaic (PV) Project, Western Cape Province	PV	75	Approved
14/12/16/3/3/2/772	Proposed establishment of the Beaufort West Solar Power Plant Site 1, Western Cape Province	PV	90	Approved
14/12/16/3/3/2/773	Proposed Establishment of the Beaufort West Solar Power Plant Site 2, Western Cape Province	PV	90	Approved
14/12/16/3/3/2/774	Proposed Beaufort West Solar power plant site 3 near Beaufort West, Western Cape Province	PV	90	Approved
14/12/16/3/3/1/2494	The proposed 220MW Jessa m wind energy facility (WEF) and associated infrastructure near Beaufort west in the Western Cape Province	Wind	220	Approved
14/12/16/3/3/1/2496	The proposed 220MW Jessa z wind energy facility (WEF) and associated infrastructure, near Beaufort West in the Western Cape Province	Wind	220	Approved
14/12/16/3/3/2/2071	Proposed Development of the 341 MW Kwagga Wind Energy Facility 2 and associated Infrastructure near Beaufort West, Western Cape	Wind	341	
14/12/16/3/3/2/2070	Proposed Development of the 279 MW Kwagga Wind Energy Facility 1 and associated infrastructure near Beaufort West in the Western Cape	Wind	279	
14/12/16/3/3/2/2070	Kwagga WEF 1 (access road)			
14/12/16/3/3/2/2072	Proposed Development of the 204.6 MW Kwagga Wind Energy Facility 3 and associated infrastructure near Beaufort West in the Western Cape	Wind	204.6	
	N1 Wind Farm, Beaufort West	Wind	240/ 160/ 80/ 72.5	
12/12/20/1784/1	Proposed Development of the 140 MW Beaufort West Wind Farm in the Prince Albert Local Municipality, Western Cape Province	Wind	140	
	Proposed Nuweveld 132/400 kV Powerline near Beaufort West, Western Cape province			
	Proposed Construction of 400 kV Powerline from Blanco Substation (George) to Droerivier Substation (Beaufort West), Western Cape			
14-12-16-3-3-2-925-2	Genelania 132/400 kV Main Transmission Substation and 400 kV Overhead Line associated with Beaufort West Wind Farm			
14-12-16-3-3-2-925-1	132/400 kV Main Transmission Substation and 400 kV Overhead Line associated with Beaufort West Wind Farm			
14/12/16/3/3/1/2464/AM2	33/132 kV Independent Power Producer (Varsfontein) substation associated with Beaufort West Wind Farm			
14/12/16/3/3/1/2465/AM2	33/132 kV Eskom Switching (Varsfontein) Station and 132 overhead line associated with Beaufort West Wind Farm			
12-12-20-1784-1-AM3	140 MW Beaufort West Wind Farm	Wind	140	
12-12-20-1784-2-AM3	140 MW Trakas Wind Farm	Wind	140	
16/3/3/1/C3/2/0032/22	Proposed Development Of A Radio Mast, Approximately 90 Metres In Height On Portion 1 Of The Farm No. 15 Of Trakaskuilen Located On The Beaufort West Cluster Of Wind Farm Developments, Near The Town Of Beaufort West In The Western Cape Province			Approved

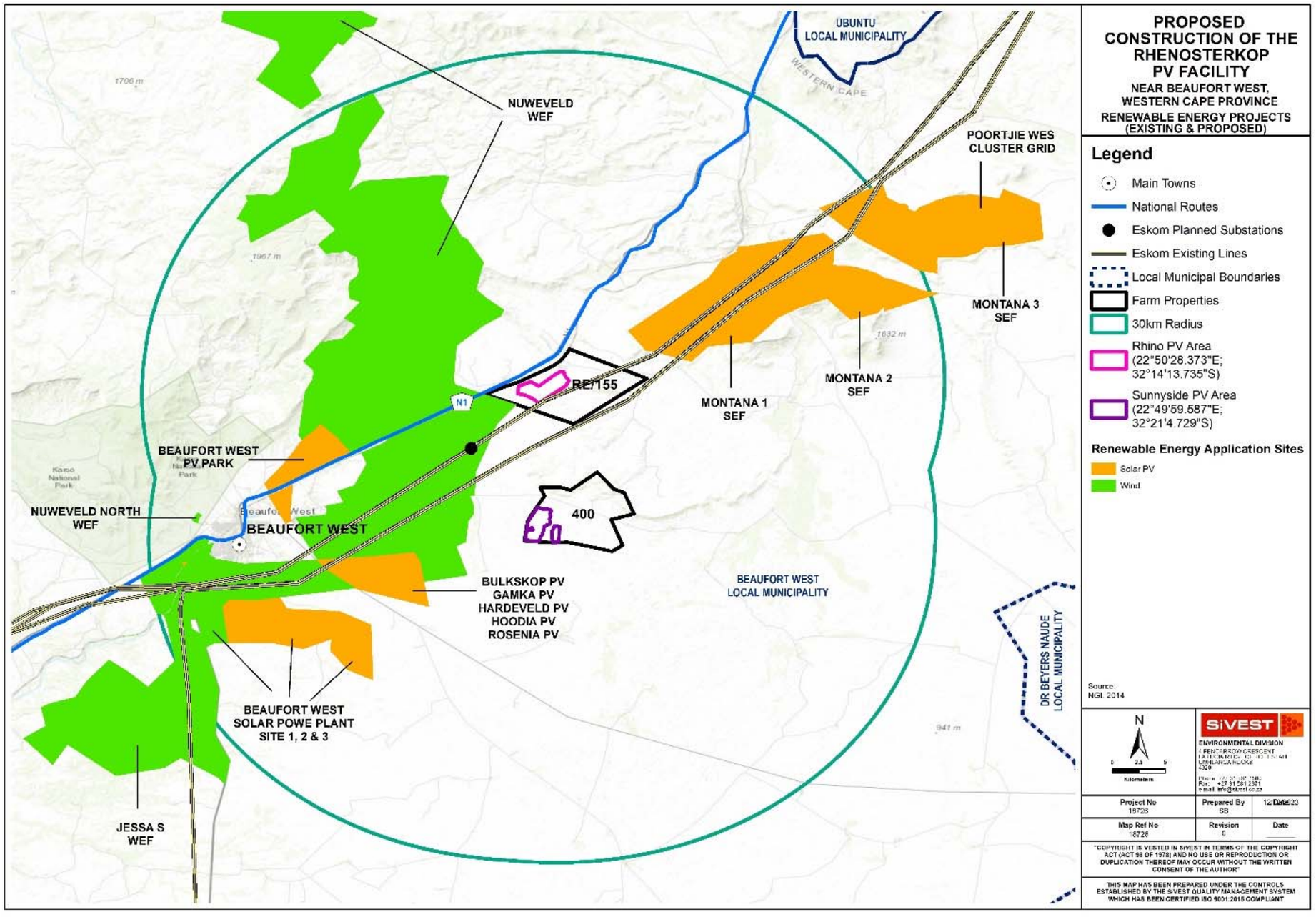

Figure 16-1: RE Projects within 35 km of the proposed SEF

The cumulative impacts identified are as follows:

