ENVIRONMENTAL IMPACT ASSESSMENT REPORT

and

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

FOR THE BRYPAAL SOLAR PROJECT

APPLICATION FOR ENVIRONMENTAL AUTHORISATION (Regulation 21- S & EIA process)

NAME OF APPLICANT: VINTAGE ENERGY (PTY) LTD.

FILE REFERENCE NUMBER : DEA Ref. 14/12/16/3/3/2/1019

Boscia Environmental Solutions

REF NO: DRAFT MAY 2018

PART A

Content of Environmental Impact Assessment Report

	PAGE
(1) An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include— (a) **details of—** **(i) the EAP who prepared the report; and** **(ii) the expertise of the EAP, including a curriculum vitae;**	**11** **12**
(b) the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including: **(i) the 21 digit Surveyor General code of each cadastral land parcel;** **(ii) where available, the physical address and farm name; and** **(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;**	**13-15**
(c) a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure 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;** **(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;**	**15-18**
(d) a description of the scope of the proposed activity, including— **(a) all listed and specified activities triggered and being applied for; and** **(ii) a description of the associated structures and infrastructure related to the development;**	**19** **22** **30**

(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	32
(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	40
(g) a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	42
(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 the development footprint alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts— (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and	44 49 54 55 130 135 141 146 160

(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	160

(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 environmental impact assessment 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;	162
(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;	231
(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	232
(l) an environmental impact statement which contains— (i) a summary of the key findings of the environmental impact assessment: (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	244 244 246

(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;	255
(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	268
(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	268
(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	268
(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	269
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	269
(s) an undertaking under oath or affirmation by the EAP in relation to— (i) the correctness of the information provided in the reports; (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 interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	269
(t) where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	270

(u) an indication of any deviation from the approved scoping report, including the plan of study, including— **(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and** **(ii) a motivation for the deviation;**	**270**
(v) any specific information that may be required by the competent authority; and **(w) any other matters required in terms of section 24(4)(a) and (b) of the Act.**	**270**
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report the requirements as indicated in such notice will apply.	**270**

PART B

Content of environmental management programme (EMPr)

	PAGE
1. (1) An EMPr must comply with section 24N of the Act and include— (a) details of– (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae; **SEE PART A FOR MORE INFORMATION**	272
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	272
(c) a map/plan at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	274
(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including— (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;	291

(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to — (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;	291 376 377
(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f); (h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f); (i) an indication of the persons who will be responsible for the implementation of the impact management actions; (j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented; (k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	383
(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	388
(m) an environmental awareness plan describing the manner in which— (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and (n) any specific information that may be required by the competent authority. (2) Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	390 393

APPENDIX:

Specialist reports		
Geotechnical investigation	PW van Deventer	2017/BES/SR/01
Topography	FJ Erasmus	2017/BES/SR/02
Soil assessment	C Faul	2017/BES/SR/03
Land use and Land capability	FJ Erasmus	2017/BES/SR/04
Ecological investigation	C Faul	2017/BES/SR/05
Fauna assessment	P Ayres	2017/BES/SR/06
Surface water assessment	D van Rensburg	2017/BES/SR/07
Geohydrological assessment	A Groenewald	2017/BES/SR/08
Heritage assessment	J van der Walt	2017/BES/SR/09
Palaeontological assessment	PW van Deventer	2017/BES/SR/10
Social impact assessment	A Barber	2017/BES/SR/11
Geological assessment	C Faul	2017/BES/SR/12
Avifauna assessment	C van Rooyen	2017/BES/SR/13
Visual impact assessment	C Faul	2017/BES/SR/14
Climate and solar radiation report	FJ Erasmus	2017/BES/SR/15
Traffic and Transportation	PW van Deventer/ C Faul	2017/BES/SR/16
Storm water management plan	P Vlok & P Harris	2017/BES/MPR/02

CV- FROM C. FAUL (BES SPECIALIST)

CV- FROM P. W VAN DEVENTER (BES SPECIALIST)

A

EAP's curriculum vitae — **B**

Surface Infrastructure Plan (Plan 1) (To be supplied by applicant) — **C**

Summary of the issues raised by interested and affected parties, letters correspondence, minutes, etc. — **D**

CORRESPONDANCE RECEIVED FORM STATE DEPARTMENTS , LOCAL AUTHORITIES , ETC. — **E**

F

	G

PART A

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1. Contact Person and correspondence address

a) Details of

i) Details of the EAP

EAP:	**Mr. Frik Erasmus**		
Professional affiliation/registration:	**South African Council for Natural Scientific Professions (SACNASP):** **Prof. Nat. Sci. : 400120/05**		
Contact person (if different from EAP):	**Me. Cindy Faul**		
Company:	**Boscia Environmental Solutions C.C.**		
Physical address:	**10 Borrius Street , Potchefstroom, 2531**		
Postal address:	**10 Borrius Street , Potchefstroom, 2531**		
Postal code:	**2531**	Cell:	
Telephone:		Fax:	
E-mail:	**sumsar@worldonline.co.za** **cindyfaul35@yahoo.com**		

(ii) the expertise of the EAP, including a curriculum vitae; **See Appendix B.**

The EAP, Mr. Erasmus has been involved in environmental studies, research, environmental management, compilation of Basic assessments EIA/EMP'S, EMP environmental auditing for the past 30 years.

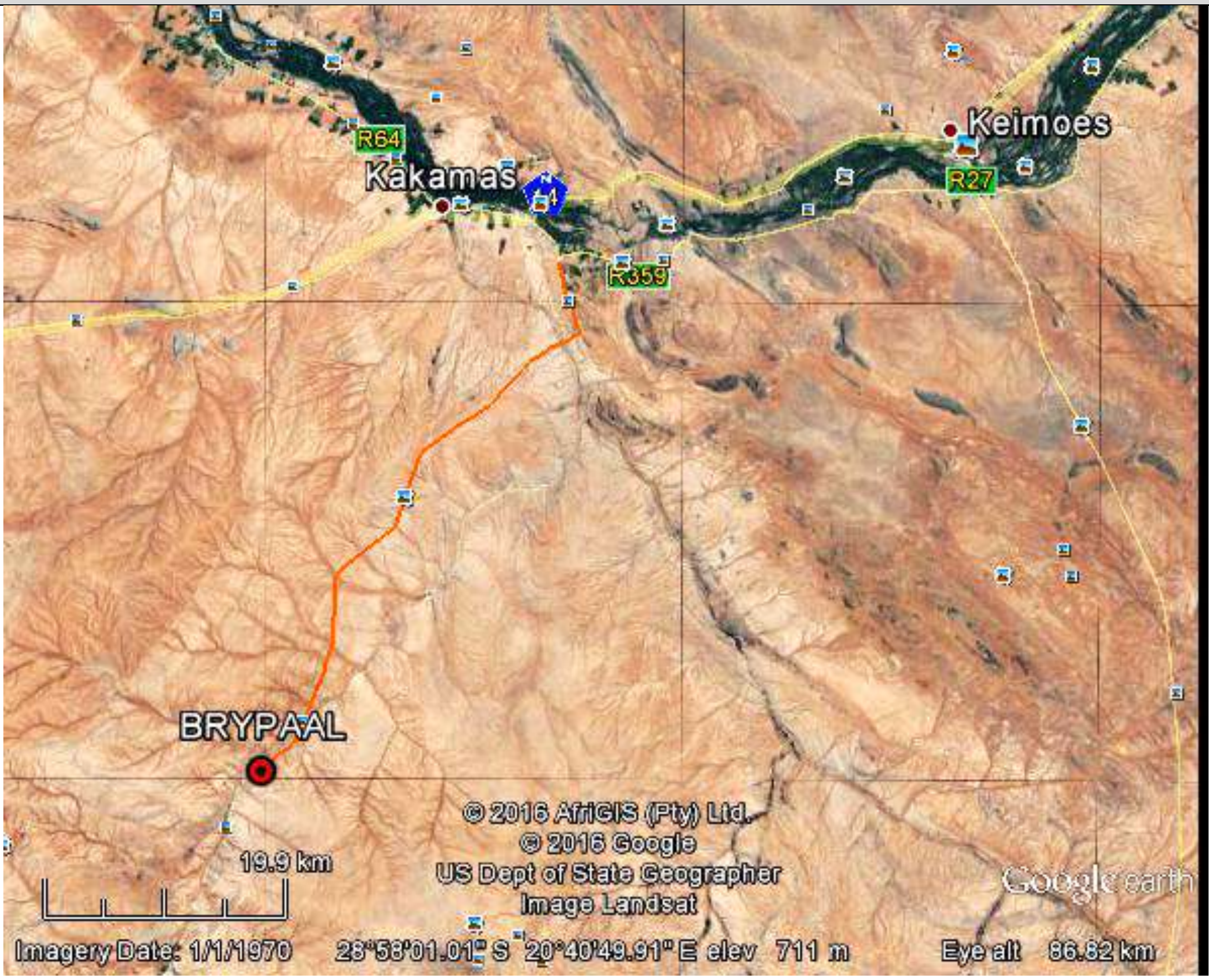
Qualifications (Highest):

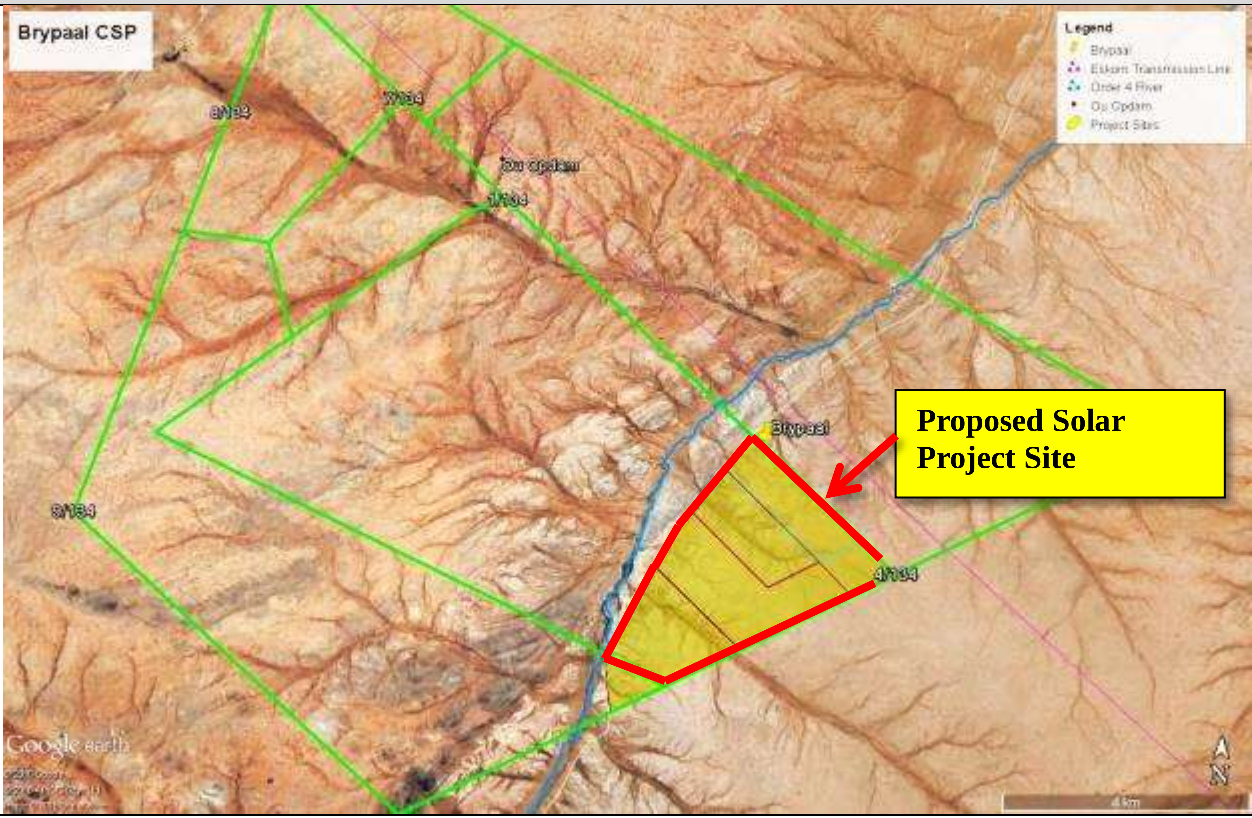
M.Sc. (Geography); M.Sc (Environmental Management & Analyses) Prof. Natural Scientist (Reg. No. 400120/05) SACNASP; Member of the IAIASA (See C.V for more detail in Appendix B).

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

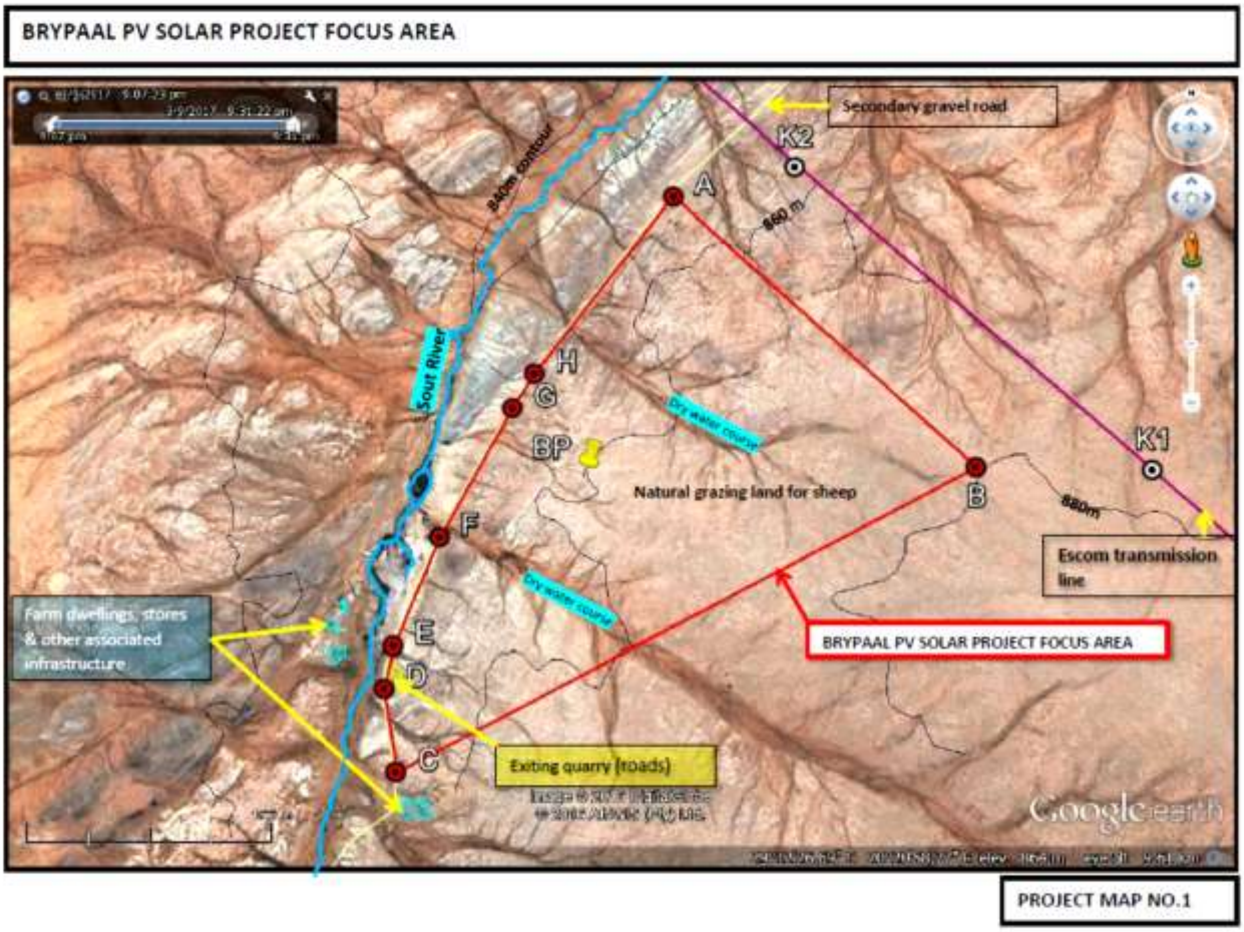
Province	**Northern Cape**
District Municipality	**Sinyanda (changed to:) - ZF Mgcawu**
Local Municipality	**Kai !Garib Local Municipality**
Ward number(s)	**9**
Nearest town(s)	**Kakamas**
Farm name(s) and number(s)	**Brypaal**
Portion number(s)	**Remainder of Portion 4 of 134**
21 digit Surveyor General Code for each farm portion	**SG21 CODE: C03600000000013400004**

Locality map

	(b) the location of the activity, including-
	 Distance: Brypaal project site is located 53,23 KM south of Kakamas
	(i) the 21 digit Surveyor General code of each cadastral land parcel;
	SG21 CODE: C03600000000013400004
	(ii) where available, the physical address and farm name;
	Farm: Remainder of Portion 4 of 134 of the Farm Brypaal District: Sinyanda (changed to:) - ZF Mgcawu

	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;
	29°11'48.91" S 20°23'19.44" E
	(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; See below:
C1	

C2 **Brypaal PV Solar Project focus area (Initial):**



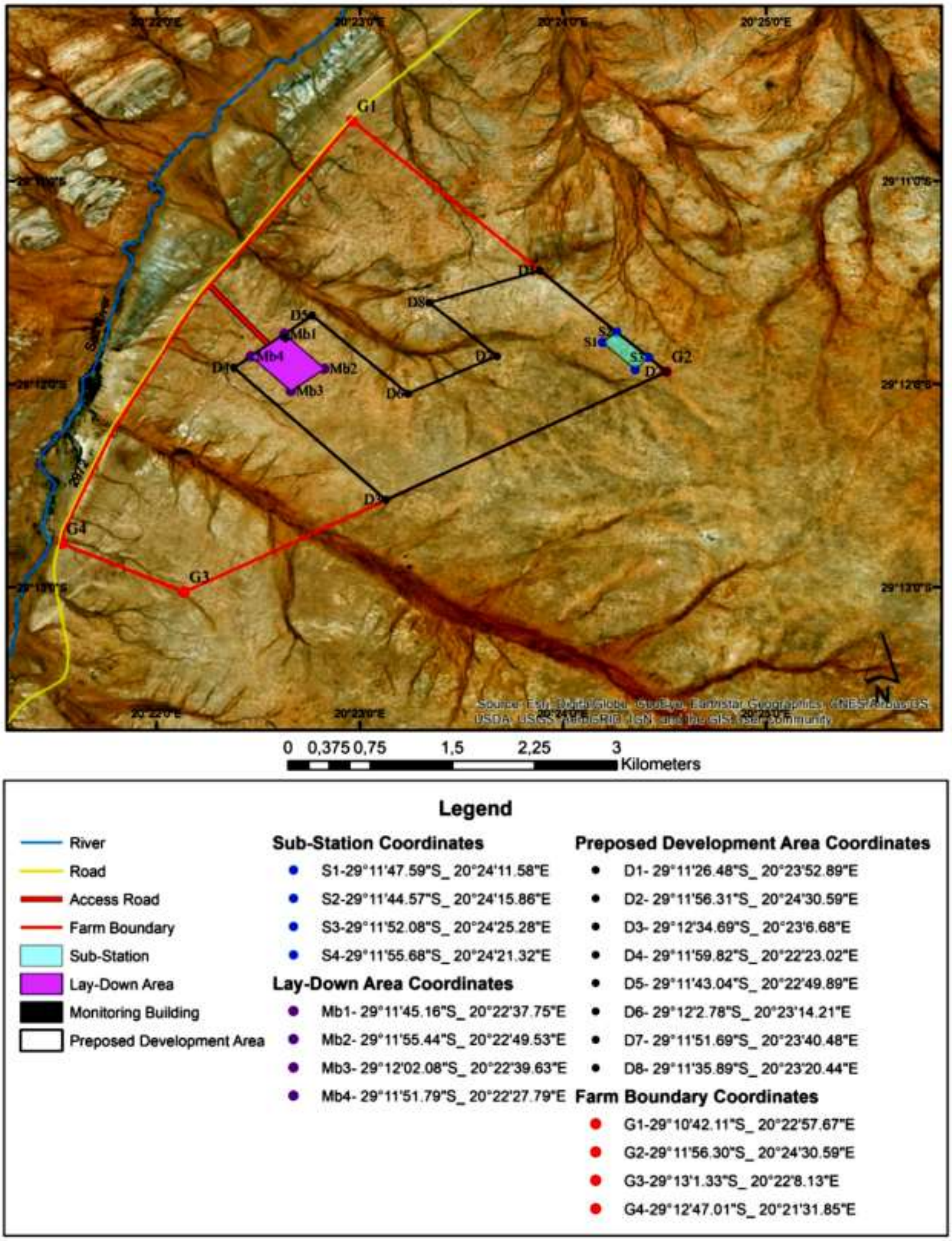
GPS point	Latitude	Longitude
A	29°10'42.54"S	20°22'58.32"E
B	29°11'56.28"S	20°24'30.36"E
C	29°13'16.62"S	20°21'34.20"E
D	29°12'54.84"S	20°21'30.36"E
E	29°12'43.80"S	20°21'32.94"E
F	29°12'15.00"S	20°21'46.74"E
G	29°11'40.38"S	20°22'8.76"E
H	29°11'31.08"S	20°22'15.48"E

Total surface area available for the project: **1032 ha**

C3	**Proposed preferred site and location within the site (PLAN NO. 1) :**
	After carefully considering all the impacts associated with this development (as identified and mitigated according to all specialist reports), it was concluded that the 320 ha development and footprint area remains in the south-eastern section of the farm, as indicated in PLAN NO. 1. The location of the sub-station was selected near the eastern boundary in order to ensure the shortest possible distance from the sub-station to the transmission power-line, and consequently minimise the visual impact thereof. The location of the laydown area was selected as follows, in order to ensure minimal environmental disturbance as well as minimal dust generation. This proposed development area corresponds to all specifications and recommendations as prescribed by all the accompanying specialist reports. **See EIAR & EMPR and Appendix A (Specialist studies) which have been used for the ultimate proposed preferred site for the Brypaal PV Solar Facility development.**

PLAN NO. 1

Development Area



PLAN NO. 1

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

<u>Proposed activity</u>: 100MW Photovoltaic (PV)Solar Power project (PVSP)

The construction of a **PHOTOVOLTAIC SOLAR POWER (PVSP) facility (with associated infrastructure**) for the generation of electricity from a renewable resource (solar radiation from the sun) where the electricity output is 100MW in total. The 100 MW electricity will be fed into the existing Escom national grid (See Part 4 for the location of existing Escom transmission line).