16.1.5.1 Rhino Solar PV Site

Table 16-8: Cumulative Potential Impacts

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ Or -)	S
Agricultural - none identified																				
Avifauna - none identified																				
Geotechnical - none identified																				
Heritage																				
Impacts to archaeological heritage resources	Cumulative destruction of significant archaeological heritage	1	1	4	1	4	1	11	-	Low	• Should any previously unknown archaeological resources be impacted during construction, work must cease in the vicinity of the find and the relevant heritage authority must be contacted	1	1	4	1	4	1	11	-	Low
Impacts to palaeontological resources	Cumulative destruction of significant palaeontological heritage	1	2	4	3	4	3	42	-	Medium	• Implementation of the Chance Fossil Finds Protocol	1	1	4	1	4	1	11	-	Low
Socio-economic																				
Increase in production	Expenditure associated with the construction of the projects will have an impact on the production of the local economy.	3	4	3	4	4	3	54	+	High	N/A	3	4	3	4	4	3	54	+	High
Increase on GDP	Temporary increase in country's GDP due to capital expenditure	3	4	3	4	4	3	54	+	High	N/A	3	4	3	4	4	3	54	+	High
Increase in Employment	The construction of the Projects will positively impact the community and beyond by creating a number of job opportunities (albeit temporary).	3	4	3	3	4	3	51	+	High	• Organise local community meetings to advise the local labour on the project that is planned to be established and the jobs that can potentially be applied for.	3	4	4	3	4	3	54	+	High
Temporary increase in social conflicts associated with the influx of people	An impact on the demographics of the area as a result of in-migration in response to job opportunities will occur.	2	3	3	3	1	3	36	-	Medium	• Where feasible, effort must be made to employ local labour in order to create maximum benefit for the communities and limit in-migration. • Train unemployed local community members with insufficient skills and increase absorption of local labour thereby decreasing in-migration.	2	3	2	3	1	3	33	-	Medium
Sense of place	The high number of facilities will have an impact on the geographical look of the local area, impacting potential local services and accommodation facilities.	3	4	3	3	1	3	42	-	Medium	• Ensure landowner's preference is adhere to. • Install screens around the construction site to reduce the visual impact of construction on surrounding properties. • Site watering (or use of appropriate dust suppressant) from time to time to reduce dust emitting from the construction site. • Also refer to visual specialist report for mitigation measures.	1	4	3	3	1	3	36	-	Medium
Terrestrial Biodiversity																				
Broad-scale ecological processes	Transformation and presence of the facility will contribute to cumulative habitat loss and impacts on broad-scale ecological processes such as fragmentation.	2	4	2	1	3	2	24	-	Medium	• Refer to specific mitigation measures of specific impacts discussed earlier	2	3	2	1	3	2	22	-	Low
Transport																				

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ Or -)	S
Cumulative traffic impacts due to other approved RE projects in a 35 km radius around the project sites	Further traffic impact due to increased traffic by other RE project being developed during the same time	3	3	1	2	2	4	44	-	High	• Same mitigation measures as above for construction phase. • It is noted that it is unlikely that the approved developments will be constructed at the exact same time. • However, for the event that the developments have similar constructions periods and use similar routes to site, it is recommended to agree on scheduling trips between projects with similar construction phase as much as possible.	3	3	1	1	2	3	30	-	Medium
Visual																				
Altered sense of place caused by the SEF and associated infrastructure	The site and surrounds are rural in character, there is a high concentration of approved renewable energy projects and associated grid infrastructure located around the project sites. While none of these facilities appear to be operational, as more of are constructed, the visual landscape is expected to be significantly transformed detracting from the visual quality of the region. As SEFs and WEFs proliferate, impacts will accumulate towards an	2	4	1	2	3	2	24	-	Medium	• Ensure that all other project owners implement measures to mitigate the impact of these projects on visual intrusion and altered sense of place, such as screening (vegetation), limit the light pollution generated by these facilities and adhere to the rehabilitation measures.	2	3	1	2	3	2	22	-	Low

16.1.5.2 Sunnyside Solar PV Site

Table 16-9: Cumulative Potential Impacts

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Agricultural - none identified																				
Avifauna - none identified																				
Geotechnical - none identified																				
Heritage																				
Impacts to archaeological heritage resources	Cumulative destruction of significant archaeological heritage	1	1	4	1	4	1	11	-	Low	• No development activities within the high archaeological sensitivity area identified • Should any previously unknown archaeological resources be impacted during construction, work must cease in the vicinity of the find and the relevant heritage authority must be contacted	1	1	4	1	4	1	11	-	Low
Impacts to palaeontological resources	Cumulative destruction of significant palaeontological heritage	1	2	4	3	4	3	42	-	Medium	• Implementation of the Chance Fossil Finds Protocol	1	1	4	1	4	1	11	-	Low
Socio-economic																				

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Recommended Mitigation Measures	Environmental Significance After Mitigation								
		E	P	R	I	D	I/M	Total	Status (+ or -)	S		E	P	R	L	D	I / M	Total	Status (+ or -)	S
Increase in production	Expenditure associated with the construction of the projects will have an impact on the production of the local economy.	3	4	3	4	4	3	54	+	High	N/A	3	4	3	4	4	3	54	+	High
Increase on GDP	Temporary increase in country's GDP due to capital expenditure	3	4	3	4	4	3	54	+	High	N/A	3	4	3	4	4	3	54	+	High
Increase in Employment	The construction of the Projects will positively impact the community and beyond by creating a number of job opportunities (albeit temporary).	3	4	3	3	4	3	51	+	High	• Organise local community meetings to advise the local labour on the project that is planned to be established and the jobs that can potentially be applied for.	3	4	4	3	4	3	54	+	High
Temporary increase in social conflicts associated with the influx of people	An impact on the demographics of the area as a result of in-migration in response to job opportunities will occur.	2	3	3	3	1	3	36	-	Medium	• Where feasible, effort must be made to employ local labour in order to create maximum benefit for the communities and limit in-migration. • Train unemployed local community members with insufficient skills and increase absorption of local labour thereby decreasing in-migration.	2	3	2	3	1	3	33	-	Medium
Sense of place	The high number of facilities will have an impact on the geographical look of the local area, impacting potential local services and accommodation facilities.	3	4	3	3	1	3	42	-	Medium	• Ensure landowner's preference is adhere to. • Install screens around the construction site to reduce the visual impact of construction on surrounding properties. • Site watering (or use of appropriate dust suppressant) from time to time to reduce dust emitting from the construction site. • Also refer to visual specialist report for mitigation measures.	1	4	3	3	1	3	36	-	Medium
Terrestrial Biodiversity																				
Broad-scale ecological processes	Transformation and presence of the facility will contribute to cumulative habitat loss and impacts on broad-scale ecological processes such as fragmentation.	2	4	2	1	3	2	24	-	Medium	• Refer to specific mitigation measures of specific impacts discussed earlier	2	3	2	1	3	2	22	-	Low
Transport																				
Cumulative traffic impacts due to other approved RE projects in a 35 km radius around the project sites	Further traffic impact due to increased traffic by other RE project being developed during the same time	3	3	1	2	2	4	44	-	High	• Same mitigation measures as above for construction phase. • It is noted that it is unlikely that the approved developments will be constructed at the exact same time. • However, for the event that the developments have similar constructions periods and use similar routes to site, it is recommended to agree on scheduling trips between projects with similar construction phase as much as possible.	3	3	1	1	2	3	30	-	Medium
Visual																				
Altered sense of place caused by the SEF and associated infrastructure	The site and surrounds are rural in character, there is a high concentration of approved renewable energy projects and associated grid infrastructure located around the project sites. While none of these facilities appear to be operational, as more of are constructed, the visual landscape is expected to be significantly transformed detracting from the visual quality of the region. As SEFs and WEFs proliferate, impacts will accumulate towards an	2	4	1	2	3	2	24	-	Medium	• Ensure that all other project owners implement measures to mitigate the impact of these projects on visual intrusion and altered sense of place, such as screening (vegetation), limit the light pollution generated by these facilities and adhere to the rehabilitation measures.	2	3	1	2	3	2	22	-	Low

16.2 Concluding Statement

No further activity alternatives are being considered. RE development in South Africa is highly desirable from a social, environmental and development point of view. Solar energy installations are more suitable for the site because of the good solar resource. The choice of technology selected for the SEF was based on environmental constraints as well as technical and economic considerations.

The full site area has been assessed by the specialists in their respective specialist studies. All constraints identified to date as indicated in the sensitivity mapping below will be taken into account and the project layout will be amended where necessary to inform the proposed layout for the SEF.

17. SUMMARY OF SPECIALIST FINDINGS AND RECOMMENDATIONS

Table 17-1: Summary of Specialist Findings and Recommendations

Specialist Study	Findings and Recommendations	
	Rhino SEF	**Sunnyside SEF**
Aquatic / Freshwater	The Compliance Statement notes that the site's indicates that the aquatic ecological footprint will have a localised and minimal impact, preserving the sensitive surroundings and water bodies associated with the broader project. The Platdoring River exhibits medium ecological sensitivity, and the L11F catchment has a low ecological importance sensitivity, with few sensitive aquatic elements near the study area. Despite being recognised as a vital ESA River system, the Platdoring River's low priority status is justified by continuous dry conditions and a persistent zero flow status. The aquatic compliance statement aims to minimise and mitigate potential impacts, with the overall effect on aquatic features deemed negligible despite ESA1 classification. • Should the project progress, engagement with the DWS for the necessary water use authorisation application processes, such as a GA or WUL, will be required. The report recommends that the low importance and sensitivity of wetlands, rivers, and drainage lines (aquatic features) be considered by the DWS in deciding whether a GA or WUL is necessary in terms of Section 21 of the NWA.	The Compliance Statement notes that the site's indicates that the aquatic ecological footprint will have a localised and minimal impact, preserving the sensitive surroundings and water bodies associated with the broader project. The Platdoring River exhibits medium ecological sensitivity, and the L11F catchment has a low ecological importance sensitivity, with few sensitive aquatic elements near the study area. Despite being recognised as a vital ESA River system, the Platdoring River's low priority status is justified by continuous dry conditions and a persistent zero flow status. The aquatic compliance statement aims to minimise and mitigate potential impacts, with the overall effect on aquatic features deemed negligible despite ESA1 classification. Should the project progress, engagement with the DWS for the necessary water use authorisation application processes, such as a GA or WUL, will be required. The report recommends that the low importance and sensitivity of wetlands, rivers, and drainage lines (aquatic features) be considered by the DWS in deciding whether a GA or WUL is necessary in terms of Section 21 of the NWA.
Terrestrial Biodiversity including Animal and Plant Species	The desktop study revealed that very few species of conservational importance are found within the quarter degree grid cells encompassing the project area. However, of these species, none were recorded during site investigations nor are they expected to occur in	The desktop study revealed that very few species of conservational importance are found within the quarter degree grid cells encompassing the project area. However, of these species, none were recorded during site investigations nor are they expected to occur in

Specialist Study	Findings and Recommendations	
	Rhino SEF	**Sunnyside SEF**
	areas directly related to the proposed project sites (with the exception perhaps of *Chersobius boulengeri*). CBAs are located north and west of the Rhino SEF site along the seasonal watercourse, Platdoring river. The small area of the CBA, which infringes the site to the west, was confirmed not to be of sensitive nature with the main drainage line in the center of the CBA being the driving feature from which the CBA has been delineated. This CBA will not be affected by the development as it infringes a mere 20 m into the site. The northern CBAs will also remain unaffected. It is also noteworthy that due to the low levels of transformation in the area, the irreplaceability of these CBAs is likely low. All major and minor drainage lines within the Rhino and Sunnyside solar PV areas are mapped as functional natural or near-natural ESAs. The ESAs are generally small and represent buffered areas around drainage features. This includes minor washes, the drainage areas largely devoid of riparian vegetation. It is unlikely that development would be able to avoid all ESAs and some habitat loss is inevitable. The minor drainage features in particular do not represent broad-scale ecological corridors and are unlikely to impact ecological functionality should development occur. Development will likely impinge on ESAs, however, these minor drainage lines are not particularly sensitive and the impacts would likely be low. The sites in question have been impacted by past and present anthropogenic activities, predominantly sheep farming, and can no longer be classified as pristine environments. This is evidenced from the grazing pressure and the presence of invasive species within the site. • Should development infringe on the 500 m regulated area surrounding any NFEPA identified wetland areas, or any specialist delineated wetlands, the applicant will need to approach the DWS and consider the relevant application processes for either a GA or a WUL.	areas directly related to the proposed project sites (with the exception perhaps of *Chersobius boulengeri*). CBAs are located north and west of the Rhino SEF site along the seasonal watercourse, Platdoring river. The small area of the CBA, which infringes the site to the west, was confirmed not to be of sensitive nature with the main drainage line in the center of the CBA being the driving feature from which the CBA has been delineated. This CBA will not be affected by the development as it infringes a mere 20 m into the site. The northern CBAs will also remain unaffected. It is also noteworthy that due to the low levels of transformation in the area, the irreplaceability of these CBAs is likely low. All major and minor drainage lines within the Rhino and Sunnyside solar PV areas are mapped as functional natural or near-natural ESAs. The ESAs are generally small and represent buffered areas around drainage features. This includes minor washes, the drainage areas largely devoid of riparian vegetation. It is unlikely that development would be able to avoid all ESAs and some habitat loss is inevitable. The minor drainage features in particular do not represent broad-scale ecological corridors and are unlikely to impact ecological functionality should development occur. Development will likely impinge on ESAs, however, these minor drainage lines are not particularly sensitive and the impacts would likely be low. The sites in question have been impacted by past and present anthropogenic activities, predominantly sheep farming, and can no longer be classified as pristine environments. This is evidenced from the grazing pressure and the presence of invasive species within the site. • Should development infringe on the 500 m regulated area surrounding any NFEPA identified wetland areas, or any specialist delineated wetlands, the applicant will need to approach the DWS and consider the relevant application processes for either a GA or a WUL.