Photo and sat image of an existing PV project

The **surface area** available for the project is approximately **1032 ha** in total.
The actual project footprint will depend on the surface areas required for the different components of the project, namely :

	1) The **PV SOLAR FIELD**: Consist of the photovoltaic solar arrays (panels).Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. **Surface area required 1,5 to 4 ha/MW = (100W X 4ha= 400ha).** 2) The **POWER INVERTERS/TRANSFORMER UNIT**: The solar arrays are typically connected to each other in strings and the strings connected to inverters that convert DC to AC. These inverters may be mounted on the back of the panel's support substructures or alternatively in a central inverter station. The strings are connected to the inverters by low voltage DC cables. Power from the **inverters** is collected in medium voltage transformers through AC cables, which may be buried or pole-mounted or piles with pre-manufactured concrete footings to support the PV panels, depending on voltage level and site conditions. Cabling between the structures, to be lain underground where practical. Connecting the solar facility to the national grid (Escom) will be via an **onsite transformer unit.** A **new power line** which will connect the PV facility into the national grid via a **new substation (need to be constructed by Escom**). **3) Solar Resource Measuring Station** A permanent solar resource measuring station will be required on the site to measure incoming solar radiation levels. 4) **Access roads** (temporary & permanent roads, 4 m- 6 m wide). 5) Temporary **LAYDOWN AREA (**workshops, mobile offices, mobile ablution facilities, material storage area, vehicle parking area, water tanks (for potable use & construction, dust suppression), fencing, etc.) A lay down area adjacent to the site or on site will be required. This will be temporary in nature (unless the property owner wishes to continue using it in the long term). The contractors' site offices and other temporary facilities will be located on site for the duration of the construction phase. 6) Permanent office/workshop/control room, etc. buildings 7) Permanent living quarters for operational phase workers 8) Equipment (Trucks & front-end loaders, excavators, cranes, etc.) 9) Topsoil /Overburden stockpiles/fill material 10) Opencast quarries/excavations – for cut & and fill material 11) Water Desalination plant (pipelines towards water storage and power plant) **(All indications at this stage from the project team is that the construction of an water desalination plant would not be necessary or • Water Desalination plant (pipelines towards water storage and power plant); very small, just for standby water supply; the rest of the operational water will be transported from Kakamas. Limited water is required for the washing of the PV-panels because nano-technology will be applied to the surface of the panels which keeps it virtually clean for very long periods of time and washing of the panels will be required cells only once a year or even longer intervals)** 12) Water storage facilities (reservoir, tanks?) 13) Waste handling facilities (for construction & operational phase) 14) Surface run-off control system (trenches, canals, run-off dissipating structures, culverts, etc. 15) Fencing (Access control)

See listed activities (GN 325, 327, 324).

This project should be seen as part of the **Strategic Infrastructure Projects** (SIPs) as described in the National Development Plan, 2011 for the Northern Cape Province, namely: SIP 8: Green energy in support of the South African economy. This involves support for sustainable green energy initiatives on a national scale through a diverse range **of clean energy options** as envisaged in the Integrated Resource Plan (IRP2010).

Technology Overview: Photovoltaic Systems:

Photovoltaic (PV)systems are widely applied in South Africa for powering professional niche applications such as telecommunications, microwave links, navigational aids and meteorology stations, where PV is well established as the best practical option. PV is also applied in small-scale remote power supplies for domestic use, game farms and community water pumping schemes. **PV cells are made from semi-conductor materials** that are able to release electrons when exposed to solar radiation by using the photo-electric effect. Electrons from several PV cells are gathered together through conductors to make up the generation capacity of one module and many modules can be connected together to produce power in large quantities. Internationally, PV is the fastest-growing power generation technology and between 2000 and 2009 the installed capacity globally grew on average by 60% per year. Worldwide more than 35GW of PVs are installed and operating, and **in South Africa as much as 8GW PV could potentially be installed by 2020**.

(*Source: Dept. of Environmental Affairs (2015): EIA Guideline)).*

(i) Listed and specified activities

Listed activities in terms of the EIA Regulations, 2014 that have been triggered for RE developments: S & EIR:

LISTED ACTIVITIES & SPECIFIED ACTIVITIES AS PER THE DETAILED PROJECT DESCRIPTION (LISTING NOTICE NO. 2)	
Listed activity as described in GN R 325	Activity 1: The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs — (a) within an urban area; or (b) on existing infrastructure.
Description of project activity that triggers listed activity	The surface area available for the project is approximately 1032 ha in total. The actual project footprint will depend on the surface areas required for the different components of the project, namely : 1) The PV SOLAR FIELD (100MW) 2) The POWER INVERTERS/TRANSFORMER UNIT 3) Solar Resource Measuring Station 4) Access roads (temporary & permanent roads, 4-6 m wide). 5) Temporary LAYDOWN AREA (workshops, mobile offices, mobile ablution facilities, material storage area, vehicle parking area, water tanks (for potable use & construction, dust suppression), fencing, etc.) 6) Permanent office/workshop/control room, etc. buildings 7) Permanent living quarters for operational phase workers 8) Equipment (Trucks & front-end loaders, excavators, cranes, etc.) 9) Topsoil /Overburden stockpiles/fill material 10) Opencast quarries/excavations – for cut & and fill material 11) Water Desalination plant (pipelines towards water storage and power plant) **(All indications at this stage from the project team is that the construction of an water desalination plant would not be necessary or • Water Desalination plant (pipelines towards water storage and power plant); very small, just for standby water supply; the rest of the operational water will be transported from Kakamas. Limited water is required for the washing of the PV-panels because nano-technology will be applied to the surface of the panels which keeps it virtually clean for very long periods of time and washing of the panels will be required cells only once a year or even longer intervals)** 12) Water storage facilities (reservoir, tanks?) 13) Waste handling facilities (for construction & operational phase) 14) Surface run-off control system (trenches, canals, run-off dissipating structures, culverts, etc.) 15) Fencing (Access control)

Listed activity as described in GN R 325	Activity 9: The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.
Description of project activity that triggers listed activity	The construction of POWER INVERTERS/TRANSFORMER UNIT and power lines (400 kV) up to the a new required Eskom connection (substation outside the project site, on an adjacent property 885m to 1006 m north of PV Solar project site border fence). **Note: Applicant busy with project planning. Info to be supplied by applicant.**
Listed activity as described in GN R 325	Activity 15: The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.
Description of project activity that triggers listed activity	The clearance of an footprint area of up to probable 500ha of a total of 1032 hectares of indigenous vegetation during site preparation for the establishment of the indicated activities under Activity (1) – The actual project footprint will depend on the surface areas required for the different components of the project, namely : 1) The PV SOLAR FIELD (100 MW) 2) The POWER INVERTERS/TRANSFORMER UNIT 3) Solar Resource Measuring Station 4) Access roads (temporary & permanent roads, 4 m wide). 5) Temporary LAYDOWN AREA (workshops, mobile offices, mobile ablution facilities, material storage area, vehicle parking area, water tanks (for potable use & construction, dust suppression), fencing, etc.) 6) Permanent office/workshop/control room, etc. buildings 7) Permanent living quarters for operational phase workers 8) Equipment (Trucks & front-end loaders, excavators, cranes, etc.) 9) Topsoil /Overburden stockpiles/fill material 10) Opencast quarries/excavations – for cut & and fill material 11) Water Desalination plant (pipelines towards water storage and power plant) 12) Water storage facilities (reservoir, tanks?) 13) Waste handling facilities (for construction & operational phase) 14) Surface run-off control system (trenches, canals, run-off dissipating structures, culverts, etc.) 15) Fencing (Access control)

LISTED ACTIVITIES & SPECIFIED ACTIVITIES AS PER THE DETAILED PROJECT DESCRIPTION (LISTING NOTICE NO. 1)	
Listed activity as described in GN R 327	Activity 12: The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; — excluding— (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; [or] (ee) where such development occurs within existing roads, [or] road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.
Description of project activity that triggers listed activity	Possible the construction of the following: (i) canals exceeding ………… square metres in size; (ii) channels exceeding ……….. square metres in size; (iii) bridges exceeding ……………square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, ……….. square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, ……… square metres in size; (vi) bulk storm water outlet(s) structures exceeding …………square metres in size; (x) buildings exceeding ……………square metres in size; (xii) infrastructure or structures with a physical footprint of ………………. square metres or more; a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; **Note: Applicant busy with project planning. Info to be supplied by applicant.**

Listed activity as described in GN R 327	Activity 13: Listed activity as described in GN R 327 Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.
Description of project activity that triggers listed activity	The 100 MW PVSP project utilizes ………………… kl/ annum water from a desalination plant, as process water for dust suppression, cleaning, construction, etc. Reservoir (tanks) would be constructed with a capacity of …………… kl . Water will be recycled via lined collection dam facilities. Surface run-off that ends-up in the dirty environment would be captured via a collection of trenches/canals and channeled to a evaporation pond (capacity ………….kl) . **Note: Applicant busy with project planning. Info to be supplied by applicant.** **(All indications at this stage from the project team is that the construction of an water desalination plant would not be necessary or •Water Desalination plant (pipelines towards water storage and power plant); very small, just for standby water supply; the rest of the operational water will be transported from Kakamas. Limited water is required for the washing of the PV-panels because nano-technology will be applied to the surface of the panels which keeps it virtually clean for very long periods of time and washing of the panels will be required cells only once a year or even longer intervals)**
Listed activity as described in GN R 327	Activity 14: The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous goods, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.
Description of project activity that triggers listed activity	The construction of temporary diesel tank storage facilities (bunded) as part of the contractor lay down site. (Capacity…………L) Note: Applicant busy with project planning. Info to be supplied by applicant.
Listed activity as described in GN R 327	Activity 19: Listed activity as described in GN R 327 Activity 19: The infilling or depositing of any material of more than [5] 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than [5] 10 cubic metres from [—(i)] a watercourse; [(ii) the seashore; or (iii)the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or estuary, whichever distance is the greater—] but excluding where such infilling, depositing, dredging, excavation, removal or moving— (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; [or] (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.

Description of project activity that triggers listed activity	1) During initial site preparation operation, the site will be surveyed and levelled for particular project (infrastructure) components (listed activities). This will involve vegetation clearance, topsoil/overburden removal & stockpiling at dedicated stockpile areas. 2) Dedicated quarries will be mechanically excavated for obtaining construction infill/backfill material (weathered overburden material). Prior to removal of material the topsoil need to be stockpiled in a dedicated stockpile next to the quarry. The material will be loaded onto trucks and transport to construction site where required for infilling, backfilling, terraces, benches, etc. 3) Surface run-off control trenches/canals/evaporation dam sites//culverts/energy dissipating structures, etc. need to be excavated/constructed.
Listed activity as described in GN R 327	Activity 24: The development of a road— (i) [a road] for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) [a road] with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road— (a) [roads] which [are] is identified and included in activity 27 in Listing Notice 2 of 2014; (b) [roads] where the entire road falls within an urban area; or (c) which is 1 kilometre or shorter.
Description of project activity that triggers listed activity	For the location of the **main access road see plan 1** indicating the main development area. **Note: Applicant busy with project planning. Info to be supplied by applicant.**

Listed activity as described in GN R 327	Activity 28: Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.
Description of project activity that triggers listed activity	The construction of a PV SOLAR POWER (PVSP) facility (with associated infrastructure) for the generation of electricity from a renewable resource (solar radiation) where the electricity output is 100MW in total. The clearance of an footprint area of less than 1032 hectares (- 400 ha for PV facility, other supporting infrastructure (maybe a additional 100 ha) , etc.) of indigenous vegetation during site preparation for the establishment of the indicated activities under Activity (1) (Listing No. 2) **Note: Indication at this stage is that the footprint would be in the order of 320 ha excluding the access road**

LISTED ACTIVITIES & SPECIFIED ACTIVITIES AS PER THE DETAILED PROJECT DESCRIPTION (LISTING NOTICE NO. 3)	
Listed activity as described in GN R 324	Activity 1: The **development of billboards** exceeding 18 square metres in size outside urban areas, mining areas or industrial complexes.
	g. Northern Cape i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus areas; iii. World Heritage Sites; iv. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; v. Sites or areas identified in terms of an international convention; vi. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; vii. Core areas in biosphere reserves; viii. Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; ix. Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or x. In an estuary.
Description of project activity that triggers listed activity	During the construction phase information/ identification of the project/ safety information billboards/ safety warning signs will be provided on site.
Listed activity as described in GN R 324	Activity 4: The development of a **road wider than 4m** with a reserve less than 13.5m. (Provincial/geographical qualifications apply based on environmental attributes)
	g. Northern Cape i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus areas; iii. World Heritage Sites; iv. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; v. Sites or areas identified in terms of an international convention; vi. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; vii. Core areas in biosphere reserves; viii. Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; ix. Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or x. In an estuary.
Description of project activity that triggers listed activity	An access road will be constructed on site to give access to the contractors initially and eventually where required a permanent road on site for easy access during the operational phase of the PVSP project. An access road is also needed as along the border fence for security reasons and also act as a fire-break.

Listed activity as described in GN R 324	Activity 10: The development of **facilities or infrastructure for the storage, or storage and handling of a dangerous good**, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 m³ (Provincial/geographical qualifications apply based on environmental attributes)
	a. Northern Cape i. In an estuary; ii. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland; iii. Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an international convention; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve; (hh) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or (ii) Within 500 metres of an estuary; or iv. Inside urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; or (cc) Within 500 metres of an estuary.
Description of project activity that triggers listed activity	The construction of temporary **diesel tank storage facilities (bunded)** as part of the contractor lay down site. (Capacity…………L) *See also Activity 14 (GN 325).(The selection of the particular activity will depend on the capacities required.* **Note: Applicant busy with project planning. Info to be supplied by applicant.**
Listed activity as described in GN R 324	Activity 14: Listed activity as described in GN R 324 Activity 14: The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres 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 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.

	g. Northern Cape i. In an estuary; ii. Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) World Heritage Sites; (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Sites or areas identified in terms of an international convention; (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Core areas in biosphere reserves; (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; (ii) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or iii. Inside urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, zoned for a conservation purpose; or (cc) Areas seawards of the development setback line.
Description of project activity that triggers listed activity	*See also Activity 15 (GN 325).(The selection of the particular activity will depend on the actual dimensions of the structures required.* **Note: Applicant busy with project planning. Info to be supplied by applicant.**

(ii) a description of the activities to be undertaken, including associated structures and infrastructure**;**

(See previous tables with reference to "Description of project activity that triggers listed activity")

See Infrastructure Plan (Plan 1) & Appendix C.

Provide a plan drawn to a scale acceptable to the competent authority but not less than 1:10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site. Need to be included in the appendices.

Note :The applicant (Vintage Energy (Pty) Ltd. is busy with project planning, design of the project, compilation of plans indicating location and dimensions of different project components (as identified under Activity 1: (Listing notice No. 2) GN 325 and also other activities as identified in terms of GN 327 and GN 324.

(e) **a description of the policy and legislative context within which the development is proposed** including 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 process;

POLICY AND LEGISLATIVE CONTEXT:

No.	**APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT** **(a description of the policy and legislative context within which the development is proposed including 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 process**	**REFERENCE WHERE APPLIED**	**HOW DOES THIS DEVELOPMENT COMPLIY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT.** **(E.g. In terms of the National Water Act a Water Use License has/ has not been applied for)**
1	**Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), (the Act) and the Environmental Impact Assessment Regulations, 2014 the Regulations)**	GNR 983, 984, 985	Application to be submitted for Environmental Authorization in terms of the National Environmental Management Act, 1998 in respect of Listed Activities that has been triggered by applications (As been identified).
2	**National Environmental Management: Biodiversity Act (Act 10 of 2004 as amended)**	NEMBA	Application for the necessary permits would be made if the specialist Fauna & Flora studies are completed and any recommendation is made to do so.
3	**National Environmental Management: Waste Act**	NEMWA	An waste license need to be applied for and a waste management plan should be compiled. Relevant activities which would require the Waste Management Licence application process to be undertaken before renewable energy development activities could commence.

4	**National Water Act (Act 36 of 1998 as amended)**	NWA Section 21	An water use license need to be applied for. The process has already been started. Base line surface water and ground water study are currently being conducted.
5	**National Heritage Resources Act (No. 25 of 1999)**	NHRA	Application for the necessary permits would be made once the Specialist has recommended in his report (Heritage Impact Assessment) to do so.
6	**Conservation and Agricultural Resources Act (Act No 43 of 1983)**	CARA	The mandate of the Conservation and Agricultural Resources Act 1983 (Act No 43 of 1983) (CARA) is to conserve "natural agricultural resources" (the soil, the water sources and the vegetation, excluding weeds and invader plants) through production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants. Possible impacts such as soil erosion, eradication of weeds and invader plants will be addressed in the EMPR document for the proposed PVSP project site.
7	**Electricity Regulation 2006 (No. 4 of 2006) as amended by the ERAA in 2007)**	ERA	The act requires registration and licensing of anyone wanting to generate, transmit, reticulate (i.e. network), distribute, trade, or import and export electricity. The applicant is consultation with the Dept. of Energy in this regard.
8	**B19: Subdivision of Agricultural Land Act (SALA) (Act no 70 of 1970) as amended**	SALA	The Subdivision of Agricultural Land Act ("Subdivision Act") regulates the subdivision of all agricultural land in the Republic. The declared purpose of the Act is to prevent the creation of uneconomic farming units and this purpose is achieved through the requirement that the Minister of Agriculture, Forestry and Fisheries ("Minister of Agriculture") must consent to the proposed subdivision. This purpose is to

			prevent the degradation of prime agricultural land in the Republic.
9	**National Forest Act (No. 84 of 1998)**	NFA	The main objective of the National Forests Act, 1998 is to promote the sustainable management and development of forests and to provide protection for certain forests and trees. This said protection is provided through the protection of all natural forests (Section 7 (1), the protection of all trees declared to be protected in terms of section 12(1) of the Act, and the regulation of certain activities in a proclaimed State forest (Section 23(1)(a) – (k)).
			Section 15: No person may cut, disturb, damage, 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.
10	**Northern Cape Nature Conservation Act (Act 9 of 2009)**	NCNCA	Addresses protected species in the Northern Cape and the permit application process related thereto. A permit application regarding provincially protected plant species as well as for large-scale harvesting of indigenous flora need to be lodged with the DENC.

Relevant activities which would require the Waste Management Licence application process to be undertaken before renewable energy development activities could commence.