Specialist Study	Findings and Recommendations	
	Rhino SEF	**Sunnyside SEF**
	• It is recommended that highly sensitive areas be avoided for development as far as possible. Existing road infrastructure should be prioritised for use to minimise new road development. • Road infrastructure crossing drainage lines must be free-draining, non-erosive in nature and bank stability must be maintained. The appropriate application process for Water Use must be followed. • Maintenance and monitoring plans should be compiled and be approved by the relevant regulatory authorities. These should relate to requirements of water use licencing, alien invasive control, and NEMA, specifically presences of SCCs and all mortalities of faunal species that occur on site. • While the presence of Black-footed Cats has been confirmed through previous assessments or direct sightings in the area under consideration, it was not found on site during the project assessment. This species is transient in nature and will avoid the area during construction. No direct impacts are expected. Nevertheless, should this species or any other SCC (faunal and floral) be identified on site during construction, this should be brought to the attention of the authors of this report to assisit with the management thereof. • It is recommended that the mitigatory measures as mentioned in Section 7 of the Terrestrial report be implemented and included in the EMPr and Authorisation application.	• It is recommended that highly sensitive areas be avoided for development as far as possible. Existing road infrastructure should be prioritised for use to minimise new road development. • Road infrastructure crossing drainage lines must be free-draining, non-erosive in nature and bank stability must be maintained. The appropriate application process for Water Use must be followed. • Maintenance and monitoring plans should be compiled and be approved by the relevant regulatory authorities. These should relate to requirements of water use licencing, alien invasive control, and NEMA, specifically presences of SCCs and all mortalities of faunal species that occur on site. • While the presence of Black-footed Cats has been confirmed through previous assessments or direct sightings in the area under consideration, it was not found on site during the project assessment. This species is transient in nature and will avoid the area during construction. No direct impacts are expected. Nevertheless, should this species or any other SCC (faunal and floral) be identified on site during construction, this should be brought to the attention of the authors of this report to assisit with the management thereof. • It is recommended that the mitigatory measures as mentioned in Section 7 of the Terrestrial report be implemented and included in the EMPr and Authorisation application.
Agricultural	The site is classified as low to medium agricultural sensitivity by the National Web-Based Environmental Screening Tool promulgated in terms of Regulation 16(1)(b)(v) of the EIA Regulations, enacted under the NEMA. This has been confirmed by this assessment, because of the agricultural production potential and current agricultural land use. The arid climate is the limiting factor for land capability, regardless of the soil and terrain capability, although shallow, rocky soils are an additional limitation. Moisture availability is very limiting to any kind of agricultural production,	The site is classified as low to medium agricultural sensitivity by the National Web-Based Environmental Screening Tool promulgated in terms of Regulation 16(1)(b)(v) of the EIA Regulations, enacted under the NEMA. This has been confirmed by this assessment, because of the agricultural production potential and current agricultural land use. The arid climate is the limiting factor for land capability, regardless of the soil and terrain capability, although shallow, rocky soils are an additional limitation. Moisture availability is very limiting to any kind of agricultural production,

Specialist Study	Findings and Recommendations	
	Rhino SEF	**Sunnyside SEF**
	including grazing and is completely insufficient for rain-fed crop production. The climate constraints mean that the site has low agricultural potential, and its agricultural use is limited to grazing only. The assessed development will not result in any loss of viable, arable land and therefore poses minimal threat to agricultural production potential.	including grazing and is completely insufficient for rain-fed crop production. The climate constraints mean that the site has low agricultural potential, and its agricultural use is limited to grazing only. The assessed development will not result in any loss of viable, arable land and therefore poses minimal threat to agricultural production potential.
Avifauna	A review of the data from the Southern African Bird Atlas Project (SABAP2) determined that a total of 183 bird species could potentially occur within the broader area where the PAOI is located (the PAOI includes the land parcels of both Rhino PV and Sunnyside PV). Of the 183 species, 75 are classified as priority species for solar developments. Of the 75 solar priority species, 24 were recorded during the on-site surveys (Site Sensitivity Verification (SSV) site visit and pre-construction monitoring surveys), and 44 solar priority species have a medium to high likelihood of occurring regularly in the project area. • The proposed mitigation measures as detailed in Sections 8 and 9 of the Avifaunal report and the EMPr must be strictly implemented.	A review of the data from the Southern African Bird Atlas Project (SABAP2) determined that a total of 183 bird species could potentially occur within the broader area where the PAOI is located (the PAOI includes the land parcels of both Rhino PV and Sunnyside PV). Of the 183 species, 75 are classified as priority species for solar developments. Of the 75 solar priority species, 24 were recorded during the on-site surveys (Site Sensitivity Verification (SSV) site visit and pre-construction monitoring surveys), and 44 solar priority species have a medium to high likelihood of occurring regularly in the project area. • The proposed mitigation measures as detailed in Sections 8 and 9 of the Avifaunal report and the EMPr must be strictly implemented.
Socio-Economic	The net positive impacts associated with the construction of the proposed development are expected to outweigh the net negative effects. The development is also envisaged to have a positive stimulus on the local economy and employment creation, leading to the economy's diversification and a small reduction in the unemployment rate. The proposed Rhino PV and Sunnyside PV facilities should therefore be considered for development. It should, however, be acknowledged that the negative impacts would be largely borne by the nearby farms and households residing on them, whilst the positive impacts will be distributed throughout both the local and national economies. Due to this imbalance, it is recommended that the mitigation measures suggested, be strictly adhered to. Application of these mitigation measures will ensure that the negative impacts on the nearby farms and businesses are minimised and that	The net positive impacts associated with the construction of the proposed development are expected to outweigh the net negative effects. The development is also envisaged to have a positive stimulus on the local economy and employment creation, leading to the economy's diversification and a small reduction in the unemployment rate. The proposed Rhino PV and Sunnyside PV facilities should therefore be considered for development. It should, however, be acknowledged that the negative impacts would be largely borne by the nearby farms and households residing on them, whilst the positive impacts will be distributed throughout both the local and national economies. Due to this imbalance, it is recommended that the mitigation measures suggested, be strictly adhered to. Application of these mitigation measures will ensure that the negative impacts on the nearby farms and businesses are minimised and that

Specialist Study	Findings and Recommendations	
	Rhino SEF	**Sunnyside SEF**
	the distribution of the potential benefits of the project are more balanced. It is important to value the landowners concerns and thus advised that further communication towards the landowners will be vital for the project.	the distribution of the potential benefits of the project are more balanced. It is important to value the landowners concerns and thus advised that further communication towards the landowners will be vital for the project.
Geotechnical	The assessment area is underlain by rock units of Adelaide Subgroup of the Beaufort Group and intrusive dolerite. the bedrock geology is covered by transported silts, sands and gravels, as well as well-developed calcrete. Some geotechnical constraints have been identified, primarily shallow and outcropping bedrock and calcrete which may cause excavation difficulties, and existing drainage channels with concentrated water flow. These conditions and associated constraints may be mitigated via standard engineering design and construction measures. The assessment Rhenosterkop Solar PV Facility area may be divided into two (2 No.) ZONEs (I and II) where similar geotechnical conditions are anticipated. ZONE I is defined by shallow occurring bedrock covered by thin, loose transported material and varying degrees of cemented calcrete. ZONE II can be characterised by relativity thicker alluvial deposits, identifiable by erosion paths, rills, and continuous drainage features. Intrusive investigation may reveal additional facets once variations in the subsoil profile become apparent. • The recommended mitigation measures must be implemented. • Further intrusive geotechnical investigations should be undertaken to confirm the engineering recommendations provided in this report.	The assessment area is underlain by rock units of Adelaide Subgroup of the Beaufort Group and intrusive dolerite. the bedrock geology is covered by transported silts, sands and gravels, as well as well-developed calcrete. Some geotechnical constraints have been identified, primarily shallow and outcropping bedrock and calcrete which may cause excavation difficulties, and existing drainage channels with concentrated water flow. These conditions and associated constraints may be mitigated via standard engineering design and construction measures. The assessment Rhenosterkop Solar PV Facility area may be divided into two (2 No.) ZONEs (I and II) where similar geotechnical conditions are anticipated. ZONE I is defined by shallow occurring bedrock covered by thin, loose transported material and varying degrees of cemented calcrete. ZONE II can be characterised by relativity thicker alluvial deposits, identifiable by erosion paths, rills, and continuous drainage features. Intrusive investigation may reveal additional facets once variations in the subsoil profile become apparent. • The recommended mitigation measures must be implemented. Further intrusive geotechnical investigations should be undertaken to confirm the engineering recommendations provided in this report.
Archaeological, Cultural Heritage and Palaeontological	The site forms part of a low significance cultural landscape representative of the Central Plateau of the Great Karoo possessing heritage value for historical, aesthetic, architectural, social and scientific reasons. The site possesses some landscape elements contributing to a composite cultural landscape, however, this particular area is already dominated by existing infrastructure. The addition of the proposed PV facility is therefore unlikely to negatively impact on any significant cultural landscape elements within this immediate context, or the broader context.	The site forms part of a low significance cultural landscape representative of the Central Plateau of the Great Karoo possessing heritage value for historical, aesthetic, architectural, social and scientific reasons. The site possesses some landscape elements contributing to a composite cultural landscape, however, this particular area is already dominated by existing infrastructure. The addition of the proposed PV facility is therefore unlikely to negatively impact on any significant cultural landscape elements within this immediate context, or the broader context.

Specialist Study	Findings and Recommendations	
	Rhino SEF	**Sunnyside SEF**
	The proposed development is located suffciently far from the N1 scenic route, existing railway infrastructure and the Rhenosterkop farmstead that the anticipated impact to the heritage significance of these resources is considered to be negligible. Although the broader area has archaeological significance in terms of the sensitive dolerite outcrops in the area and associated rock art sites, no archaeological resources of significance were identified within the area proposed for the Rhino Solar Energy Facility (SEF). No further mitigation is recommended. A number of ruins of farm structures were identified within the development footprint for the Sunnyside SEF. These ruins are associated with the historic farming practices in this area and as such, have been determined to have contextual cultural value. These resources are Graded IIIC. A no development buffer of 50 metres (m) is recommended around these sites. Due to the age of these ruins, and their historic nature, excavations that take place in close proximity to these ruins are more likely to negatively impact associated buried archaeological heritage. It is recommended that this area be avoided by development activities. No observations of palaeontological significance were noted within the area proposed for development. However, the geology underlying the development area remains sensitive for impacts to significant palaeontological heritage. Based on the outcomes of the report, it is not anticipated that the proposed development will negatively impact on significant heritage resources on condition that: • The buffers recommended are implemented, i.e., a no-go buffer area of 400 m on Point ID 006, 50 m on Point ID 016, 046 to 050 and 100 m on Point ID 045 (refer to Table 4 of the HIA for more detail). • The HWC Chance Fossil Finds Procedure is implemented for the duration of construction activities. • The recommendations of the VIA are implemented.	The proposed development is located suffciently far from the N1 scenic route, existing railway infrastructure and the Rhenosterkop farmstead that the anticipated impact to the heritage significance of these resources is considered to be negligible. Although the broader area has archaeological significance in terms of the sensitive dolerite outcrops in the area and associated rock art sites, no archaeological resources of significance were identified within the area proposed for the Rhino Solar Energy Facility (SEF). No further mitigation is recommended. A number of ruins of farm structures were identified within the development footprint for the Sunnyside SEF. These ruins are associated with the historic farming practices in this area and as such, have been determined to have contextual cultural value. These resources are Graded IIIC. A no development buffer of 50 metres (m) is recommended around these sites. Due to the age of these ruins, and their historic nature, excavations that take place in close proximity to these ruins are more likely to negatively impact associated buried archaeological heritage. It is recommended that this area be avoided by development activities. No observations of palaeontological significance were noted within the area proposed for development. However, the geology underlying the development area remains sensitive for impacts to significant palaeontological heritage. Based on the outcomes of the report, it is not anticipated that the proposed development will negatively impact on significant heritage resources on condition that: • The buffers recommended are implemented, i.e., a no-go buffer area of 50 m on Point ID 019 to 022 (refer to Table 4 of the HIA for more detail). • The HWC Chance Fossil Finds Procedure is implemented for the duration of construction activities. • The recommendations of the VIA are implemented.

Specialist Study	Findings and Recommendations	
	Rhino SEF	**Sunnyside SEF**
	• Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.	Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.
Risk (BESS)	• In order to highlight the maximum differences between the possible technology types, this study is based on the assumption that redox flow batteries (typically vanadium based chemistry) could be installed within a building using bulk tanks, while solid state batteries (typically lithium based chemistry) would be installed in shipping containers that have hundreds of individual batteries combined into packs. Redox flow batteries can be installed in containers where the individual quantities of electrolyte involved would be smaller, although the hazards are the same just smaller in magnitude. • There will always be residual risks but with the recommended preventative and mitigative measures these could be considered suitably low and therefore broadly acceptable.	• In order to highlight the maximum differences between the possible technology types, this study is based on the assumption that redox flow batteries (typically vanadium based chemistry) could be installed within a building using bulk tanks, while solid state batteries (typically lithium based chemistry) would be installed in shipping containers that have hundreds of individual batteries combined into packs. Redox flow batteries can be installed in containers where the individual quantities of electrolyte involved would be smaller, although the hazards are the same just smaller in magnitude. • There will always be residual risks but with the recommended preventative and mitigative measures these could be considered suitably low and therefore broadly acceptable.
Transport	• Feasible accessibility was assessed considering sight lines, access spacing requirements and road safety aspects and are discussed in this report. It is recommended to ensure that the access points are kept clear of vegetation and any other obstructions to ensure sight lines are kept. • In general, non-motorised transportation (NMT) is a dominant mode of transportation in rural areas, with private cars and minibus/taxis being the second-most used mode of transport, followed by buses.	• Feasible accessibility was assessed considering sight lines, access spacing requirements and road safety aspects and are discussed in this report. It is recommended to ensure that the access points are kept clear of vegetation and any other obstructions to ensure sight lines are kept. • In general, non-motorised transportation (NMT) is a dominant mode of transportation in rural areas, with private cars and minibus/taxis being the second-most used mode of transport, followed by buses.