NEMWA Activity Listing Category A (relevant to Renewable Energy)
Storage of waste: 3(1)The storage including the temporary storage of general waste in lagoons.
Recycling and recovery: 3(2)The sorting, shredding, grinding, crushing, screening or bailing of general waste at a facility that has an operational area in excess of 1000m2. 3(5)The recovery of waste including the refining, utilisation, or co-processing of waste in excess of 10 tons but less than 100 tons of general waste per day or excess of 500kg but less than 1 ton of hazardous waste per day, excluding recovery that takes place as an integral part of an internal manufacturing process within the same premises.
Treatment of Waste: 3(6)The treatment of general waste using any form of treatment at a facility that has the capacity to process in excess of 10 tons but less than 100 tons. 3(7)The treatment of hazardous waste using any form of treatment at the facility that has the capacity to process in excess of 500kg but less than 1 ton per day excluding the treatment of effluent, wastewater or sewage.

The Hazardous Substances Act (No. 15 of 1973)
The Hazardous Substances Act (HAS, No. 15 of 1973) was promulgated to provide for the control of substances which may cause injury, ill-health or death. Substances are defined as hazardous if their inherent nature is: toxic, corrosive, irritant; strongly sensitising, flammable and pressure generating (under certain circumstances) which may injure cause ill-health, or death in humans. HAS is administered by the department of health in consultation with other departments. The Hazardous Substances Act also provides for matters concerning the division of such substances or products into four groups in relation to the degree of danger, the prohibition and control of the importation, manufacture, sale, use, operation, application and disposal of such substances. • Group 1 substances include all hazardous substances (as defined above); • Group 2 substances include mixtures of Group 1 substances; • Group 3 substances include substances found in certain electronic products (i.e. product with an electronic circuit); and • Group 4 substances include all radioactive substances Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste[5] Under the South African National Standards (SANS), hazardous substances are given an identification number and are classified into nine classes (**Table 11**). Minimum requirements for dealing with these substances are provided in **Table 12** below.

National Water Act (Act 36 of 1998 as amended)
The National Water Act (NWA) includes provisions requiring that a **water use license** be issued by the Department of Water & Sanitation (DWS) before a project developer engages in any activity defined as a water use in terms of the NWA. Water use definitions considered probably or possibly relevant to Renewable Energy projects in terms of the NWA, section 21, includes: • Taking of water from a water resource; • Storing of water; • Impeding or diverting the flow of water in a water course; • Engaging in a stream flow reduction activity; • Engaging in a controlled activity (this includes the use of water for power generation purposes); • Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process; • Altering the bed, banks, course, or characteristics of a watercourse. This includes altering the course of a watercourse (previously referred to as a river diversion). A guideline[6] has been produced by the DWS which provides direction and assistance to applicants and stakeholders and water users on the following: • The various water uses that require authorisation; • Necessary consultative processes; • The departmental requirements for the specific water uses; • The evaluation and assessment process; • Information on the decision-making process • The appeal process. The guideline covers all water use authorisation mechanisms through all stages of the authorisation process, providing an overview of the water uses, contact details of relevant official, details of the information required during the licence application process, and an overview of the process leading to the issuing of a water use authorisation (see Figure 5below). The CA responsible for administrating the NWA is the DWS regional office, dependent on the province in which the activity is taking place. Please note that the appeal process is only initiated as and when required (after the EA has been granted or denied).

National Heritage Resources Act (No. 25 of 1999)
National Heritage Sites in South Africa are places that that are of historic or cultural importance and which are for this reason declared in terms of Section 27 of the National Heritage Resources Act (NHRA). The designation was a new one that came into effect with the introduction of the Act on 1 April 2000 when all former National Monuments declared by the former National Monuments Council and its predecessors became provincial heritage sites as provided for in Section 58 of the Act. Both national and provincial heritage sites are protected under the terms of Section 27 of the NHRA and a permit is required to work on them. National Heritage Sites are declared and administered by the national Heritage Resources Authority, SAHRA whilst provincial heritage sites fall within the domain of the various provincial heritage resources authorities**. Heritage resources are protected by the Act and may not be disturbed in any way without a permit issued by the South African Heritage Resources Agency or the relevant Provincial Heritage Resources Authority. Section 38(1) of the NHRA stipulates the triggers which would require a Heritage Impact Assessment (HIA) to become part of an EIA submitted for consideration by the relevant state department.**

Electricity Regulation 2006 (No. 4 of 2006) as amended by the ERAA in 2007)
The Electricity Regulation Act (No 47 of 1999, as amended in 2007; RGA) provides a national regulatory framework for the electricity supply industry and makes the National Energy Regulator of South Africa the overseer and enforcer of the framework. **The act requires registration and licensing of anyone wanting to generate, transmit, reticulate (i.e. network), distribute, trade, or import and export electricity.** In addition, the act regulates the reticulation of electricity by municipalities[7]. In order to become registered, the applicant must: Submit an application for registration accompanied by a prescribed registration fee. • In order to obtain a license, the applicant must provide: • A prescribed application fee; • Description of the applicant, including vertical and horizontal relationships with other persons engaged in the operation of generation, transmission and distribution facilities, the import or export of electricity, trading or any other prescribed activity relating thereto; • Documented evidence of the administrative, financial and technical abilities of the applicant as may be required by the Regulator; • A description of the proposed generation, transmission or distribution facility to be constructed or operated or the proposed service in relation to electricity to be provided, including maps and diagrams where appropriate; • A general description of the type of customer to be served and the tariff and price policies to be applied; • The plans and the ability of the applicant to comply with applicable labour, health,

safety
and environmental legislation, subordinate legislation and such other requirements as may be applicable;

- A detailed specification of the services that will be rendered under the licence; and
- Evidence of compliance with any integrated resource plan applicable at that point in time

or provide reasons for any deviation for the approval of the Minister.

Conservation and Agricultural Resources Act (Act No 43 of 1983)

The mandate of the Conservation and Agricultural Resources Act 1983 (Act No 43 of 1983) (CARA) is to conserve "natural agricultural resources" (the soil, the water sources and the vegetation, excluding weeds and invader plants) through production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants.
Section 6 of the Act concerns the control measures which the following may be applicable to IPPs (subsections (2) (f), (g) and (o)):

- the regulating of the flow pattern of run-off water;
- the utilization and protection of the vegetation; and
- the construction, maintenance, alteration or removal of soil conservation works or other structures on land.

Regulation 8 regulating the flow pattern of run-off water states that no land user shall in any manner whatsoever divert any run-off water from a water course on his farm unit to any other water course, except on authority of a written permission by the executive officer. No land user shall effect an obstruction that will disturb the natural flow pattern of run-off water on his farm unit or permit the creation of such obstruction unless the provision for the collection, passing through and flowing away of run-off water through, around or along that obstruction is sufficient to ensure that it will not be a cause for excessive soil loss due to erosion through the action of water or the deterioration of the natural agricultural resources.

Regulations 15 and 16 under this Act, which contain problem plants (known as weeds or invaders), were amended during March 2001 and make provision for four categories of problem plants:

- Category 1: Prohibited plants which must be controlled, or eradicated where possible (except in bio-control reserves, which are areas designated for the breeding of biocontrol agents)
- Category 2: Mainly commercial plantation spp. but also plants for woodlots, animal fodder, soil stabilisation etc.; allowed only in demarcated areas (by permit) under controlled conditions and in bio-control reserves
- Category 3: Mainly ornamental spp., no further planting allowed (except with special written permission), nor trade in propagative material. Existing plants may *remain but must be prevented from spreading. (* except those within the flood line of watercourses or wetlands or as directed by the executive officer)
- Bush encroachers: indigenous woody spp. which requires sound management

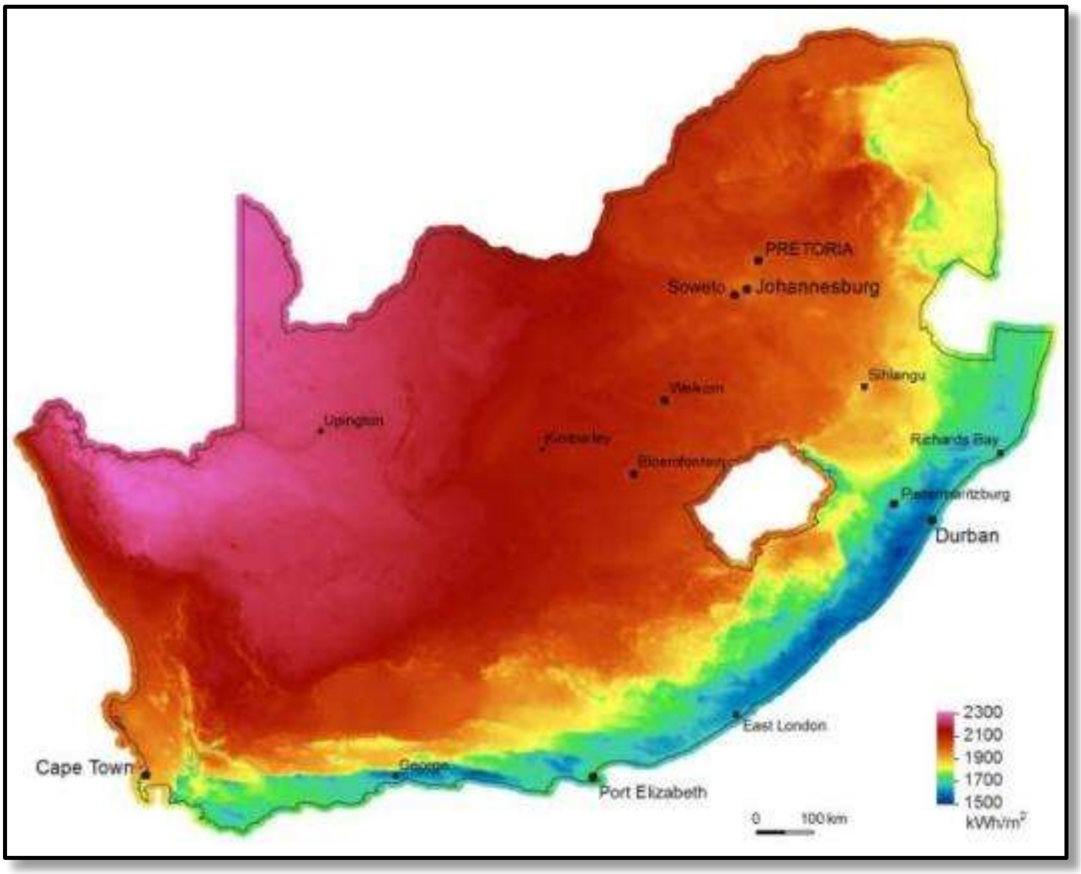
practices to prevent them from becoming a problem. CARA is administered by the National Department of Agriculture (DoA), through its Directorate: Land Use and Soil Management (D: LUSM).

B19: Subdivision of Agricultural Land Act (SALA) (Act no 70 of 1970) as Amended
The Subdivision of Agricultural Land Act ("Subdivision Act") regulates the subdivision of all agricultural land in the Republic. The declared purpose of the Act is to prevent the creation of uneconomic farming units and this purpose is achieved through the requirement that the Minister of Agriculture, Forestry and Fisheries ("Minister of Agriculture") must consent to the proposed subdivision. This purpose is to prevent the degradation of prime agricultural land in the Republic.

(f) a **motivation for the need and desirability for the proposed development**, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report:

Solar Energy:

South Africa experiences some of the highest levels of solar radiation in the world (between 1500 and 2300 kWh/m2/annum) and therefore, possesses considerable solar resource potential for solar water heating applications, solar photovoltaic (PV) and concentrated solar power (PVSP) generation.



There is a focus in South Africa on moving towards increasing the generation base from renewable energy sources. The fact that the Department of Energy has a Renewable Energy Independent Power Producer Procurement Programme is a testament that the government is seeking more independent power producers to meet the country's ever growing electricity demand. Additionally the Integrated Resource Plan for Electricity 2010-30 being implemented by the Department of Energy, highlights the electricity demand forecasts and Government's plan to meet this demand through a variety of approaches and technologies, one of which is to implement more renewable energy projects. The need for solar power technology developments in South Africa has been increasing over the recent years, as it is a means of providing the country with an alternate energy supply, the need for which is directly proportional to the increase in social and economic growth and development within the country. South African citizens are also growing more aware of global issues such as climate change and sustainable development, which also tie into using more "environmentally friendly" methods with which to meet the country's energy requirements. In the past, most of South Africa's energy demands were met using fossil fuels, mainly coal. South Africa does, however, have the means with which to generate electricity via renewable energy resources, such as solar, wind, hydro, tidal, wave, geothermal, and others.

The use of renewable energy resources contributes to diversifying the fuel sources used for energy production, improving electricity production efficiency, decreasing the quantity of burned fossil fuels, decreasing Greenhouse Gas (GHG) emissions and decreasing the amount of other aerial pollutant emissions. This all, in turn, contributes to improving the sustainability of South Africa's development.

The development of solar energy is important for South Africa to reduce its overall environmental footprint from power generation (including externality costs), and thereby to steer the country on a pathway towards sustainability. Coal-based power generation is a major global source of carbon dioxide emissions, which contributes to global warming. Coal power also leads to releases of harmful emissions such as oxides of sulphur and nitrogen. Traditional coal-based electricity generation currently contributes approximately 90% of South Africa's supply, which indicates the economic need to develop renewable energy facilities in South Africa. The MRP Douglas project would contribute to this target. Solar generation avoids the water consumption associated with generation of power from coal, which is important given that South Africa is an arid country with severe water constraints. Eskom currently uses approximately 2% of South Africa's total fresh water resources to produce power largely from wet-cooled coal power stations. These power stations typically use approximately 10 000 m3 of fresh water per MW per annum (Eskom presentation, Water Security Africa, 18-20 May 2009). Accelerated climate change has the potential to impact on the availability and quantity of water in South Africa, with decreases in summer rainfall predicted in the interior and increasing instances of droughts and floods. This creates a risk for water-dependent power generation. By comparison, solar energy has no direct water consumption for operation but only for periodic cleaning of the solar panels. This important characteristic reduces the demand on South Africa's already overstretched water resources while also avoiding the risks of drought on ability to generate power.

<u>Need and desirability of the activity in the context of the preferred location:</u>

The location of the property (Brypaal), on which the proposed development options are under consideration, will be ideally located in terms of available electricity infrastructure connection (near (885m-1006m to the existing Escom transmission 400 kVA infrastructure), road access, water supply and topography (flat slope area). The total surface area available is 1032 ha of which probable 500ha will be utilized for PV solar field and supporting infrastructure.

If implemented, the proposed Brypaal PV solar development would add an additional 100 MW into the Eskom grid. The development will generate electricity from a renewable energy resource which has nearly zero carbon dioxide emissions, unlike coal fired power plants, South Africa's main electricity resource.

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

The **location of the property (Brypaal),** on which the proposed development options are under consideration, **will be ideally located in terms of available electricity infrastructure connection (near (885m-1006m to the existing Escom transmission 400 kVA infrastructure), road access, water supply and topography (flat slope area).** The total surface area available is 1032 ha of which probable less than 500ha will be utilized for PV solar field and supporting infrastructure.

If implemented, **the proposed Brypaal PV solar development would add an additional 100 MW into the Eskom grid.** The development will generate electricity from a renewable energy resource which has nearly zero carbon dioxide emissions, unlike coal fired power plants, South Africa's main electricity resource.

According to the Social Impact Assessment the following positive outcomes could result from the construction of the PV Solar facility at Brypaal:

* The findings of the SIA indicate that the development of the proposed Brypaal CSPF will **create employment and business opportunities** for locals during both the construction and operational phase of the project.

* **The establishment of a Community Trust will also benefit the local community**. The enhancement measures listed in the report should be implemented in order to maximse the potential benefits. The significance of this impact is rated as High Positive. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole.

* **The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level**. These benefits are linked to foreign Direct Investment, **local employment and procurement and investment in local community initiatives**. The establishment of the proposed Brypaal CSPF is therefore supported by the findings of the SIA.
Due the number of other renewable energy projects proposed in the KGLM, it is recommended that the KGLM liaise with the proponents to investigate how best the Community Trusts can be established and managed so as to promote and support local, socio-economic development in the region as a whole.

* **The establishment of renewable energy facilities, such as the Brypaal CSP, therefore not only address the environmental issues associated with climate change and consumption of scarce water resources, but also creates significant socio-economic opportunities and benefits, specifically for historically disadvantaged, rural communities**.

See APPENDIX A for Social Impact Report (DOC. REF: (2017/BES/SR/11))

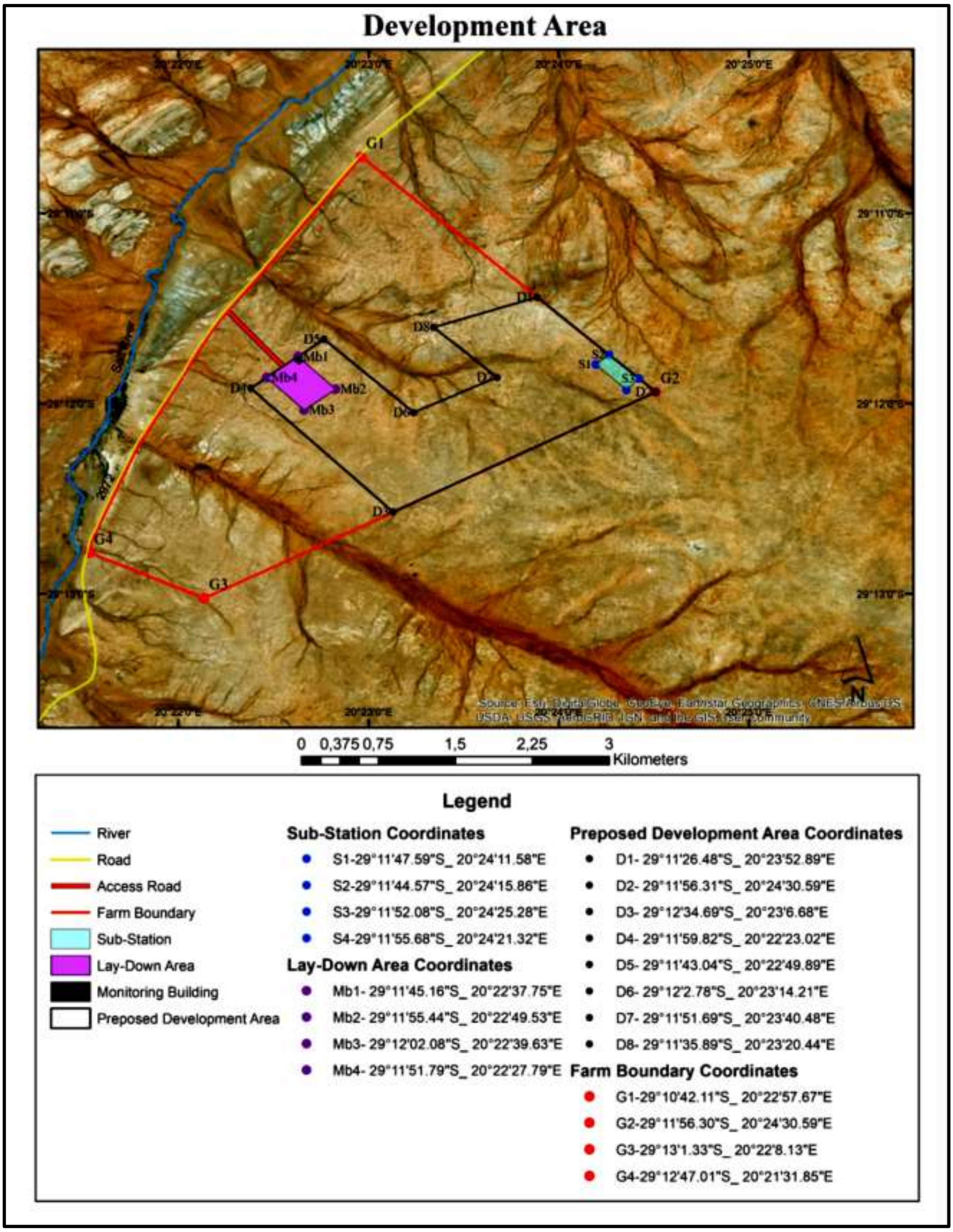
(h) a **full description** of the **process** followed to reach **the proposed preferred activity, site and location within the site**, including -

(i) details of all the **alternatives** considered;

STEP	PROPOSED PREFERRED ACTIVITY:	DESCRIPTION ACTIVITY/ACTION
1	Type of activity to be undertaken:	**Alternative 1**: The initial project proposal was the construction of a **CSP (Concentrated Solar power)** facility. Due to the restrictions poses by the availability of a reliable water source (the Sout River and borehole water) the decision was taken to rather plan for a **(Alternative 2) PV solar facility** which only makes use of water during the construction and cleaning during the operational phase. (This was concluded after inputs given by EKO Environmental, the Geo-hydrologist). The **preferred activity/technology** which is now being planned for is : The **construction of a PHOTOVOLTAIC SOLAR POWER (PVSP) facility (with associated infrastructure)** for the generation of electricity from a renewable resource (solar radiation from the sun) where the electricity **output is 100MW in total**. The 100 MW electricity will be fed into the existing Escom national grid
2	Proposed preferred site and location within the site	
2.1	Identification of a piece of land/property near existing Escom transmission line / infrastructure, access roads and possible water resource.	Vintage Energy (the applicant) identified the property and is in consultation with the property owner, Mr. Spannenberg. An agreement was reach between the parties for the possible utilization of the piece of land for a planned solar project.
2.2	The property on which or location where it is proposed to undertake the activity	Farm: Remainder of Portion 4 of 134 of the Farm Brypaal By using topographical map in combination of satellite imagery and initial site investigation it was concluded that the project site (as been indicated in part 3) that have been selected, poses the most promise as an ideal location for the proposed PV Solar project.