Specialist Study	Findings and Recommendations	
	Rhino SEF	**Sunnyside SEF**
	Currently, there are no known future planned public transport facilities in the vicinity of the site. However, generally the appointed contractor of a renewable energy project will provide either shuttle busses or accommodation on site for workers during the construction phase. • The highest trip generator for the proposed projects is expected during the construction phase. The actual construction stage peak hour trips are dependent on the construction period, construction programming, material availability, component delivery, abnormal load permitting, etc. The decommissioning phase is expected to generate similar trips as the construction phase. The recommended mitigation measures must be adhered to.	Currently, there are no known future planned public transport facilities in the vicinity of the site. However, generally the appointed contractor of a renewable energy project will provide either shuttle busses or accommodation on site for workers during the construction phase. • The highest trip generator for the proposed projects is expected during the construction phase. The actual construction stage peak hour trips are dependent on the construction period, construction programming, material availability, component delivery, abnormal load permitting, etc. The decommissioning phase is expected to generate similar trips as the construction phase. • The recommended mitigation measures must be adhered to.
Visual/ Landscape	The sites are generally flat with elevated areas to the north-west and east of the Rhino SEF site and to the north of the Sunnyside SEF site. Further to the west and north-west of the sites, prominent mountain ranges are visible in the background. To the south-east and south of the sites fewer ridges exist, and isolated koppies and wide flat plains, typical of the Karoo, are more common. Ephemeral watercourses drain the relatively higher altitudes. The Platdoring River traverses the Remainder of Farm Rhenosterkop 155. The vegetation on the sites include dwarf spiny shrubland, few low growing trees, drought-resistant grasses cover and thicket. The area around the project is predominantly characterised by grazing lands (natural vegetation), with supporting infrastructure (roads, powerlines and a railway line [Rhino SEF]). A mining permit has been issued for a dolerite quarry ~2.5 km to the east of the Rhino SEF. The sites are located 27 to 30 km from the nearest town of Beaufort West. The Karoo National Park is located about 30 km to the east of the sites. The visual quality of the area can be experienced through long closed views across plains of low growing vegetation and prominences and ridgelines defining the horizon and occasional pockets of development such as farmsteads and small towns, such as Beaufort	The sites are generally flat with elevated areas to the north-west and east of the Rhino SEF site and to the north of the Sunnyside SEF site. Further to the west and north-west of the sites, prominent mountain ranges are visible in the background. To the south-east and south of the sites fewer ridges exist, and isolated koppies and wide flat plains, typical of the Karoo, are more common. Ephemeral watercourses drain the relatively higher altitudes. The Platdoring River traverses the Remainder of Farm Rhenosterkop 155. The vegetation on the sites include dwarf spiny shrubland, few low growing trees, drought-resistant grasses cover and thicket. The area around the project is predominantly characterised by grazing lands (natural vegetation), with supporting infrastructure (roads, powerlines and a railway line [Rhino SEF]). A mining permit has been issued for a dolerite quarry ~2.5 km to the east of the Rhino SEF. The sites are located 27 to 30 km from the nearest town of Beaufort West. The Karoo National Park is located about 30 km to the east of the sites. The visual quality of the area can be experienced through long closed views across plains of low growing vegetation and prominences and ridgelines defining the horizon and occasional pockets of development such as farmsteads and small towns, such as Beaufort

Specialist Study	Findings and Recommendations	
	Rhino SEF	**Sunnyside SEF**
	West. The visual quality of the sites is consistent with the visual quality of the region: natural, visually untransformed environment that can be experienced by receptors as barren and harsh due to the desolate nature of the landscape. Both sites are used for sheep grazing. Both Rhino and Sunnyside SEF range from not visible to marginally visible from various viewpoints around the SEF sites. As such, the visibility of these SEF sites is considered low. PV arrays will introduce a large, uniform anthropogenic artefact into the landscape discordant with scale, texture and current land use around the SEF sites. The discordant nature of the SEF will result in the SEF being experienced as a visual intrusion in the landscape. As such, the project is considered to have low integrity with the surrounding landscape. Glare modelling was conducted for the proposed PV arrays. Notable findings of the modelling are as follows: • No glare emanating from Rhino SEF will be experienced by receptors; and • Motorists will experience short durations of yellow category glare from Sunnyside SEF while travelling on the gravel road. Less than 2.5 hours of yellow category glare will be experienced per year along the gravel road. • The recommended mitigation measures must be implemented.	West. The visual quality of the sites is consistent with the visual quality of the region: natural, visually untransformed environment that can be experienced by receptors as barren and harsh due to the desolate nature of the landscape. Both sites are used for sheep grazing. Both Rhino and Sunnyside SEF range from not visible to marginally visible from various viewpoints around the SEF sites. As such, the visibility of these SEF sites is considered low. PV arrays will introduce a large, uniform anthropogenic artefact into the landscape discordant with scale, texture and current land use around the SEF sites. The discordant nature of the SEF will result in the SEF being experienced as a visual intrusion in the landscape. As such, the project is considered to have low integrity with the surrounding landscape. Glare modelling was conducted for the proposed PV arrays. Notable findings of the modelling are as follows: • No glare emanating from Rhino SEF will be experienced by receptors; and • Motorists will experience short durations of yellow category glare from Sunnyside SEF while travelling on the gravel road. Less than 2.5 hours of yellow category glare will be experienced per year along the gravel road. The recommended mitigation measures must be implemented.

18. ENVIRONMENTAL IMPACT STATEMENT

Taking into consideration the findings of the BA process for the proposed development and the fact that specialist recommendations have been used to inform the project design and layout of the facility, it is the opinion of the EAP that the majority of the negative impacts associated with the implementation of the proposed project can be mitigated to acceptable levels. While there are potential negative environmental impacts associated with the proposed development, the extent of the positive benefits associated with the implementation of the project in terms of RE supply and positive local and regional economic impact are considered to outweigh the negative impacts.

After consideration of the findings presented in the BAR, it is the reasoned opinion of the EAP that the proposed Rhino and Sunnyside SEF is acceptable and EA could be granted.

The following Compliance Statement and Specialist Assessments have been undertaken for the project:

- Agriculture Compliance Statement
- Avifaunal Assessment
- Terrestrial Biodiversity (including Animal and Plant Species) Assessment
- Archaeology, Cultural Heritage and Palaeontology Assessment
- Socio-Economic Assessment
- Aquatic Biodiversity (including Wetland) Assessment
- Transportation Assessment
- Visual Assessment
- Risk (BESS) Assessment
- Geotechnical Assessment (Desktop)

The specialist assessments were conducted to address the potential impacts relating to the proposed development in order to ascertain the level of each identified impact, as well as mitigation measures which may be required. A summary of the main findings of the specialists are included in **Section 17** of this Final BAR.

18.1 Agriculture and Soils

Due to the facts that the solar facility will not occupy scarce, viable cropland, that it can still be used to graze sheep, and that its negative impact is offset by economic benefits to farming, the overall negative agricultural impact of the development (loss of future agricultural production potential) is assessed here as being of low significance and as acceptable.

From an agricultural impact point of view, it is recommended that the proposed development be approved. The conclusion of this assessment on the acceptability of the proposed development and the recommendation for its approval is not subject to any conditions.

18.2 Cultural Heritage, Archaeological and Palaeontology

The site forms part of a low significance cultural landscape representative of the Central Plateau of the Great Karoo possessing heritage value for historical, aesthetic, architectural, social and scientific reasons. The site possesses some landscape elements contributing to a composite cultural landscape however this particular area is already dominated by existing infrastructure. The addition of the proposed PV facility is therefore unlikely to negatively impact on any significant cultural landscape elements within this immediate context, or the broader context. The proposed development is located sufficiently far from the N1 scenic route, existing railway infrastructure and the Rhenosterkop farmstead that the anticipated impact to the heritage significance of these resources is considered to be negligible.

Although the broader area has archaeological significance in terms of the sensitive dolerite outcrops in the area and associated rock art sites, no archaeological resources of significance were identified within the area proposed for the Rhino SEF. No further mitigation is recommended. A number of ruins of farm structures were identified within the development footprint for the Sunnyside SEF. These ruins are associated with the historic farming practices in this area and as such, have been determined to have contextual cultural value. These resources are Graded IIIC. A no development buffer of 50 m is recommended around these sites.

Due to the age of these ruins, and their historic nature, excavations that take place in close proximity to these ruins are more likely to negatively impact associated buried archaeological heritage. As such, an area of higher archaeological sensitivity has been identified. It is recommended that this area be avoided by development activities.
No observations of palaeontological significance were noted within the area proposed for development. However, the geology underlying the development area remains sensitive for impacts to significant palaeontological heritage. There are limited impacts anticipated to archaeological and palaeontological heritage from this proposed development and as such, the principle of a renewable energy facility in this location is supported from a heritage perspective as the infrastructure is located in an area able to tolerate the impact of the proposed PV infrastructure.

18.3 Geotechnical

From a geotechnical and geological perspective, no fatal flaws or sensitivities have been identified within or close to the Rhenosterkop Solar PV Facility assessment area. It is therefore recommended that the proposed activity be authorised.

18.4 Terrestrial Biodiversity

The potential impacts of the activities related to development of the sites should be minimal considering the overall low sensitivity of the habitat. Of the twelve (12) broad scale potential impacts, three (3) were rated as Medium with the rest rated as Low prior to mitigation. Following mitigation, all potential impacts can be reduced to Low level. From a terrestrial biodiversity point of view, inclusive of fauna and flora elements, the project in question should be allowed to continue. An EA should take cognisance of the recommendations mentioned below.

18.5 Avifauna

Despite the High Sensitivity rating for avifauna, there are no fatal flaws or unacceptable impacts associated with the proposed SEF project, provided the above-mentioned recommendations are strictly implemented and maintained.

The impacts identified are acceptably mitigated to Low (negative) impact with the exception of the displacement of avifauna due to habitat transformation as a result of the proposed development. This impact is mitigated to Medium (negative) impact. However, this is not considered to be a fatal flaw. The mitigation measures in this report, and input into the EMPr are considered satisfactory and as best practise for a SEF as proposed by the Applicant.

18.6 Landscape/ Visual

The proposed project comprises the development of the Rhino and Sunnyside SEFs. These SEFs are discordant with the scale, texture and use of the current land use. Furthermore, the region has a low VAC due to the absence of development around the site, open space and low growing vegetation. These considerations are moderated by the low overall view sensitivity, visibility and exposure to solar reflection for both SEFs. Therefore, the SEFs are anticipated to result in a moderate visual impact.

These SEFs will alter visual quality during the construction and decommissioning phases, as well as alter sense of place, visual quality and result in visual intrusion during the operational phase. The impact of altered sense of place and visual intrusion caused by construction and decommissioning activities associated with

both Rhino and Sunnyside SEFs has been assessed to be of ***low*** to ***medium*** significance. The impacts associated with the operational phase of the SEFs have been assessed to be of ***medium*** or ***low*** significance and with the implementation of mitigation are reduced to ***low***. The cumulative impact of the SEFs and the existing and proposed infrastructure is assessed to be of ***low*** significance after mitigation. These impacts are deemed to be acceptable on the assumption that the mitigation measures listed in sections above and in the EMPr are implemented for both Rhino and Sunnyside SEF.

Based on the assessment and the assumption that the mitigation measures will be implemented, the specialist is of the opinion that the visual impacts of the Rhino and Sunnyside SEFs are acceptable and there is no reason not to authorise the project.

18.7 Risk

The Impact Assessment contains all the recommended preventative and mitigative measures necessary to ensure risks are not unacceptably high. There will always be residual risks but with the recommended preventative and mitigative measures these could be considered suitably low and therefore broadly acceptable.

18.8 Socio-Economic

The assessment concentrated on gathering both secondary and primary data to establish a comprehensive social baseline, essential for identifying potential socio-economic impacts linked to the proposed development. This report aimed to create a foundation against which the potential social and economic consequences of the development project could be thoroughly assessed and understood. A summary of the potential positive and negative impacts identified for the detailed design and construction, operational and decommissioning phases.

A number of potential positive and negative social impacts have been identified for the proposed development during this BA process. Based on the findings, no red flags or fatal flaws have been identified from a socio-economic perspective which could preclude the progress of the proposed development.

18.9 Transportation

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Rhino PV and Sunnyside PV projects were identified and assessed and are summarized as follows:

- The traffic impact of the solar PV facility was assessed together as requested by the developer.
- The main impact on the external road network will be during the construction phase. This phase is temporary in comparison to the operational period. The number of abnormal loads vehicles was estimated and found to be able to be accommodated by the road network including the recommended mitigation measures.
- The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be of medium negative impact. However, with mitigation measures a rating of negative low impact can be given.
- During operation, it is expected that maintenance and security staff will periodically visit the facility and water be transported to site possibly twice a year for the cleaning of panels. The generated trips can be accommodated by the external road network and the impacts are rated negative low with the recommended mitigation measures.

- The traffic generated during the decommissioning phase will be similar to or even less than the construction phase traffic and the impact on the surrounding road network will also be considered to be of low negative impact with mitigation measures.
- For the cumulative impact, all approved developments in a radius of 35 km from the project site were considered to be developed at the same time (which will in reality be unlikely). After mitigation, a rating of a negative medium impact is given.
- No fatal flaws were picked up during the assessment provided that the mitigation measures are considered as far as possible.