2.3	Available surface area in the project focus site:	A total surface area of 1032 ha is available for the project. • This more than enough as the PV project will probably require **less than 400ha for the solar field and additional ±100ha** for supporting infrastructure such as roads , buildings, etc. • Given the fact that sufficient surface area is available, alternative location of project infrastructure components could be best planned for. <u>Planning need to take place with environmental limitations (if any) also in mind as identified in environmental specialist studies as part of the EIA.</u> • See **APPENDIX A for specialist studies** conducted and recommendations given with regard to the project. • After carefully considering all the impacts associated with this development (as identified and mitigated according to all specialist reports), it was concluded that the 320 ha development and footprint area remains in the south-eastern section of the farm, as indicated in **PLAN NO. 1.** The location of the sub-station was selected near the eastern boundary in order to ensure the shortest possible distance from the sub-station to the transmission power-line, and consequently minimise the visual impact thereof. The location of the laydown area was selected as follows, in order to ensure minimal environmental disturbance as well as minimal dust generation. This proposed development area corresponds to all specifications and recommendations as prescribed by all the accompanying specialist reports. **See EIAR & EMPR and Appendix A (Specialist studies) which have been used for the ultimate proposed preferred site for the Brypaal PV Solar Facility development.**

2.4	**<u>Note :</u>** **The applicant (Vintage Energy (Pty) Ltd. is busy with project planning, design of the project, compilation of plans indicating location and dimensions of different project components (as identified under Activity 1: (Listing notice No. 2) GN 325 and also other activities as identified in terms of GN 324 and GN 327.** **During the final design of the project the planning team should also take into consideration the environmental limitations (if any), recommendations also in mind as identified in environmental specialist studies as part of the EIA (See APPENDIX A).**



3	The following environmental specialist studies have been completed and copies included in APPENDIX A, namely: • Geo-technical study • Geology description of the study area • Soil description of the study area • Topography of the study area • Climate description of the study area • Land use and land capability of the study area • Biodiversity assessment (fauna & flora surveys) of the study area & additional Avifauna impact assessment • Surface and ground water survey of the study area • Socio-economic impact study of the project • Archaeological/human heritage study of the study area **These reports and /or descriptions of environment and findings/recommendations have been included in the EIAR/EMPR as appendices (SEE APPENDIX A)** or **descriptions of the environment** within the EIA. **The following studies also have been conducted as requested:** *** Visual Impact Assessment;** *** Traffic Impact Assessment;** *** Avifauna Impact Assessment.** *** Application for an Water Use Licence (WULA) by another geohydrology/surface water consultancy company.** ***Mr. Gys Hoon from Eko Environmental have recently passed away and the outstanding WULA application could therefore not be completed. (ETC)***

4	Alternatives
	Land-use alternatives At present the proposed site is zoned for agricultural land-use, and is mainly used for sheep grazing. The area investigated during the EIA process for the proposed development defined by a non-arable and low potential grazing land. Hence, agricultural land use is not a preferred alternative. Location alternatives: • Technical suitability The proposed Brypaal site falls within the area designated as being of high suitability for grid connection as it is 885 to 1006 m from the 400kV Escom power line. • Ecological suitability <u>No CBA are present on or in close proximity to the proposed Brypaal site.</u> No threatened ecosystems listed under s.52(1)(a) of NEMBA is present on the site. • Visual suitability The site is not visible from the nearby town of Kakamas. No protected area will be impacted visually by the proposed PV Solar project. Technology and layout alternatives as part of the development: Different spatial configurations are considered when investigating site layout alternatives. Site-specific and technology alternatives as well as the “no go” option will be explored during the EIA phase once the layout plans of the Brypaal PV Solar project are available. Alternatives with regard to grid connection and possible power line routes between the on-site substation and the existing power line (alternative routes) will also be examined in detail for the EIA, once the routing alternatives have been considered.

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

Public Participation (PP) is not only a legal requirement (Chapter 6 of NEMA), but also a vital component of any environmental authorisation process. Guidelines specify **public review periods of 30 days** and emphasizes the importance of due process in involving previously disadvantaged communities. This is done by providing documentation in local languages and giving sufficient opportunity for rural communities to be involved in the BA or S&EIR process. The objectives of the Public Participation Process are:

- To provide stakeholders with information on the proposed project and opportunities to **comment**;
- To ensure that stakeholders have the opportunity to raise **issues of concern and suggestions** for enhanced benefits;
- To ensure that stakeholders have the opportunity to **comment** on the technical and public participation processes of the BA + S&EIR; and
- To ensure that stakeholders have the opportunity to comment on the findings of the BA or S&EIR.(Source:DEAT EA guideline (2015))

IDENTIFICATION CRITERIA	Mark with an X where applicable	
	YES	NO
Will the landowner be specifically consulted?	X	
Will the lawful occupier on the property other than the Landowner be consulted?		
Will a tribal authority or host community that may be affected be consulted?		
Will recipients of land claims in respect of the area be consulted?		
Will the landowners or lawful occupiers of neighbouring properties been identified?	X	
Will the local municipality be consulted?	X	
Will the Authority responsible for power lines within 100 metres of the area be consulted?	X	
Will the Authorities responsible for public roads or railway lines within 100 metres of the area applied for be consulted?	X	
Will the Authorities responsible for any other infrastructure within 100 metres the area applied for be consulted? (Specify)- Escom	X	
Will the Provincial Department responsible for the environment be consulted? • Already started during July 2016 and ongoing.	X	
Will all of the parties identified above be provided with a description of the proposed project as referred above?	X	
Will all the parties identified above be requested in writing to provide information as to how their interests (whether it be socio-economic, cultural, heritage or environmental) will be affected by the proposed solar project?	X	
Other, Specify		

The S & EIR Process table below stipulates the Legal EIA time frames. Note these timeframes represent a generic guide specific to NEMA authorization and can vary on a project to project basis:

S & EIR PROCESS	
1	Compilation of the Application for a Environmental authorization: **RESUBMISSION=DONE**
1.1	Submit Application form to CA (Competent Authority) *** Resubmission of the application has taken place on the ………………….2018.**
1.2	CA acknowledges application form within 10 days *** Letter has been received on the…………2018 (Appendix E).**
1.3	CA should submit comments to applicant within 30 days *** Letter has been received on the…………2018 (Appendix E).**
2	Compilation of Scoping Report:
2.1	Scoping report subjected to public participation process of at least 30 days *** DONE.**
	Tasks: This section provides an overview of the tasks being undertaken in the Scoping Phase, with a particular emphasis on providing a clear record of the public participation process followed. *Task 1: I&AP identification, registration and the creation of an electronic database (register)* Prior to advertising the EIA process an initial database of I&APs will be developed for the Scoping process (include requests to register interest in the project by I&APs.) While I&APs will be encouraged to register their interest in the project from the start of the process, following the public announcements (see Task 2), the identification and registration of I&APs will be ongoing for the duration of the study. Stakeholders from a variety of sectors, geographical locations and/or interest groups can be expected to show an interest in the development proposal, for example • Government /State departments (national, provincial and local); • Environmental NGOs; • Community Representatives and CBOs; • Directly affected communities; • Business and Commerce; and • Other. In terms of the electronic database (register), I&AP details are being captured and automatically updated as and when information is distributed to or received from I&APs. This ongoing and up-to-date record of communication is an important component of the public participation process. It must be noted that while not required by the regulations those I&APs proactively identified at the outset of the Scoping Process will remain on the project database through the EIA process and will be kept informed of all opportunities to comment and will only be removed from the database by request. As per the EIA Regulations, future consultation during the Impact Assessment phase will only take place with registered I&APs. Stakeholders who were involved in the initial consultation will be added to the register. The I&AP register will be updated throughout the EIA process. *Task 2: Announcement of the Scoping process/project:* In order to notify and inform the public of the proposed project and invite members of the public to register as I&APs, the project and EIA process will be advertised in the Gemsbok local newspaper .

	An advertisement will be placed in the Gemsbok local newspaper (one in English and one in Afrikaans). A copy of the advertisements will be attached in the appendices during the preparation of the final scoping report.

	Distribution of the Background information Document (BID) and a letter of invitation to participate sent to all I&APs on the database (register), accompanied by a registration, comment and reply sheet that was mailed/emailed to the entire stakeholder database. Site notices will be placed at the boundary fences/gate of the PV Solar project focus area. Public Meetings: - Upington: Tuesday 25 July 2017 at 10:00 at AGS Lofoord, Rand, Upington for Government officials, and other interested parties. - Farm Brypaal: Tuesday 25 July 2017 at 14:00 on the farm Brypaal, at the home of Mr. and Mrs.Human. - Kakamas: Wednesday 26 July at 10:00 at Primary School Central Kakamas, for Government Officials and public and all other interested parties. - Kakamas: Wednesday 26 July 2017 at 19:00 at Kakamas Primary School, Sonneblom Street, Stand 1225, for public and all other interested parties. The facilitator, the representatives of the project applicant and the EIA team will be present to interact and engage with members of the public, key I&AP groups (such as Councillors, surrounding landowners, affected organs of state, environmental organisations). They will be and proactively invited to attend a meeting where they are provided with an overview of the project and EIA process (Draft Scoping report as basis for discussion). A register and minutes will be kept during the meeting. I & Ap's will be asked to provide contact details and written comments by completing the forms handed out and sent via the Post Office, e-mail, etc. The comments received and issues raised, both in writing and at the public meeting, will be captured in a Comment and Response Report. All comments received from I&APs during this comment period will be included in the Comments and Response Report that will accompany the final Scoping Report to be submitted to the CA.
2.2	Submit Scoping Report (SR) to CA within 44 days receipt of the application by the CA. *** DONE**
2.3	The CA, within 43 days of receipt of a scoping report accept or refuse the SR. *** Note: The Scoping Report has been accepted by the DEA (See Appendix E dated 28 September 2017)**

3	**Compilation of EIA Report & EMPR: IN THE PROCESS**
3.1	DRAFT EIAR & EMPR subjected to public participation process of at least 30 days
3.2	Incorporate comments received and also of CA.
3.3	Submit notification in writing that the EIR & EMPR will be submitted within 156 days of the receipt of the application by the CA.- EIAR & EMPR subjected to another public participation process of at least 30 days
3.4	Public participation during the impact assessment phase of the EIA will entail a review of the findings of the EIA, presented in the Draft EIA and EMP Reports. These reports will be made available for public comment. I&APs will be advised timeously of the availability of these reports and how to obtain them. Stakeholders will be encouraged to comment either in writing (mail or email) or by telephone. A I & AP stakeholder meeting will be held to discuss the impact assessment. Ample notification of due dates will be provided. All the issues, comments and suggestions raised during the comment period on the Draft EIA Report/EMP will be added to the Comment and Response Report (CRR) that will accompany the Final EIA Report/EMP. The Final EIA Report/EMP will be submitted to the CA for a decision about the proposed PV Solar project.
3.5	NOTE: Submission of scoping report to competent authority 21. (1) If S&EIR must be applied to an application…………… (2) Subject to regulation 46, and if the findings of the scoping report is still valid and the environmental context has not changed, the submission of a scoping report as contemplated in subregulation (1) need not be complied with- (a) in cases where a scoping report was accepted as part of a previous application for environmental authorisation and the application was refused because of insufficient information; (b) on condition that regulation 16 is complied with and that such **application is accompanied by proof that registered interested and affected parties, who participated in the public participation process conducted as part of the previous application, have been notified of this intended resubmission of the application prior to submission of such application;** *** DONE as part of the EA application(dated ………….2018) .** **Resubmission of application**: (c) if the application contemplated in paragraph (b) is submitted by the same applicant for the same development, as applied for and refused as contemplated in paragraph (a); and (d) **if an environmental impact assessment report inclusive of specialist reports and an EMPr, which must have been subjected to a public participation process of at least 30 days** and which reflects the incorporation of comments received, including any comments of the competent authority, is **submitted within a period of two years from the date of the acceptance of the scoping report** contemplated in paragraph (a). *** YES. The documentation is hereby submitted within the 2 year period (starting from the acceptance of the Scoping report on 28/9/2017)**

3.6	CA within 10 days acknowledges receipt of EIR & EMPR
4	Decision on the S & EIR application:
4.1	CA within 107 days of receipt of the EIR & EMPR grant or refuse authorization
4.2	The CA must, within 05 days notify (letter) the applicant of the decision
4.3	The applicant, within 08 days of the date of the decision, notify I&AP's of the decision and publish a notice and the applicant, within 08 days of the date of the decision, notify I&AP's of the decision and publish a notice draw the attention of all registered interested and affected parties to the fact that an appeal maybe lodged against the decision in terms of the National Appeals Regulations, if such appeal is available in the circumstances of the decision.

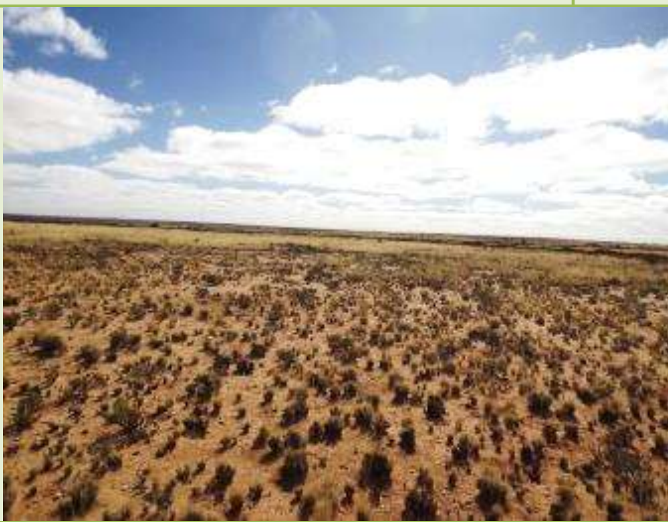
NOTE: At this stage the formal public participation process has been conducted. All supporting documentation will be attached once compiled after inputs from I & Ap's, such as minutes, comment & response report, notices, etc. SEE APPENDIX D.

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

SEE APPENDIX D FOR DOCUMENTATION (Summary of the issues raised by interested and affected parties, letters, correspondence, minutes, etc.) IN THIS REGARD.

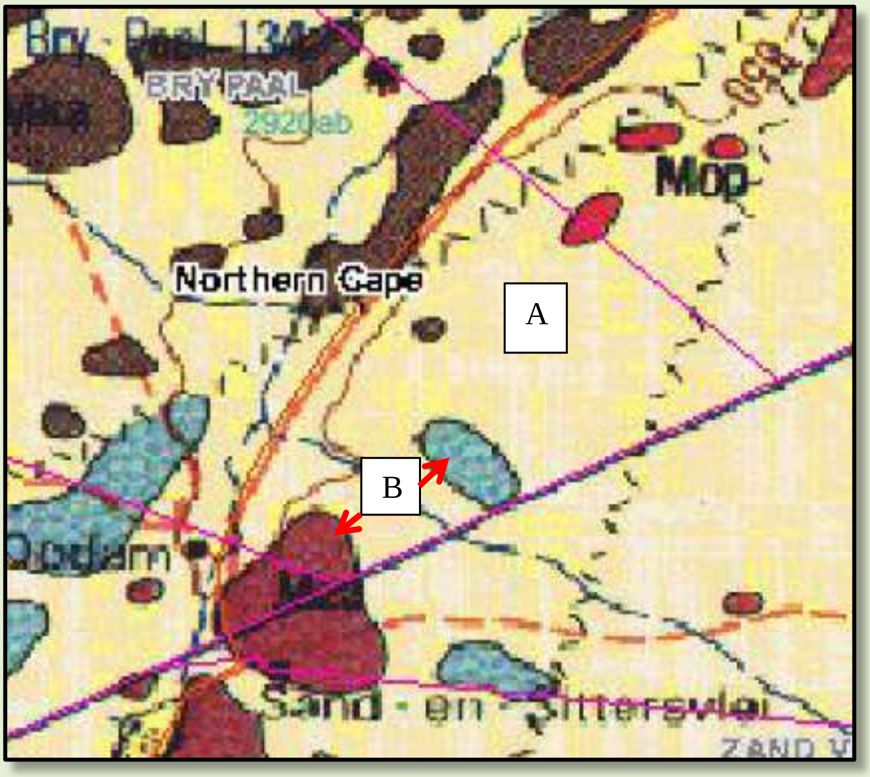
(iv) the **environmental attributes** associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

1. **Baseline Environment:**

1.1 EXISTING SURFACE INFRASTRUCTURE	The proposed PVSP project site **(1032ha)** is part of a existing farm (agricultural) utilized for grazing production for sheep. No other structure exists on the site itself. Access is gained by existing farm roads (2 spoor).
	
	

1.2 Presence of Servitudes	None.

1.3 Geology



GEOLOGY LEGEND:

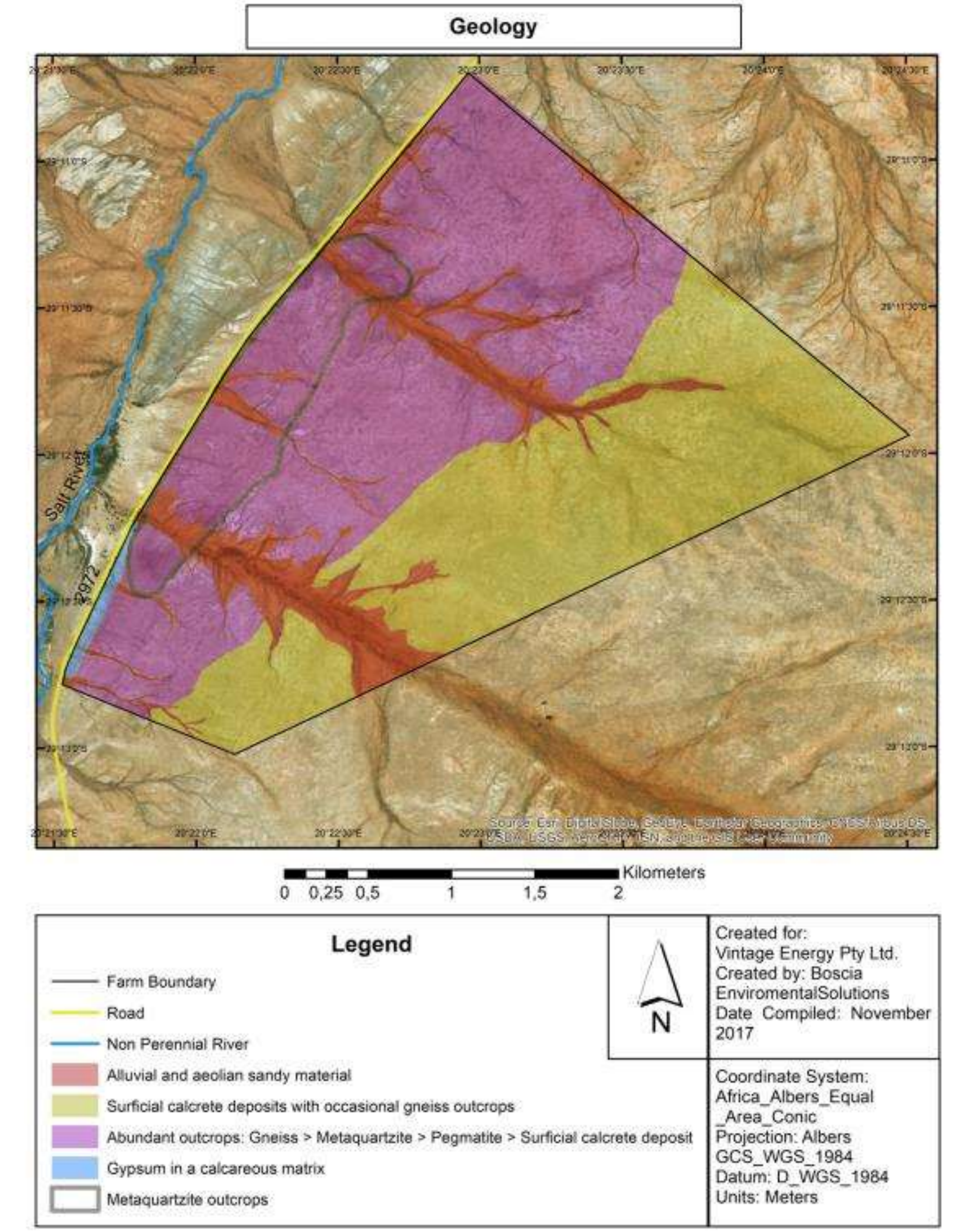
Lithology		Stratigraphy
Q- alluvium, sand, calcrete	A	Quaternary deposits
Gneiss, Granite, quartzite, shale, etc.	B	Namaqwaland metamorphic region

Source: 1:250 000 Geology map

An Geological survey and geotechnical survey of the proposed PV project site has been carried out by by Boscia Environmental Sevices (BES). See Appendix A (DOC REF: 2017/BES/SR/12 & 2017/BES/SR/01) for full reports in this regard).