18.10 Aquatic Biodiversity

The development of the Rhino PV facility will have a very small to no impact on freshwater biodiversity should the management actions be taken into consideration during the construction phase. Some impact is expected as a result of the proposed SEFs as a result of the infilling of drainage lines within the development areas. The potential impacts are considered to be of very low to low impact with implementation of the mitigation measures. No aquatic impacts are expected to occur during the operational phase however it is the recommendation from the specialists that the client/applicant remains committed to ongoing monitoring and evaluation of the Rhino PV project to ensure that the Rhino PV Facility continue to meet its environmental commitments and minimise the impact on the aquatic ecosystem. It is further encouraged that the Rhino PV facility maintain open lines of communication with stakeholders and authorities to ensure that they are informed of any changes or developments in the project.

The development of the Sunnyside PV facility will not impact on any freshwater biodiversity should the management actions be taken into consideration during the construction phase. Similar to the Rhino PV facility some impacts is expected as a result of the proposed SEFs as a result of the infilling of drainage lines within the development areas with impacts considered to be very low.

The proposed Rhino PV and Sunnyside PV energy facilities can be executed without substantial adverse effects and impacts on the aquatic ecosystems, given the diligent implementation of the proposed mitigation measures. Consequently, based on the outlined mitigations and controls in this report, it is the expert opinion that the project can be carried out successfully, ensuring environmental compliance and sustainability.

19. ENVIRONMENTAL MANAGEMENT PROGRAMME AND CONDITIONS TO BE INCLUDED IN THE ENVIRONMENTAL AUTHORISATION

In accordance with Appendix 4 of the EIA Regulations, an EMPr has been included within the EIA. The EMPr includes the impact management measures formulated by the various specialists and the recording of the proposed impact management outcomes for the development have also been included in the EMPr (**Appendix 9**).

The EMPr provides suitable measures to avoid, reverse, mitigate or manage identified potential impacts and to determine the extent of the residual risks that need to be managed and monitored. The relevant management plans have also been incorporated into the EMPr (where required), which will assist in this regard. Taking into account the potential negative and significant positive impacts that the proposed development could have on the biophysical and social environment, it is the opinion of the EAP that the proposed development should be authorised subject to the following conditions of authorisation:

- All of the specialist mitigation measures identified in this BA report must be made conditions of the EA.
- It is important that all of the listed mitigation measures are costed for in the construction phase's financial planning and budget so that the contractor and/or developer cannot give financial budget constraints as reasons for non-compliance.
- All feasible and practical mitigation measures recommended by the various specialists must be incorporated into the Final EMPr and implemented, where applicable;
- The specialist recommendations included in **Section 17** must be made conditions of the EA.
- Where applicable, monitoring should be undertaken to evaluate the success of the mitigation measures recommended by the various specialists.
- The activity-specific construction EMPr must be adhered to.
- An independent ECO must be appointed by the applicant to monitor the implementation of the EMPr. The ECO should undertake regular site inspections and compile an environmental audit report.

20. FINAL PROPOSED ALTERNATIVE WHICH RESPONDS TO THE IMPACT MANAGEMENT MEASURES, AVOIDANCE, AND MITIGATION MEASURES IDENTIFIED THROUGH THE ASSESSMENT

The final proposed alternative is the layout that has been assessed in this report. Please see Appendix 3# for the preferred alternative layout.

21. ASPECTS WHICH WERE CONDITIONAL TO THE FINDINGS OF THE ASSESSMENT EITHER BY THE EAP OR SPECIALISTS WHICH ARE TO BE INCLUDED AS CONDITIONS OF AUTHORISATION

Refer to Section 16.

22. UNCERTAINTIES, ASSUMPTIONS AND GAPS IN KNOWLEDGE

The assessment has been based, by SiVEST, on information sourced and provided by the Applicant, site visits conducted, specialist findings and the application of the SiVEST assessment criteria. The EAP is of the opinion that the assessment method applied is acceptable. SiVEST assumes that:

- All the information provided by the Applicant is accurate and unbiased.
- The available data, including Topo-cadastral maps, Orthophotographs, geological maps and Google Earth images, are reasonably accurate.
- All information contained in the specialist studies provided is accurate and unbiased. Refer to specialist studies (**Appendix 6**) for their specific assumptions and limitations.
- It is not always possible to involve all I&APs individually, however, every effort has/ will be made to involve as many I&APs as possible. It is also assumed that individuals representing various associations or parties convey the necessary information to these associations/ parties.
- It is not possible to determine the actual degree of the impacts that the development will have on the immediate environment without some level of uncertainties. Actual impacts can only be determined following construction and/or operation commences.

23. AUTHORISATION OF THE PROPOSED PROJECT

The final layout of the proposed project has been designed to avoid no-go features on site that have been identified through the various specialist studies that have been undertaken, and the iterative process with specialists to be able to present a development feasible and considerate of the environmental sensitivities. No fatal flaws were identified by the specialists. Whilst it is acknowledged that the project will result in negative impacts, these can be mitigated to acceptable levels.

Based on the findings of the specialist studies and this assessment, provided further concerns are not raised in comments during the pending PPP, the EAP has no reason to recommend that the project not be authorised, provided that the mitigation measures are adhered to. The conditions to be included in the EA for the project are listed in **Section 17** of this Final BAR.

The EA should be valid for a period of 10 years. It is unclear, at this stage, as to when the project will be concluded although this will be dependent on the commencement which the Applicant will inform the DFFE of in advance.

24. EAP DECLARATION

The declarations, CV's and qualifications of the EAPs responsible for the preparation of this report are attached in **Appendix 1**.

25. INFORMATION REQUIRED BY THE COMPETANT AUTHORITY, WHERE APPLICABLE

Currently not applicable.

26. CONCLUSION

This BAR has covered activities and findings related to the BA process for the proposed project. Professional experience, specialist knowledge, relevant literature and local knowledge of the area have all been used to identify the potential issues associated with the proposed project. No fatal flaws were identified during the BA process.

There is no guarantee that all the potential impacts arising from the proposed project have been identified within the BA phase, however, the report provides an outline of the established measures that were taken to best identify all the potential impacts.

In conclusion, SiVEST, as the independent EAP is of the view that:

- The site location and project description can be authorised based on the findings of the suite of specialist assessments;
- A cumulative impact assessment of similar developments in the area was undertaken by the respective specialists and the EAP. Based on the findings, majority of the cumulative impacts associated with the proposed development can be kept either low or medium after the implementation of mitigation measures.

In addition, the socio-economic specialist found that the project will result in several positive cumulative effects on the socio-economic environment and that these cumulative impacts will be positive high, before and after the implementation of mitigation measures; and

- Through the implementation of mitigation measures, together with adequate compliance monitoring, auditing and enforcement thereof by the appointed ECO as well as the CA, the potential negative impacts associated with the proposed development can be mitigated to acceptable levels. The EMPr must be approved to ensure implementation and adherence to mitigation measures and to ensure correct reporting thereon.
- The proposed development through the discussed need and desirability indicates that development is well within the objectives of the various national, provincial and local policies and guidelines.

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