Table 1: The Lithostratigraphy of the study area.

Ma	Epoch	Lithostratigraphic units	Lithology
0-1.8	Holocene/ Pleistocene	Kalahari- Quaternary	Gypsum in calcareous matrix
0-2.0	Holocene/ Pleistocene	Kalahari- Quaternary	Alluvial and aeolian sandy material
0-5.0	Holocene, Pleistocene and Miocene	Kalahari, Quaternary, Late Tertiary	Calcrete (soft, hard bank, nodular, tabular etc)
1200-1800	Namaqua Natal Metamorphic Province	Meso-Proterozoic, Bushmanland Terrane	Metaquartzite, glassy quartzite, quartzite schist, calcsilicates
1400-2000	Swazian, Basement	Swazian	Granitic gneiss



The north-western part of the study area consists of abundant outcrops with the following order of abundancy: Gneiss > metaquartzite > pegmatite > surficial calcrete deposits. The south-eastern part of the study area consists of surficial calcrete deposits with occasional gneiss outcrops. The drainage systems consist of alluvial and aeolian sandy material.

1.4 CLIMATE *** Climatic region**: W	**<u>Region W and SWAs - Desert and poor steppe</u>** This region occupies about half of the Northern and Western Cape Province, southern South West Africa and the Namib desert further north. The rainfall is unreliable, amounts to about 250 mm (10 inches) per year in the interior and decreases to an insignificant 50 mm (2 inches) or less towards the west coast. In the interior the precipitation is mainly due to convectional showers in summer and autumn occurring on about two days per month, whilst on or near the coast the sparse rainfall occurs mainly in winter. Single very rare heavy showers can account for as much as the normal annual precipitation. Hail is seldom recorded in this region. Snow occurs about five times per annum on the southern mountain ranges (around Sutherland) but is rare on the western escarpment, though this type of precipitation has been recorded in the Namib as far north as Walvis Bay. Due to the cold Benguela current the west coast is frequently *foggy*. Fog advances onto the coastal flats (sometimes as far as 20-30 miles inland) during the night and recedes seaward in the forenoon; this diurnal motion is connected with the intense heating of the land during three day and cooling at night due to terrestrial radiation. The moisture necessary for maintaining the prolific (wild flower) vegetation which adorns the countryside in the western Cape (Namaqualand) after a fortuitous winter shower, is probably largely due to condensation from low clouds and fog. Temperatures are subject to great variation both seasonal and diurnal. The average daily maximum temperature in January is of the order of 35˚C (95˚F) and in July 18˚C (64˚F), whilst extremes can reach respectively 46˚C (115˚F) and 32˚C (90˚F). Average daily minima are about 17˚C (63˚F) in January and 3˚C (37˚**F) in** July; extremes can reach 5˚C (41˚F) and -10^{0}C (14˚F) respectively. On the interior plateau frost is common in winter. One of the hottest areas in South Africa is found in the Orange River Valley around Goodhouse and one of the coldest spots is Sutherland in the Roggeveld. In the Kalahari and Southwest Africa one sometimes encounters dust storms similar to the"haboob" of the Sudan, whilst the coastal belt is subject to hot easterly winds and sandstorms which are decidedly unpleasant. The latter occur mainly during the winter season when an anticyclone is established over the interior. Source: WB28.
	Proposed solar farm lies within rainfall zone D5N and quaternary sub catchment D53H. The solar farm is located in a semi-arid region, receiving on average 80.5 mm (1940 - 1998) according to the Kakamas Gauging Station, D7E002. Rainfall occurs in the form of showers and thunderstorms, falling in the summer months of October to March and usually peaking in January or March. The summers are very hot and the winters cool. From Figure 2 the highest average rainfall is experienced in March while the lowest average rainfall occurs during the winter months July and August.

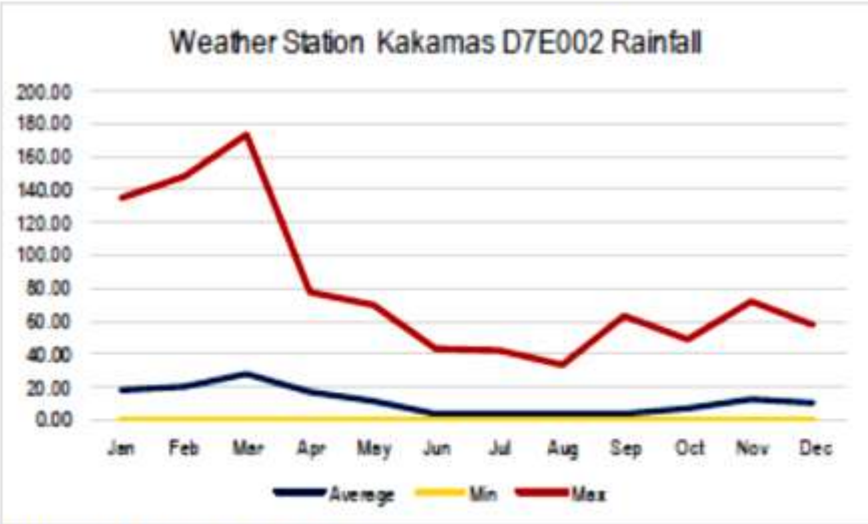


Figure 2. Mean rainfall at Kakamas weather station.

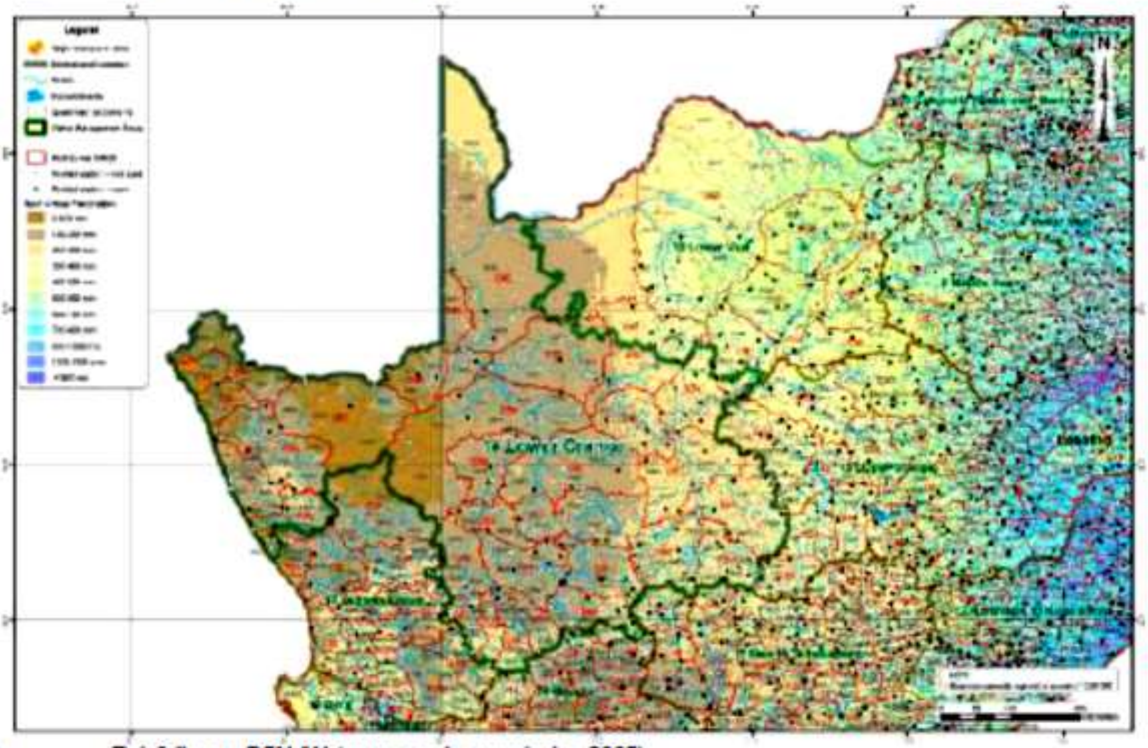
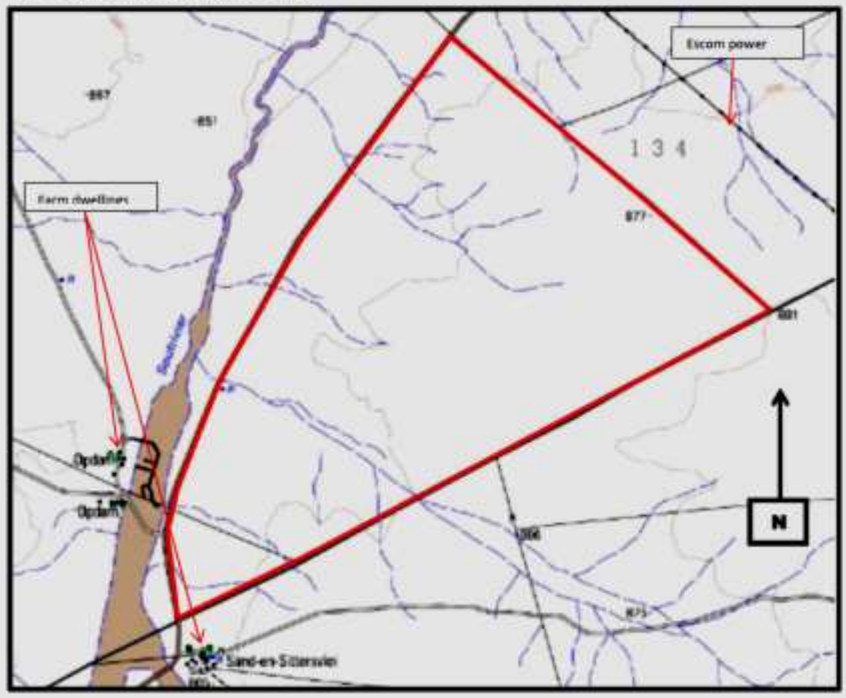


Figure 3. Rainfall zone D5N (Water research commission 2005)

1.5 TOPOGRAPHY

1) General description of the topography of the project focus area:
The terrain morphology of the portion of the farm proposed for the solar development is characterised by a flat plain sloping from east to west and northeast towards the southwest. The height of the site project is above mean sea level (m.s.l.) is approximately 877 -853m.

TOPOGRAPHICAL MAP (2920 ab):



It is important to describe the topography of the PV project focus area as certain limitation such as ,steep slope surface areas prone to erosion (high surface run-off) , can hamper the construction of the facility. Flatter slope surface areas are being preferred.

According to the Terrain morphological map of Southern Africa (G.P.Kruger , Dept. of Agriculture, Pretoria: 1983) the PV focus surface area occurs within the terrain morphological class A(1) that is being described " Flat plains with low relief". The percentage of area with slope less than 5% is more than 80%.

The majority of the surface area is described a flat (see GOOGLE EARTH SLOPE ANALYSES OF THE PROJECT AREA USING SATTELITE IMAGERY) with average slopes of 0,3%, 0,8% and 0,9 % etc. (See part B). This makes the project site an ideal focus area for the PV solar project.

Topographical features that need to be avoided are "dry stream water courses" that are draining towards the Salt River.

The majority of the proposed project area (study area) lies between 860-880m above sea level and sloping towards the western side with a height of 860m towards 840m above sea level. The project area on the western side is more dissected by dry water courses, draining the project surface area towards the Sout River.
See map (Part B).

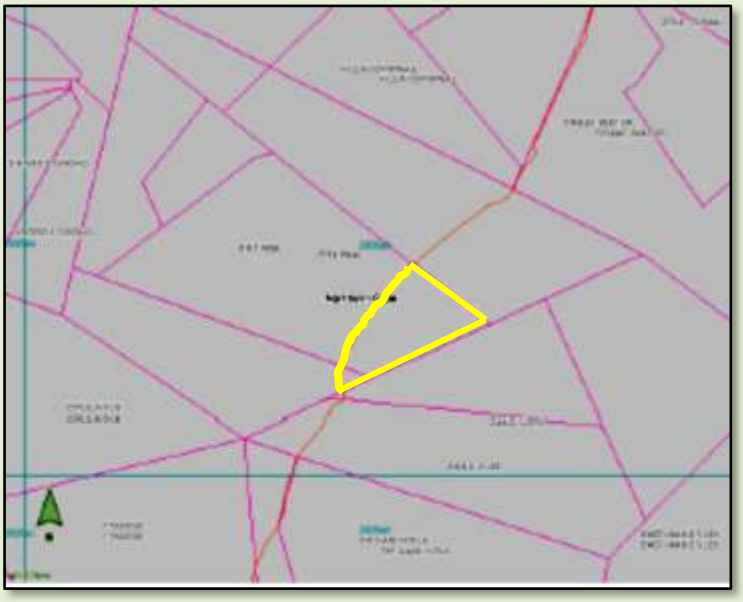
	See Part B for topographical map indicating " dry water courses" that forms part of the Salt River drainage basin that should be avoided. The majority of the proposed project area (study area) lies between 860-880m above sea level and sloping towards the western side with a height of 860 towards 840m above sea level. The project area on the western side is more dissected by dry water courses, draining the project surface area towards the Sout River.

1.6 SOIL

The soils in the whole study area were found to be of the hard rock outcrops and shallow lithosols **(Coega soil form).**

LEGEND:

LP2, Soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils. Lime generally present in part or most of the landscape.



Source: ARC GIS (2016)

An **Soil survey** of the proposed PVSP project site has been completed by Boscia Environmental Sevices (BES). See Appendix A for full report (Doc Ref: 2017/BES/SR/03)

6.1 Land Type Data

Soil:

A predictive soil mapping approach was followed due to low soil variability and restrictive climatic conditions relating to agricultural potential. Note that since the information obtained from the land type survey is of a reconnaissance nature, only the general dominance of the soils in the landscape can be provided and not the actual area of occurrence within a specific land type. Land type data was obtained from the Agricultural Research Council (Land Type Survey Staff, 2003) and entails the division of land into land types, typical terrain cross sections and dominant soil types for each terrain unit (consult Annexure A Figure A-3 for more information). A land type can be defined as an area with similar climate, topography and soil distribution patterns.

One land type (Ag3) dominates the entire study area. According to the Land Type Survey Staff (2003), 40% of land type Ag3 consists of freely drained, shallow (< 300 mm deep), red, eutrophic, apedal soils with yellow-brown soils comprising less than 10% of this land type. The average depth of all soils is 280.5 mm. Approximately 77% of land type Ag3 consist of soils with a depth of ≤ 300 mm (depth class D1), whereas 12.5% consist of soil with a depth of 901 mm to 1200 mm (depth class D4). The average topsoil clay percentage of land type Ag3 is 10.7%. Around 88.5% of land type Ag3 consist of loamy sand soils (clay class C2) with an average clay percentage of 6.1% to 15% in the topsoil, whilst 1% consist of sandy loam soils (clay class C3) with an average clay percentage of 15.1% to 25% in the topsoil (Land Type Survey Staff, 2003).

The soils of land type Ag3 can be divided into three soil classes. Table 2 illustrates the different soil classes, description of soil classes, soil forms and percentage occupancy of each soil class within land type Ag3.

Table 2: Description of soil classes within land type Ag3 (Land Type Survey Staff, 2003).

Soil Classes	Description	Soil Form	Percentage occupancy
S2	Freely drained, structureless soils.	*Hutton, Clovelly, Griffen, Shortlands, Oakleaf.*	58,3%
S13	Lithic soil (shallow soils on hard weathering rocks).	*Mispah, Glenrosa.*	31,2%
S16	Non-soil land classes	*Pans, rivers, stream beds, erosion structures, marshes, reclaimed land, dunes, gravel, etc.*	0,5%

Approximately 58.3% of land type Ag3 consists of freely drained, structureless soils, whereas 31.2% consist of characteristic lithic soils. A small part (0.5%) of land type Ag3 is occupied by structures like pans, rivers, stream beds, erosion structures, marshes, reclaimed land, dunes and gravel.

6.2 Site Visit, Soil Survey and Soil Analyses

All soil description data, as well as soil classification per mapping unit***.....(See Appendix A for full report).***

Soil description data and field observations were utilised for soil classification purposes (Land Type Survey Staff, 1991; MacVicar et al., 1977; Soil Classification Working Group, 1991). The classification system of the WRB Reference Soil Group (IUSS Working Group WRB, 2006) as well as that of USDA Soil Taxonomy (Soil Survey Staff, 1999) were used for further classification.

As illustrated in ……..(See Appendix A for full description) a total of ten soil forms and eleven soil families were identified accordingly.

The identified soil forms include Dundee, Oakleaf, Augrabies, Knersvlakte, Oudtshoorn, Addo, Brandvlei, Coega, Etosha and Mispah.

Based on the observations and information obtained (See Appendix A for full report) a map was constructed illustrating all soil forms within the study area (Figure 14).

These **soil forms were grouped into four individual soil groups** known as **silicic soils, calcic soils, cumulic soils and lithic soils** (Fey, 2010; Brummer, 2015; Fanourakis, 1991; IUSS Working Group WRB, 2006; Schmidhuber, 2015; Von M Harmse & Hatting, 1985). Each soil group is discussed ……………….. based on description, properties, morphology and genesis.

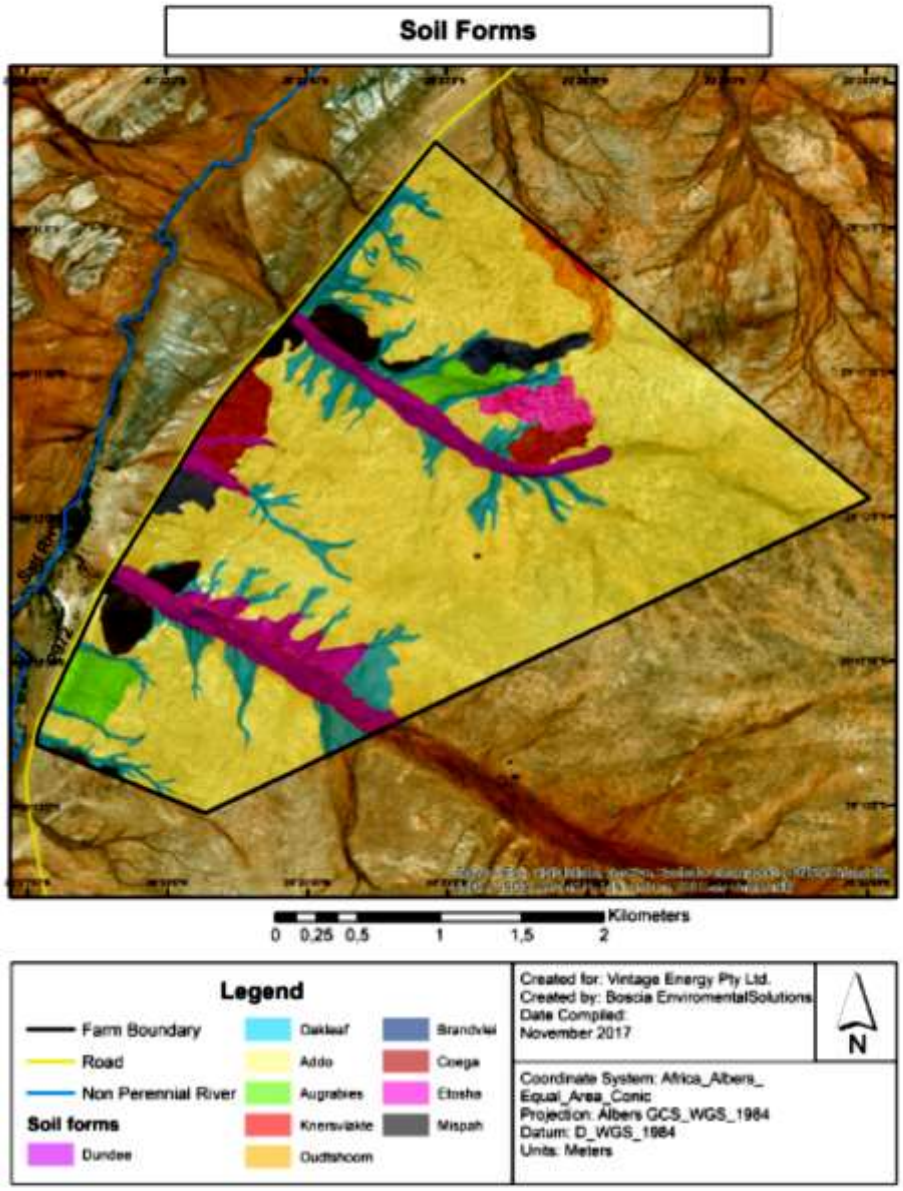


Figure 14: Map indicating the soil forms for the study area (Google Earth, 2016).

1.7 **PRE-MINING LAND CAPABILITY**	This is an existing farm with indication that the surface area is being utilized for grazing purposes (sheep) and the land capability of the site itself is classified as non-arable, low potential grazing land (according to ARC GIS, 2016). (See location on satellite image , Part 3). **Grazing potential:** 7 ha/small stock unit. 31-40 ha/ large stock unit. 
1.8 LAND-USE	This is an existing farm with indication that the surface area is being utilized for grazing purposes (sheep) and the land capability of the site itself is classified as non-arable, low potential grazing land (according to ARC GIS, 2016). (See location on satellite image , Part 3).

1.9 VEGETATION (FLORA)

32 – ORANGE RIVER BROKEN VELD

Source (Veld types of South Africa, Acocks (1988:p81)

Typical vegetation cover found in the study area.

The majority of the area is already disturbed by agricultural activities activity.

The vegetation of the proposed PROJECT AREA falls under veld type no. 32, Orange River Broken Veld, of Acocks (1975).

32a. **Typical Orange River Broken Veld**

The presence of *Aloe dichotoma* with *Euphorbia avasmontana* makes this veld type quite unmistakable. Just as the valley bushveld and related types are adaptations of the eastern coastal branch of the tropical flora to arid conditions, so the Orange River Broken Veld is an adaptation of the central branch of the tropical flora, while the Namaqualand Broken Veld is not only an adaptation of the west coastal and central branches, but also of certain elements of the eastern branch which have worked their way right along the coast. The Orange River Broken Veld also has a few elements of the east coastal flora and of the west coastal flora, which have come up the Orange River Valley or else across the eastern part of the upper plateau where False Karoo is now found.

The typical Orange River Broken Veld occurs on a variety of rocks, e.g. banded ironstone, dolomite, quartzite and granite. Altitude ranges from 750-1350 m above sea level and rainfall from about 150-350 mm per annum. Owing to its proximity to the permanent water of the Orange River, it is, as a rule, badly tramped out.

Typical trees and shrubs include the following, with *Tamarix usneoides* coming up the Orange River nearly as far as Koegas:
Aloe dichotoma, *Euphorbia avasmontana, Sarcostemma viminale form Acacia mellifera subsp. Detinens,*
karroo W
erioloba

Rhus lancea W,
laevigata
burchellii
dregeana

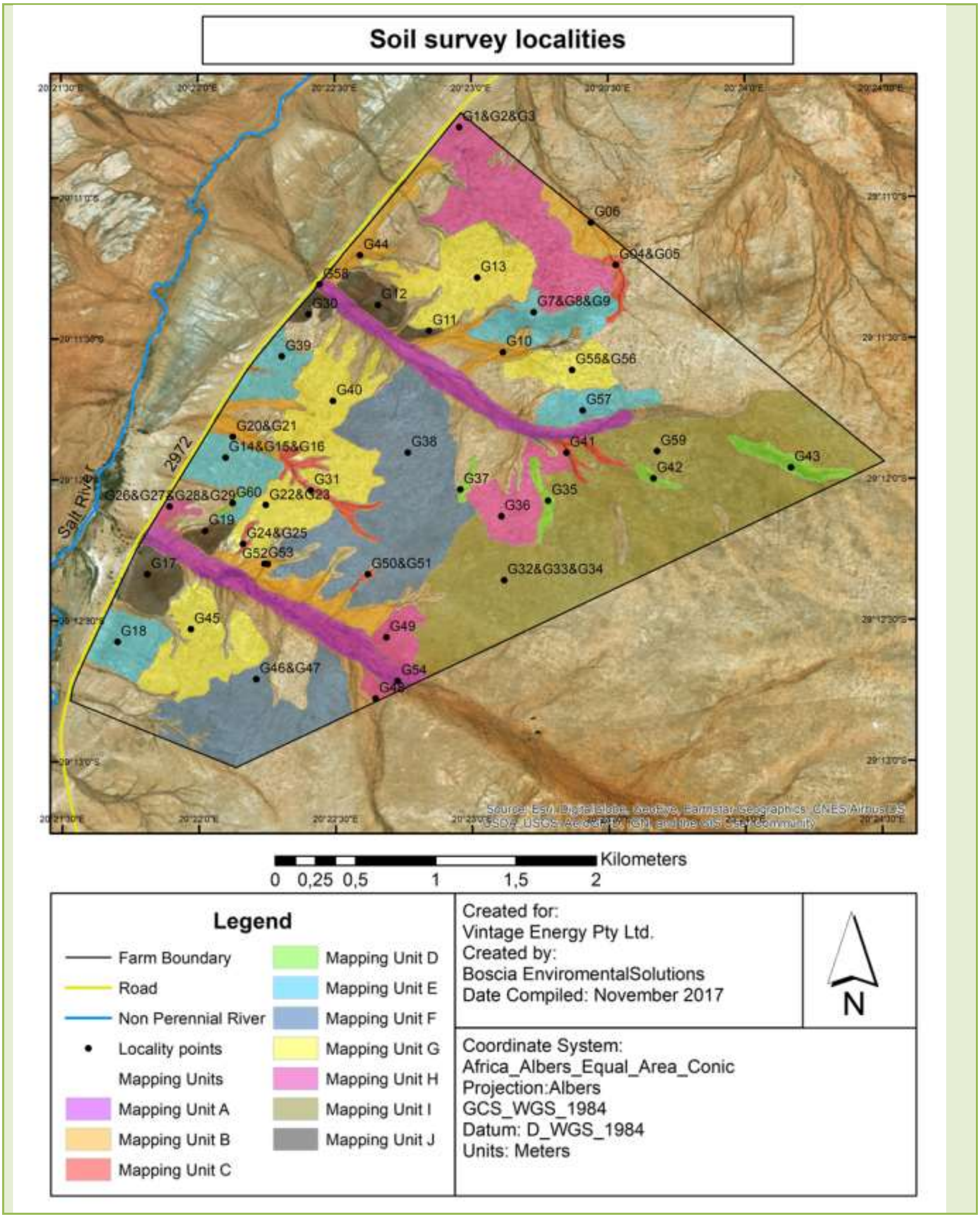
Salix capensis W, Tarchonanthus camphoratus, Phaeoptilum spinosum,
Ziziphus mucronata

Rhigozum trichotomum
obovatum
Lycium oxycarpum, Ehretia rigida , Boscia albitrunca, Cadaba aphylla Putterlickia pyracantha, Nymania capensis, Ficus ingens,
Olea europaea subsp Africana, Grewia flava, etc.

SEE APPENDIX A (DOC REF. 2017/BES/SR/05): Flora Specialist Ecological Impact Assessment for the proposed PVSP project site (BES). The majority of the project focus area falls within the ECOLOGICAL SUPPORT AREA but is not covered by the Namakwa District Biodiversity Sector Plan (Source: SANBI).

According to Mucina & Rutherford (2006), the vegetation types that occur within the area, affected by the proposed development, is the **Bushmanland Arid Grassland (Nkb3).** The conservation status for the Bushmanland Arid Grassland is Least Threatened, and have been little

	impacted by transformation. In Mucina & Rutherford (2006) 6 endemic species are listed for the Bushmanland Arid Grassland: - *Dinteranthus pole-evansii* - *Larryleachia clinteri* - L. marlothii - Ruschia kenhardtensis - Lotononis oligocephala - Nemesia maxi Local-level impacts are not likely to be of any significance due to the widespread nature of the biogeographically important and endemic species known for this vegetation type. The Bushmanland Arid Grassland is one of the largest vegetation types in South Africa. 17 The vegetation differences on this site reflects the substrate conditions including soil depth, texture, and geology. The areas with coarse material (for instance the deep, sandy soils in the drainage systems) are dominated by shrubby vegetation, while the areas with fine material or abundant geological outcrops (for instance the calcic soils) are dominated by grasses. The north-western part of the study area consists of abundant outcrops with the following order of abundancy: Gneiss > metaquartzite > pegmatite > surficial calcrete deposits. This area has a large proportion of grasses (to a lesser extent than the south-eastern parts), combined with shrubs and rocky outcrops with no vegetation. The south-eastern part of the study area consists of surficial calcrete deposits with occasional gneiss outcrops, and a dominating grassland. The drainage systems consist of alluvial and aeolian sandy material, and are dominated by shrubs. 4.7. Listed and Protected Plant Species For the quarter degree square 2920 AB, 109 indigenous plant species have been recorded (according to the SANBI SIBIS database). This includes one species with conservation concern that was ***not*** found on site (*Calobota lotononoides (Schltr.) Boatwr. & B.-E.van Wyk* Near Threatened). Another species within the same genus (*Calobota spinescens (Harv.) Boatwr. & B.-E. van Wyk*) was found in this area, but are considered as **Least Concern**. There is also one additional species present (*Hoodia gordonii*), protected under the Northern Cape Nature Conservation Act of 2009. All individual *Hoodia gordonii* plants observed during the vegetation survey are mapped (Figure 10). Some of these individual plants will be effected by the development. The total number of affected individuals is however likely to be low (would be less than 100 plants). Since *Hoodia gordonii* is not listed by the SIBIS database, as indigenous to the quarter degree square 2920 AB, and due to its limited distribution here, it is not a common phenomenon to see this species in this area. Although there may be some present within the solar field, this would only be a few individuals. 4.8. Critical Biodiversity Areas For this study area, no Critical Biodiversity Areas have been defined, and no fine-scale conservation planning has been done. This area does not fall within a National Protected Areas Expansion Strategy Focus Area (NPAES), and therefore is **not** characterised: - with exceptional biodiversity; - as significant for the maintenance of ecological processes; or - as significant to climate change buffering. According to Mucina and Rutherford (2006), the Bushmanland Arid Grassland is considered as least threatened, with little transformation and a very low erosion potential. Given the concentration of renewable energy facilities in this biome, this development would however have a small contribution to the cumulative impact in the area (Figure 8). **4**


Soil survey localities
G1&G2&G3
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G44
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G12
G30
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G39
G55&G56
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Salt River
G26&G27&G28&G29
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Legend
Farm Boundary
Road
Non Perennial River
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Mapping Unit E
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4.9. Habitat Description

The habitat features observed on this area correspond to the geological distribution. The different habitats and features observed will be described based on their biodiversity attributes and proximity to the proposed development area. The study area can be divided into 4 main habitats as illustrated in Table 3.

Table 3: Habitat description and correlation.

Habitat	Sub-division	Mapping Units (MU)	Vegetation Type	Soil Forms	Dominating Geology	Images
Grassland		Various D units I1.1 & I1.2 H3, H5 & H7 F5 & F6	There is some variation in species composition. Some areas are dominated largely by low shrubs (see Figure 3 – Mapping Unit D), while the majority of this habitat is dominated largely by different *Stipagrostis* species.	The dominant soil forms: - Molopo - Askham - Kimberley - Plooysburg - Etosha - Gamoep - Addo - Prieska - Brandvlei - Coega	The south-eastern part of the study area consists of surficial calcrete deposits with occasional gneiss outcrops.	

Habitat	Sub-division	Mapping Units (MU)	Vegetation Type	Soil Forms	Dominating Geology	Images
Shrubby Grassland		Various D units All E All G All J H1 F4 and part of F3	This area has a large proportion of grasses (even though the **Shrubby Grassland and the Grassland closely resemble each other in terms of grass species composition, variations do occur within vegetation structure and dominance**), combined with shrubs and rocky outcrops with no vegetation. The dominating species in *Stipagrostis obtuse (Delile) Nees* (**having a smaller structure in the Shrubby Grassland than in the Grassland**). The smaller structure is probably due to limiting soil depth and dominating outcrops. The north-eastern parts of this habitat contain a population of *Hoodia gordonii*, which is listed as a protected species.	The dominant soil forms: - Glenrosa - Mispah - Coega - Addo - Prieska - Etosha - Gamoep	The north-western part of the study area consists of abundant outcrops with the following order of abundancy: Gneiss > metaquartzite > pegmatite > surficial calcrete deposits.	
	Bare Patches	E	These bare patches have a very sparse vegetation cover and even areas where vegetation is absent. The reason for the formation of bare patches is unclear. Where vegetation is present, the area is dominated by species like *Salsola barbata Aellen*, *Salsola tuberculate (Moq.) Frenzl.*, *Lycium oxycarpum Dunal*, *Eriocephalus ambiguous*, *Pteronia mucronate*, *Lycium boscifolium Schinz*, *Eriocephalus ambiguous*.	The soil can be described as a fine silty material. The dominating soil forms are: - Glenrosa - Mispah		

Drainage Systems	Stream Order 3	A	Drainage lines with stream order 3 (Mapping Unit A) are dominated by *Stipagrostis zeyheri* and various shrubs.	Dominating soil forms: - Dundee - Namib With an abrupt transformation between the A-horizon and the B-horizon.	Alluvial and aeolian sandy material.	
	Stream Order 2	B	Drainage lines with a stream order 2 (Mapping Unit B) are dominated by shrubs like *Rhigosum trichotomum*, and various *Stipagrostis* species.	Dominating soil forms: - Dundee - Hutton - Oakleaf - Knersvlakte - Oudtshoorn	Alluvial and aeolian sandy material.	
	Stream Order 1	C	Drainage lines with stream order 1 (Mapping Unit C) is dominated by shrubs like *Rhigosum trichotomum*.	Too small to demarcate as individual mapping unit. Same soil forms as adjacent.	Less sediments and more pegmatite outcrops.	

1.10 **ANIMAL LIFE (FAUNA)**	Domestic animals such as sheep (Dorper) do occur on the site. **SEE APPENDIX A (DOC REF. 2017/BES/SR/05) : Baseline fauna assessment** **- that has been conducted on the proposed PVSP project site. The majority of the project focus area falls within the ECOLOGICAL SUPPORT AREA but is not covered by the Namakwa District Biodiversity Sector Plan (Source: SANBI). All the work herein has been conducted by GreenThorn Environmental Solutions and its independent affiliates.**
	3.3.5. Fauna Mammals The Nama-Karoo, now almost devoid of large wild ungulates, holds some 10 million sheep (Ovis aries) (Figure 5) and Goats (Capra hircus). The once plentiful and diverse set of nomadic herbivores has been replaced by large encamped herds of small livestock with specialist feeding habits. Prolonged heavy grazing is considered to suppress shoot/root formation and flowering in the Nama-Karoo flora, which leads to compositional changes and depletion and thinning out of the vegetation, particularly those components that the sheep find palatable. Reptiles Reptiles are extremely secretive and difficult to observe even during intensive field surveys conducted over several seasons. The majority reptile species are sensitive to severe habitat alteration and fragmentation. Subsequently, the emphasis should be on identifying available habitat which are favourable for reptiles (e.g. snakes and lizards). Reptile species likely to occur across the project area include the Variegated Skink (Trachylepis variegata), Western Three-striped Skink (Trachylepis occidentalis), Western Rock Skink (Trachylepis sulcata sulcata) and Southern Rock Agama (Agama atra) as well as several sand lizard species, such as the Spotted Sand Lizard (Pedioplanis lineoocellata). Suitable habitat occurs for the Karoo Girdled Lizard (Karusasaurus polyzonus), inhabiting fissures between rocks and under loosely embedded rocks. Favourable habitat exists throughout most of the study area for various snake species. Amphibians Breeding in African frogs is strongly dependent on rain, especially in the drier parts of the country where surface water only remains for a short duration. Most frog species in the Northern Cape Province can be classified as explosive breeders. Explosive breeding frogs utilise ephemeral or seasonally inundated grassy pans for their short duration reproductive cycles. The amphibians of the area belong to the Kalahari assemblage whose boundaries conform closely to those of the Kalahari savannas of the Northern Cape and North-West provinces. The Kalahari is distinguished especially by its deep sandy substrates, and this feature has a marked effect on the availability of surface water. This is likely to be the key factor in the biogeography of amphibians. It is significant that the sole listed indicator species is a terrestrial breeder namely the Bushveld Rain Frog (Breviceps adspersus). The Kalahari assemblage has low species richness, with total species accounts not exceeding 10 species per grid cell anywhere in the assemblage. Only one endemic species, the Karoo Toad Vandijkophrynus (Bufo) gariepinus, enters the assemblage peripherally, and no range restricted species present. Avifauna An estimated 113 species could potentially occur in the study area. Of these, 9 are South African Red Data species, 14 are southern African endemics and 23 are near-endemics. This means that 8% of the species that occur could potentially occur in the study area are Red Data species, and almost 33% are southern African endemics of near-endemics.

Overall, the study area potentially contains a total of 37 endemics and near-endemics, which is 23% of the total southern African endemics and near-endemics.

SEE APPENDIX A (DOC REF. 2017/BES/SR/13) FOR A DETAILED FOCUSED AVIFAUNAL IMPACT ASSESSMENT.

4.2. Fauna assessment
4.2.1. Findings
Favourable fauna habitat exists throughout the project area (Table 2 and Figure 12). Drainage lines are the most prominent landscape feature within the project area (Figure 2). These drainage lines are also important corridors for fauna (e.g. rodents) to traverse the landscape.

Although the habitat described in Table 2 are not unique within the area, further fragmentation of natural systems may have detrimental impacts on ecological systems.
Table 2: General habitat across project area

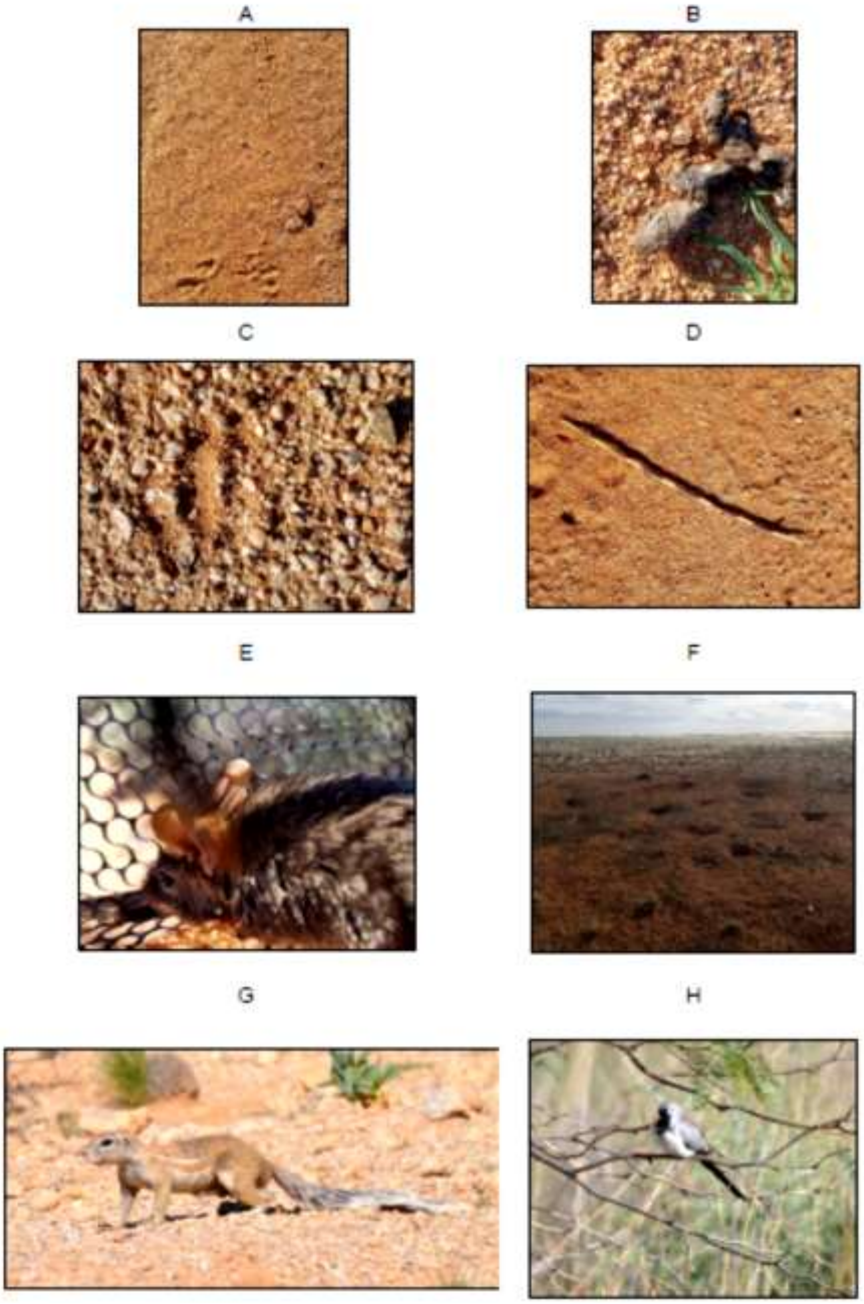
Table 2: General habitat across project area

Drainage lines • Characterised by deep sandy soils, shrubs and forbs. • Topographical location: Low laying areas. • Example of fauna identified within habitat: o Cape Porcupine; o Round-Eared Elephant Shrew; and o Small Grey Mongoose	
Grasslands • Characterised by a large denuded areas and grasses. • Topographical location: Mid to upper slope. • Example of fauna identified within habitat: o Aardwolf; o Bat-eared Fox; o Cape Fox; o Ground Squirrel; o Spotted Sand Lizard; and o Owl, Spotted eagle	

Shallow rocky outcrops
• Characterised by sparse vegetation, mostly grasses and forbs, shallow soil with a prominent rocky layer.
• Topographical location: upper slope.
• Example of fauna identified within habitat:
  o Steenbok; and
  o Ludwig's Bustard
	

Areas transformed by agricultural activities (e.g. establishment of infrastructure)
• Disturbances / transformation made to the natural environment creates unique habitat which may favours certain fauna (e.g. water hole).
• Note: at the time of the assessment no water was found on the property, including the artificial dam.
• Example of fauna identified within habitat:
  o Southern Pale Chanting Goshawk;
  o Snake species (snake skin found at dam)
	

The species listed in Table 3, Table 4, Table 5 and Table 6 lists fauna which may occur in the area and highlights the species which were observed (or signs e.g. of their presents) during the site assessment. **Figure 13 indicates the location of the most significant findings.**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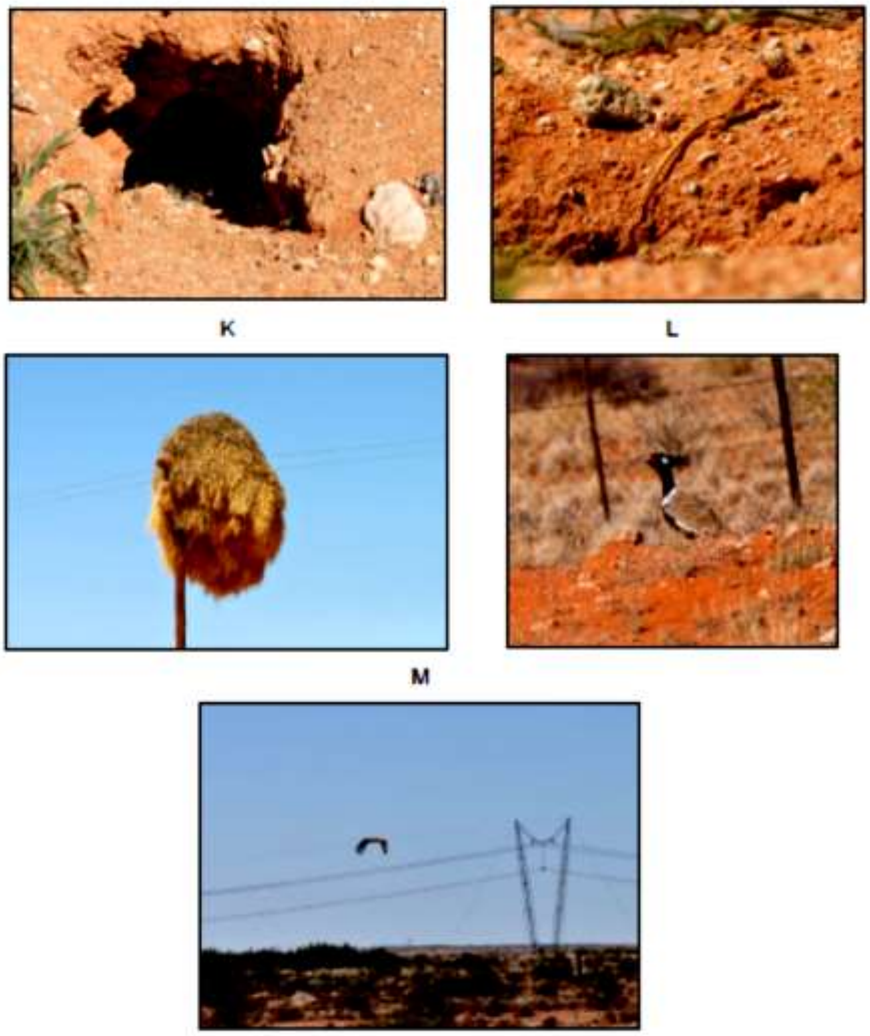


Figure 12: Signs of fauna found across the project area (A: Tracks of sheep; B: Scat; C: Tracks of steenbok; D: Porcupine quill; E: Round-Eared Elephant Shrew caught in a snap trap; F: Ground Squirrel burrows; G: Ground Squirrel; H: Dove, Namaqua; I: Burrow; J: Spotted Sand Lizard; K: Sociable Weaver Nest; L: Black Korhaan (Likely Northern); M: Ludwig's Bustard in flight with powerline visible on the neighbouring property in the background)

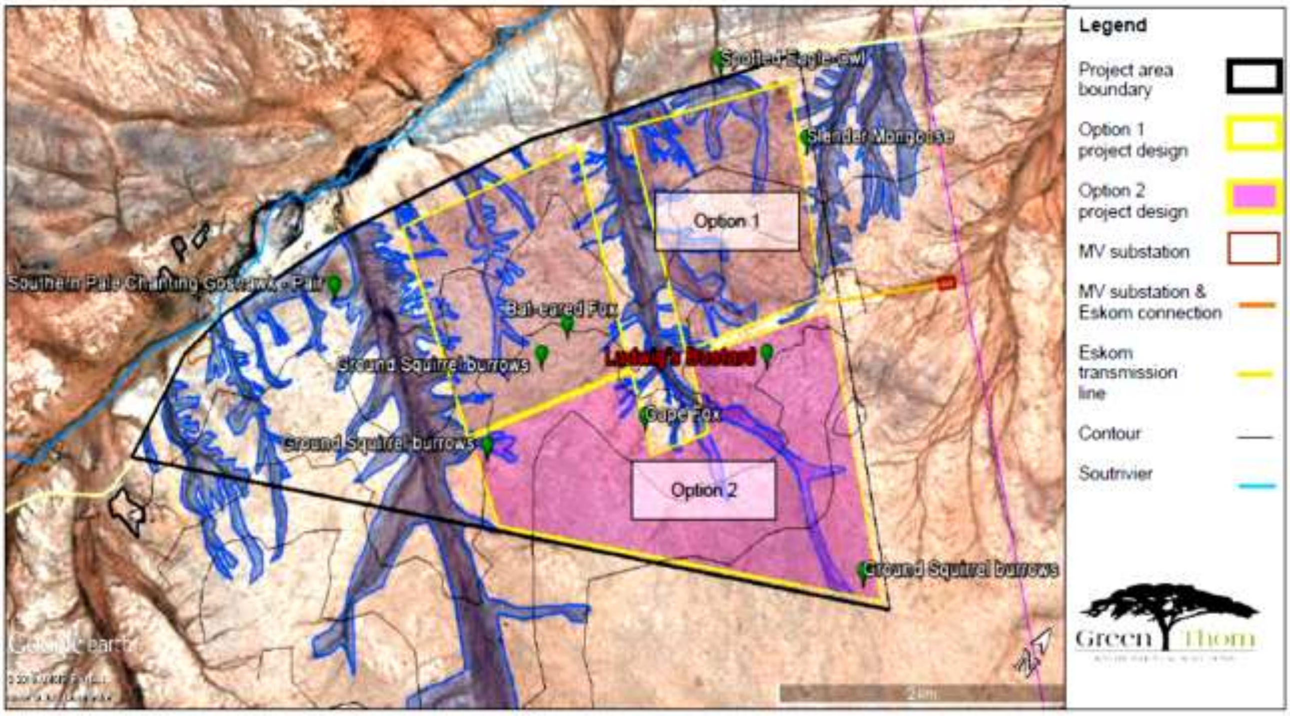


Figure 13: Locations of the most significant findings made during the fauna site assessment

Table 3: Lists of amphibians which may occur in the area

Common name	Taxon name	Red list category
Bubbling Kassina	*Kassina senegalensis*	Least Concern
Bushveld Rain Frog	*Breviceps adspersus*	Least Concern
Guttural Toad	*Amietophrynus gutturalis*	Least Concern
Queckett's River Frog	*Amietia queckettii*	Least Concern
Tremelo Sand Frog	*Tomopterna cryptotis*	Least Concern
Western Olive Toad	*Amietophrynus poweri*	Least Concern

Table 4: Lists of birds which may occur in the area (yellow infilled rows indicate species which were observed during the site assessment; Red text indicates threatened status higher than "Least Concerned")

Common Name	Taxon Name	Red list category
Avocet, Pied	*Recurvirostra avosetta*	Least Concern
Barbet, Acacia Pied	*Tricholaema leucomelas*	Least Concern
Bishop, Southern Red	*Euplectes orix*	Least Concern
Bunting, Lark-like	*Emberiza impetuani*	Least Concern
Bustard, Ludwig's	*Neotis ludwigii*	Endangered
Canary, White-throated	*Crithagra albogularis*	Least Concern
Chat, Familiar	*Cercomela familiaris*	Least Concern
Chat, Tractrac	*Cercomela tractrac*	Least Concern
Crow, Pied	*Corvus albus*	Least Concern
Dove, Laughing	*Streptopelia senegalensis*	Least Concern

Note: M: Ludwig's Bustard OBSERVED in flight with powerline visible on the neighbouring property in the background)

M

Common Name	Taxon Name	Red list category
Dove, Namaqua	*Oena capensis*	Least Concern
Goose, Egyptian	*Alopochen aegyptiacus*	Least Concern
Goshawk, Southern Pale Chanting	*Melierax canorus*	Least Concern
Korhaan, Northern black	*Afrotis afraoides*	Least Concern
Lapwing, Blacksmith	*Vanellus armatus*	Least Concern
Lark, Karoo Long-billed	*Certhilauda subcoronata*	Least Concern
Lark, Sabota	*Calendulauda sabota*	Least Concern
Lark, Spike-heeled	*Chersomanes albofasciata*	Least Concern
Martin, Rock	*Hirundo fuligula*	Not listed
Masked-weaver, Southern	*Ploceus velatus*	Least Concern
Mousebird, White-backed	*Colius colius*	Least Concern
Owl, Spotted eagle	*Bubo africanus*	Least Concern
Plover, Three-banded	*Charadrius tricollaris*	Least Concern
Prinia, Black-chested	*Prinia flavicans*	Least Concern
Quelea, Red-billed	*Quelea quelea*	Least Concern
Reed-warbler, African	*Acrocephalus baeticatus*	Not listed
Sandgrouse, Namaqua	*Pterocles gutturalis*	Least Concern
Shelduck, South African	*Tadorna cana*	Least Concern
Sparrow, Cape	*Passer melanurus*	Least Concern
Sparrowlark, Grey-backed	*Eremopterix verticalis*	Least Concern
Stilt, Black-winged	*Himantopus himantopus*	Least Concern
Sunbird, Dusky	*Cinnyris fuscus*	Least Concern
Swift, Little	*Apus affinis*	Least Concern
Teal, Cape	*Anas capensis*	Least Concern
Thick-knee, Spotted	*Burhinus capensis*	Least Concern
Turtle-dove, Cape	*Streptopelia capicola*	Least Concern
Wagtail, Cape	*Motacilla capensis*	Least Concern
Warbler, Rufous-eared	*Malcorus pectoralis*	Least Concern

Table 5: Lists of mammals which may occur in the area (yellow infilled rows indicate species which were observed during the site assessment; Red text indicates threatened status higher than "Least Concerned")

Common name	Taxon name	Subspecies	Red list category
Aardvark	*Orycteropus afer*		Least Concern
Aardwolf	*Proteles cristata*		Least Concern
Bat-eared Fox	*Otocyon megalotis*		Least Concern
Black-backed Jackel	*Canis mesomelas*		Least Concern
Blesbok	*Damaliscus pygargus*	*phillipsi*	Least Concern
Blue Wildebeest	*Connochaetes taurinus*	*taurinus*	Least Concern
Brown Hyaena	*Hyaena brunnea*		Near Threatened
Cape Fox	*Vulpes chama*		Least Concern
Cape Hare	*Lepus capensis*		Least Concern
Cape Porcupine	*Hystrix africaeaustralis*		Least Concern

Common name	Taxon name	Subspecies	Red list category
Cape Short-tailed Gerbil	*Desmodillus auricularis*		Least Concern
Caracal	*Felis caracal*		Not listed
Common Eland	*Taurotragus oryx*		Not listed
Darlings Horseshoe Bat	*Miniopterus schreibersii*		Near Threatened
Dassie Rat	*Petromus typicus*		Least Concern
Dent's Horseshoe Bat	*Rhinolophus darlingi*		Least Concern
Gemsbok	*Oryx gazella*		Least Concern
Gerbil	*Tatera leucogaster*		Least Concern
Ground Pangolin	*Manis temminckii*		Vulnerable
Ground Squirrel	*Xerus inauris*		Least Concern
Hairyfooted Gerbil	*Gerbillurus vallinus*		Least Concern
Hairy-footed Gerbil	*Gerbillurus paeba*		Least Concern
Honey Badger	*Mellivora capensis*		Least Concern
Large-eared African Desert Mouse	*Malacothrix typica*		Least Concern
Lesser Musk Red Shrew	*Crocidura hirta*		Least Concern
Namaque Rock Mouse	*Aethomys namaquensis*		Least concern
Polecat	*Ictonyx striatus*		Least concern

Common name	Taxon name	Subspecies	Red list category
Red Hartebeest	*Alcelaphus caama*		Least concern
Reddish-gray Musk Shrew	*Crocidura cyanea*		Least concern
Round-Eared Elephant Shrew	*Macroscelides proboscideus*		Not listed
Scrub Hare	*Lepus saxatilis*		Not listed
Sheep	*Ovis aries*		Not listed
Slender Mongoose	*Galerella sanguinea*		Not listed
Small Grey Mongoose	*Galerella pulverulenta*		Not listed
Small Spotted Cat	*Felis nigripes*		Vulnerable
South African Hedgehog	*Atelerix frontalis*		Least concern
South African Mole-rat	*Cryptomys hottentotus*		Least concern
Southern African Mastomys	*Mastomys coucha*		Least concern
Springbok	*Antidorcas marsupialis*		Least concern
Steenbok	*Raphicerus campestris*		Least Concern
Suricate	*Suricata suricatta*		Least concern
Waterbuck	*Kobus ellipsiprymnus*	*ellipsiprymnus*	Least concern
Yellow Mongoose	*Cynictis penicillata*		Least concern
Xeric Four-striped Grass Rat	*Rhabdomys pumilio*		Least concern

Table 6: Lists of reptiles which may occur in the area (yellow infilled rows indicate species which were observed during the site assessment; Red text indicates threatened status higher than "Least Concerned")

Common name	Taxon name	Red list category
Bibron's Gecko	*Chondrodactylus bibronii*	Not Listed
Blunt-tailed Worm Lizard	*Dalophia pistillum*	Not Listed
Brown House Snake	*Boaedon capensis*	Not Listed
Bushveld Lizard	*Heliobolus lugubris*	Not Listed
Cape Cobra	*Naja nivea*	Not Listed
Cape Gecko	*Pachydactylus capensis*	Not Listed
Common Giant Ground Gecko	*Chondrodactylus angulifer*	Least Concern
Common Ground Agama	*Agama aculeata*	Least Concern
Horned Adder	*Bitis caudalis*	Least Concern
Karasburg Tree Skink	*Trachylepis sparsa*	Least Concern
Karoo Girdled Lizard	*Karusasaurus polyzonus*	Near Endemic
Karoo Sand Snake	*Psammophis notostictus*	Least Concern
Maurice's Worm Lizard	*Monopeltis mauricei*	Least Concern
Puff Adder	*Bitis arietans*	Least Concern
Quartz Gecko	*Pachydactylus latirostris*	Least Concern

Common name	Taxon name	Red list category
Rhombic Eggeater	*Dasypeltis scabra*	Least Concern
Serrated Tent Tortoise	*Psammobates oculifer*	Least Concern
Southern Rock Agama	*Agama atra*	Least Concern
Spotted Barking Gecko	*Ptenopus garrulus*	Least Concern
Spotted Sand Lizard	*Pedioplanis lineoocellata*	Least Concern
Turner's Gecko	*Chondrodactylus turneri*	Least Concern
Variegated Skink	*Trachylepis variegata*	Least Concern
Western Rock Skink	*Trachylepis sulcata*	Least Concern

1.11.1 AVI FAUNA	**SEE APPENDIX A (DOC REF: 2017/BES/SR/13) : An AVIFAUNAL IMPACT ASSESSMENT have been conducted by Chris van Rooyen Consulting.** **- For more detail see report.**

6 BASELINE ASSESSMENT

6.1 Important Bird Areas

There are no Important Bird Areas (IBA) within a 50km radius around the proposed BSPP. It is therefore highly unlikely that the proposed development will have a negative impact on any IBA.

6.2 Habitat classes

Vegetation structure, rather than the actual plant species, is more significant for bird species distribution and abundance (Harrison *et al.* 1997). The description of the vegetation types occurring in the development area largely follows the classification system presented in the Atlas of southern African birds (Harrison *et al*. 1997). The criteria used 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. It is important to note that no new vegetation unit boundaries were created, with use being made only of previously published data. The description of vegetation presented in this study therefore concentrates on factors relevant to the bird species present and is not an exhaustive list of plant species present.

6.2.1 Biomes and vegetation types

The study area forms part of the Nama Karoo Biome, and the Bushmanland Bioregion (Mucina & Rutherford 2006). The study area comprises mainly Bushmanland Arid Grassland, Bushmanland Sandy Grassland and Bushmanland Basin Shrubland. The Bushmanland Arid Grassland is characterised by irregular plains dominated by *Stipagrostis* species. In some regions the vegetation structure is altered by low shrubs of *Salsola* species. Bushmanland Sandy Grassland is characterised by sandy grassland plains dominated by *Stipagrostis* and *Schmidtia* species. There is also a common occurrence of drought-resistant shrubs, and after rainfall the display of ephemeral spring flora including *Grielum humifusum* and *Gazania lichtensteinii*. The Bushmanland Basin Shrubland is characterised by irregular plains dominated by shrubs including *Rhigozum, Salsola*, *Pentzia* and *Eriocephalus* as well as different *Stipagrostis* grass species. After rainfall *Gazania* and *Leysera* species may also be present (Mucina & Rutherford, 2006).

The differences in vegetation at the site reflects the substrate conditions including soil depth, texture, and geology. The areas with coarse material (for instance the deep, sandy soils in the drainage systems) are dominated by shrubby vegetation, while the areas with fine material or abundant geological outcrops (for
instance the calcic soils) are dominated by grasses (Boscia 2018).

Figure 4: Shrubby vegetation in a drainage line at the study area

Figure 5: The study area is situated on a vast grassy plain.

The study area forms part of the semi-arid Bushmanland region and falls within the very late summer rainfall region (Schulze, 1997). According to meteorological statistics from the South African Weather Services (Weather Bureau, 2016) the average annual rainfall for this area, from 1992 up to 2015, was between 140 mm and 250 mm per annum. The variation in average temperatures within this area is extreme with maximum temperatures during the summer reaching up to 40.8 °C and minimum temperatures as low as -3 °C. The overall topography of the site is relatively homogenous and ranges from 857m to 880m above mean sea level with the highest part of the landscape to the south-east and the lowest part to the north-west. The study area is predominantly used for livestock farming. The infrastructure present within the boundaries of the study area is limited to a feeding and water trough, border fences and a gravel pit. There is also a small earth dam (not considered as a pan system) in the northern corner of the site. Parallel to the north-western border of the site (located outside the study area) is the Loeriesfontein- Kakamas road. (Boscia 2018). There is also the 400kV Aries – Kokerboom transmission line running approximately 900m from the site, parallel to the north-eastern border of the study area.

Whilst the distribution and abundance of the bird species in the development area are mostly associated with natural vegetation, as this comprises virtually all the habitat, it is also necessary to examine external modifications to the environment that might have relevance for priority species. Anthropogenic avifaunal relevant habitat modifications which could potentially influence the avifaunal community that were recorded in or close to the study area are a water trough, a dam, fences and a high voltage transmission line. These are discussed in more detail below.

6.2.2 Surface water

Surface water is of specific importance to avifauna in this semi-arid environment. The study area contains an open water trough that provide drinking water to livestock. Open water troughs are important sources of surface water and could potentially be used extensively by various bird species, including large raptors, to drink and bath. There is also a small dam in the northernmost corner of the study area. The dam was dry when the surveys were conducted, but it could hold water after good rains, when it could be attractive to various bird species, including large raptors, to drink and bath. It could also serve as an attraction to waterbirds when it contains water. The development area itself contains no surface water.

6.2.3 High voltage lines

High voltage lines are an important potential roosting and breeding substrate for large raptors in the area. Existing high-voltage lines are used extensively by large raptors in arid regions of South Africa e.g. in 2005 an aerial survey of the Ferrum – Garona 275kV line which starts at Kathu and terminates at Garona Substation approximately 16km north of Groblershoop, found a total of 19 Martial Eagle and 7 Tawny Eagle nests on transmission line towers (Van Rooyen 2007). High voltage lines therefore hold a special importance for large raptors, but also for Sociable Weavers which often construct their giant nests within the lattice work or cross-arms of high voltage structures. The study area does not contain any high voltage lines, but the Aries – Kokerboom 400kV line runs just north-east of the study area (see Figure 6). Martial Eagle was observed to perch on the towers during the surveys. The line was inspected for potential raptor nesting activity, but only an inactive corvid nest was recorded.

Figure 6: The Aries – Kokerboom 400kV high voltage line

6.2.4 Fences

The study area is fenced off on all sides with barbed wire fences (see Figure 7). Farm fences provide important perching substrate for a wide range of birds in this treeless environment where natural perches are scarce, as a staging post for territorial displays by small birds and also for perch hunting for raptors such as
Greater Kestrel, Rock Kestrel and Southern pale Chanting Goshawk.

Figure 7: The study area is surrounded by fences on all sides.

6.3 Avifauna

6.3.1 Southern African Bird Atlas 1 and 2

The SABAP1 and SABAP2 data indicate that a total of 91 bird species could potentially occur in the broader
area – Appendix 2 provides a comprehensive list of all the species, including those recorded during the preconstruction
monitoring. Of these, 28 species are classified as priority species (see Section 4 for definition of
a priority species) and 6 of these are Red Data species. The probability of a priority species occurring in the
study area is indicated in Table 2.
Table 2 below lists all the priority species and the possible impact on the respective species by the proposed
solar energy infrastructure. The following abbreviations and acronyms are used:

- EN = Endangered
- VU = Vulnerable
- NT = Near-threatened

6.3.2 Pre-construction surveys

A visit to the study area was conducted on 9 February 2018, followed up by on-site surveys from 28 February to 2 March 2018 (summer) and again from 10 – 12 April 2018 (autumn). Surveys were conducted according to the best practice guidelines for avifaunal impact studies at solar developments, compiled by
BirdLife South Africa (BLSA) in 2017 (Jenkins *et al*. 2017). Please see Appendix 1 for details of the methodology used in the surveys.

6.3.2.1 Priority species abundance

The abundance of priority species recorded during the two seasonal surveys are displayed in Table 3 and Figure 8 below.

Table 2: Index of kilometric abundance for all species recorded by means of walk transects during seasonal surveys at the study area. Priority species are indicated in red (incidental sightings excluded).

Species	Su: IKA	Au: IKA
Ant-eating Chat	0.42	0.17
Black-chested Prinia	0.13	0.00
Black-eared Sparrowlark	0.21	0.08
Bokmakierie	0.00	0.13
Cape Sparrow	0.17	0.04
Capped Wheatear	0.00	0.08
Chat Flycatcher	0.04	0.04
Double-banded Courser	0.08	0.08
Fawn-coloured Lark	0.04	0.04
Greater Kestrel	0.21	0.04
Grey-backed Sparrowlark	1.17	0.38
Karoo Chat	0.00	0.21
Karoo Korhaan	0.08	0.50
Lark-like Bunting	0.00	0.04
Namaqua Sandgrouse	0.58	0.38
Northern Black Korhaan	0.00	0.08
Pied Crow	0.25	0.08
Rufous-eared Warbler	0.00	0.25
Sabota Lark	0.58	0.54
Scaly-feathered Finch	0.58	0.00
Sickle-winged Chat	0.08	0.00
Spike-heeled Lark	3.04	2.71
Stark's Lark	0.92	0.08
Tractrac Chat	0.13	0.00

Table 3: Priority species potentially occurring at the site, conservation status, priority criteria, SABAP reporting rates, probability of occurrence, habitat use and potential impacts.

											Habitat				Impact					
Species	Taxonomic name	SABAP2 reporting rate	SABAP1 reporting rate	Red Data status Global	Red Data status Regional	Endemic - South Africa	Endemic - Southern Africa	Priority species	Probability of occurrence	Recorded during pre-construction surveys	Nama Karoo	Surface water	Fences	High voltage lines	PV panel collisions	Displacement - disturbance	Displacement - habitat loss	Drowning	Powerline collisions	Entrapment in fences
Bustard, Ludwig's	*Neotis ludwigii*		13	EN	EN		Near-endemic	√	High		√					√	√		√	√
Bustard, Kori	*Ardeotis kori*		0	NT	NT			√		√									√	√
Buzzard, Jackal	*Buteo rufofuscus*		11			Near endemic	Endemic	√	Low		√	√	√	√		√	√	√		
Canary, Black-headed	*Serinus alario*		8.3			Near endemic	Endemic	√	High	√	√		√		√	√				
Chat, Anteating	*Myrmecocichla formicivora*	50	25				Endemic	√	High		√		√		√	√				
Eagle, Booted	*Aquila pennatus*		33					√	High	√	√	√		√			√	√		
Eagle, Martial	*Polemaetus bellicosus*		33	VU	EN			√	High	√	√	√		√			√	√		
Eagle-owl, Spotted	*Bubo africanus*		13					√	High		√		√	√	√	√				
Falcon, Lanner	*Falco biarmicus*	50	17	LC	VU			√	High		√	√	√	√	√	√		√		
Falcon, Pygmy	*Polihierax semitorquatus*		50					√	Low		√			√	√	√				
Flamingo, Greater	*Phoenicopterus ruber*		5.6	LC	NT			√	Medium			√				√			√	
Goshawk, Southern Pale Chanting	*Melierax canorus*	100	29				Near-endemic	√	High		√	√	√	√	√	√		√		
Kestrel, Greater	*Falco rupicoloides*		54					√	High	√	√		√	√	√	√				
Kestrel, Rock	*Falco rupicolus*		13					√	High		√		√	√		√				
Korhaan, Karoo	*Eupodotis vigorsii*		29	LC	NT		Endemic	√	High	√	√					√	√		√	√
Korhaan, Northern Black	*Afrotis afraoides*		21				Endemic	√	High		√					√	√		√	√
Lark, Karoo Long-billed	*Certhilauda subcoronata*	50	13				Endemic	√	High		√		√		√	√	√			
Lark, Large-billed	*Galerida magnirostris*		17			Near endemic	Endemic	√	High	√	√		√		√	√	√			
Mousebird, White-backed	*Colius colius*	50	5.6				Endemic	√	Low		√				√	√	√			
Owl, Barn	*Tyto alba*		17					√	High		√		√	√	√	√				
Scrub-robin, Karoo	*Cercotrichas coryphoeus*		13				Endemic	√	High		√				√	√				
Shelduck, South African	*Tadorna cana*	100	17				Endemic	√	Medium			√			√		√		√	
Shoveler, Cape	*Anas smithii*		5.6				Near-endemic	√	Medium			√			√				√	
Sickle-winged Chat	*Cercomela sinuata*	0	0				Endemic	√	High	√	√		√		√	√	√			
Sparrowlark, Black-eared	*Eremopterix australis*	50	33			Near endemic	Endemic	√	High	√	√				√	√	√			
Warbler, Rufous-eared	*Malcorus pectoralis*	100	29				Endemic	√	High		√				√	√	√			
Weaver, Sociable	*Philetairus socius*		71				Endemic	√	Low		√			√	√	√				
White-eye, Orange River	*Zosterops pallidus*		8.3				Endemic	√	Very Low		√				√	√	√			

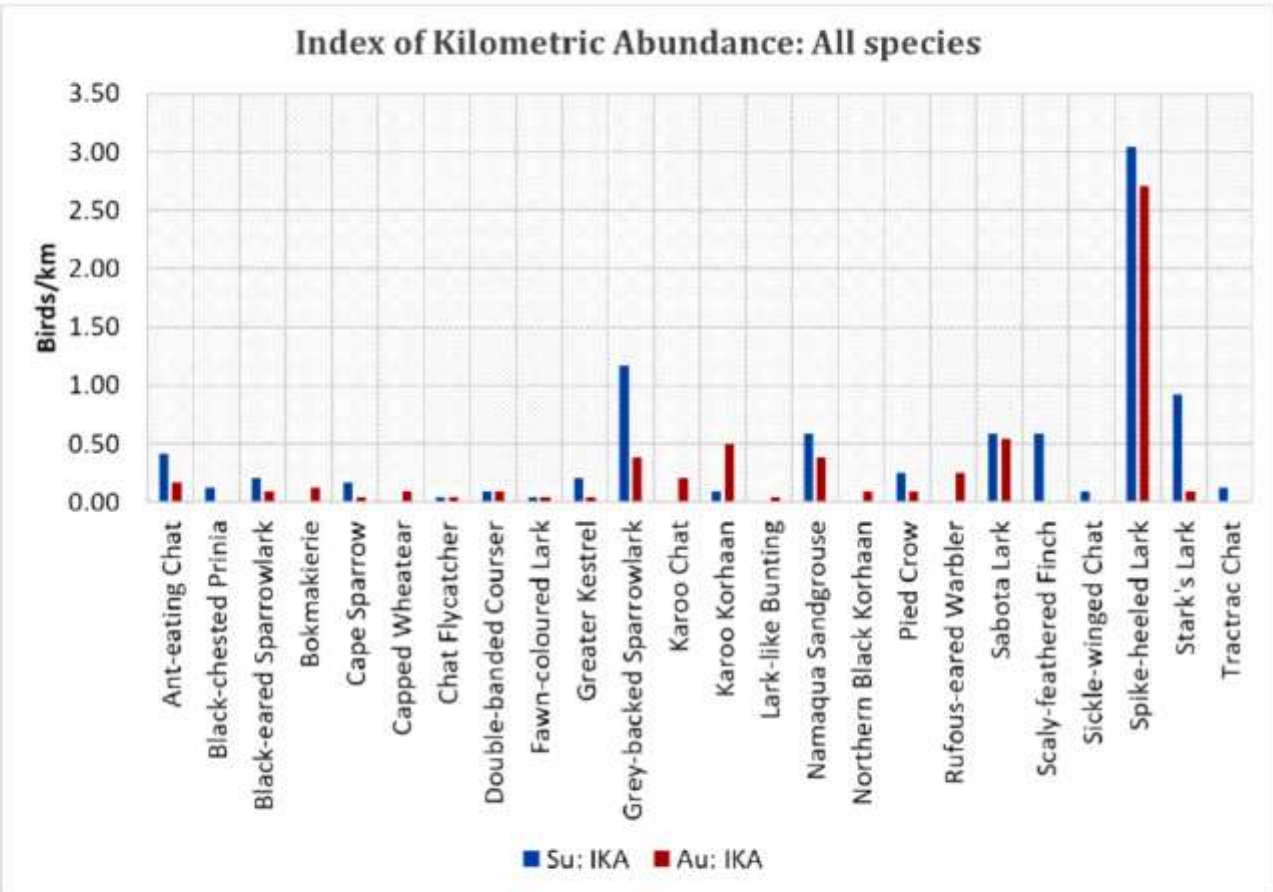
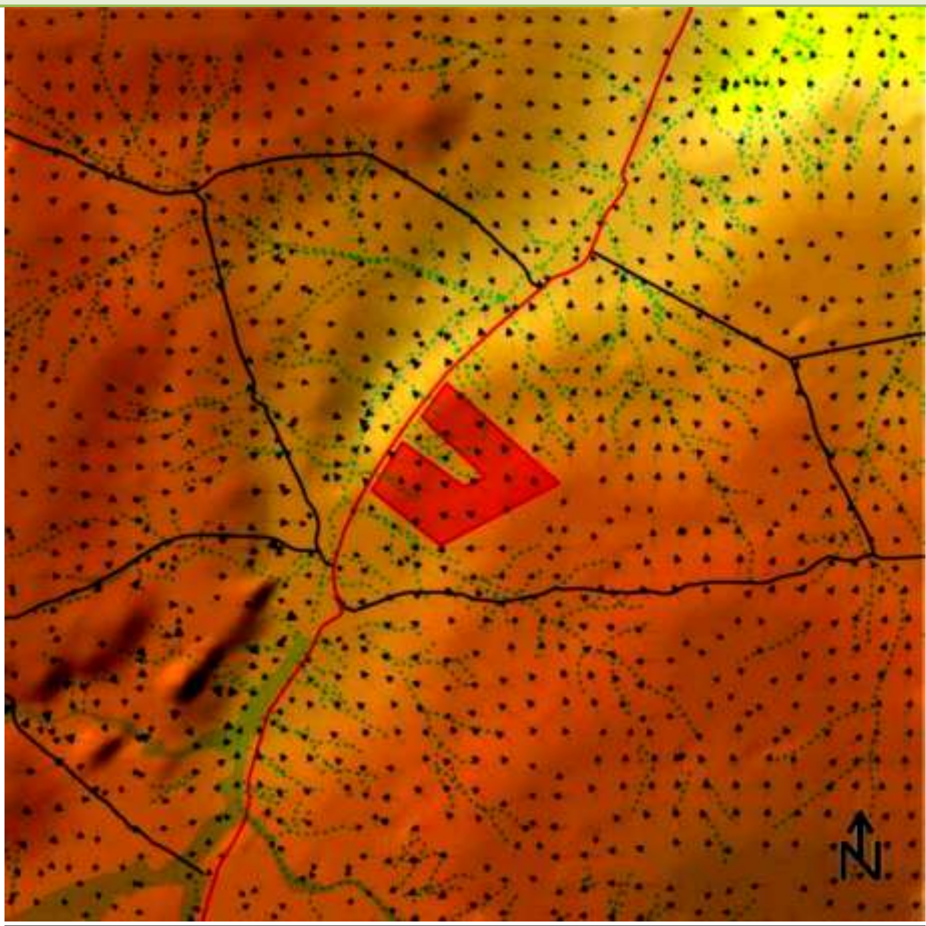


Figure 8: Index of kilometric abundance (IKA) for all species recorded during walk transects at the study area during summer and autumn.

	6.3.2.2 Discussion **The overall abundance of priority species at the site was low, with an average of 0.58 and 0.63 birds/km being recorded in summer and autumn respectively.** For all birds combined, the IKA for summer was 8.13 birds/km, and 5.33 birds/km for autumn. The counts show an overall decrease from summer to autumn counts, which may be the results of deteriorating veld conditions during that period. Although the area had some rains just prior to the autumn counts, it was too early to have had an impact on the vegetation after a long and dry summer. Of interest is that resident species such as Spike-heeled Lark *Chersomanes albofasciata* and Sabota Lark *Calendulauda sabota* showed very showed very little fluctuation in abundance between seasons, but nomadic species such as Grey-backed Sparrowlark *Eremopterix verticalis* and Stark's Lark *Spizocorys starki* were far more abundant during the summer counts, indicating responses to veld conditions. Scaly-feathered Finch *Sporopipes squamifrons* described by Hockey et al. (2005) as "resident, locally nomadic" were also more abundant during the summer, and entirely absent during autumn. Somewhat inexplicably, the highly sedentary Karoo Korhaan, the only Red Data species encountered regularly during counts, were more abundant during the autumn counts.
	CONCLUSIONS: The proposed BSPP will have some pre-mitigation impacts on avifauna at a site and local level which will range from High to Low. The impact of displacement due to disturbance during the construction phase is rated as Medium and will remain at a Medium level after mitigation. The impact of displacement of priority species due to habitat transformation associated with the operation of the plant and associated infrastructure is rated as High. This impact can be partially reversed through mitigation, putting it at a Medium level, after mitigation.. The remaining envisaged impacts, i.e. mortalities in the operational phase due to collisions with the solar panels and entrapment in perimeter fences are both rated as Low and should be mitigatable to a Very Low level with appropriate mitigation. The impact of the proposed 400kV grid connection is assessed to be Low and can be further mitigated to a Very Low level, due to the short length of the proposed overhead line. The relatively small size of the footprint leads one to the conclusion that the cumulative impact of the facility on priority avifauna should in all likelihood be Very Low, taking into account the lack of other renewable projects within a 30km radius around the development area. **Recommendation:** **From an avifaunal impact perspective, the proposed development could go ahead, provided the proposed mitigation measures are strictly implemented. No further monitoring will be required during the operational phase.**

1.11 SURFACE WATER	<u>Water management area (14)</u> : **Lower Orange River** <u>River</u>: **Salt River which is a tributary of the Hartbees River.** **The proposed PVSP project site falls under the primary drainage region D and in quaternary sub-catchment D53H. The catchment is approximately 147 km² in size.** **SEE APPENDIX A: An Surface and Groundwater survey (DOC REF: 2017/BES/SR/07 & 2017/BES/SR/08) have been conducted by Eko Environmental.** 3.1 Surface water The study area is located within the Lower Orange Management Area, Quaternary Drainage Area D53H. The non-perennial Sout river lays to the north-eastern boundary and run-off is in a north -eastern direction towards the Sout river. Figure 9.
	 Figure 9. Local topography and drainage in the vicinity of the proposed solar farm.

	Process and potable water will be supplied from a desalination plant and associated reservoir . Water for dust suppression will be supplied by tanker from probable newly drilled boreholes. An **Surface and Groundwater survey** have been conducted by Eko Environmental, which will spell out recommendations in this regard.
	Surface Water Assessment (DOC REF: 2017/BES/SR/07) : 4. Wetland Assessment For the purpose of this report the general ecology of the study area will first be discussed followed by a discussion of the wetland system. 4.1 General ecology and description of the study area (Mucina & Ruterford 2006) The study area consists of a large portion of land approximately 60 km south west of the town of Kakamas and to the south east of the South River (Map 1). The area consists of natural vegetation with very few impacts. The extent of the site proposed for the solar facility is 623 ha. The site is situated on Portion 4 of the farm Breipaal 134. The land use of the site is concerned with livestock farming and the only impacts is therefore trampling and overgrazing by livestock. Small farm tracks and a dirt road does impact on aspects such as runoff and stream flow although this impact is still considered as low. Only one small earthen weir is located within the runoff pattern on the site and this impact is also considered as low. The Sout River itself contains several weirs upstream of the site but these are also not as numerous and this impact is still considered low. The study area is situated within the Nama Karoo Biome in the Bushmanland Region and therefore contains areas dominated by dwarf karroid shrubs and areas containing a well developed grass layer. Watercourses including the ephemeral streams and drainage lines are dominated by shrubs and trees. The region is considered to have a low rainfall and forms part of an arid area. The topography on the site is rather uniform but does vary to some degree over the site. The site slopes from east to west and toward the Sout River. The site can be regarded as a plain with watercourses causing channels in the landscape. Small rocky outcrops are present but are not prominent land forms. Altitude varies from 880 m in the east to 845 m in the west and illustrates the gradual slope toward the river. Due to the increase in slope toward the river this area contains a high amount of seasonal and ephemeral streams and drainage lines (Map 2 & 3). The immediate region is very arid and receives rainfall mainly in late summer/early autumn with a mean annual rainfall of 62 mm. Rainfall also varies considerably from year to year. The occurrence of wetland areas is therefore very low. The monthly maximum temperature varies from 20˚C in July to 33˚C in January. Frost occurs during winter but is not common with frost ranging from 10 to 30 days. Geology in the study area consists of generally highly deformed metamorphosed sedimentary and volcanic rocks intruded by granitoids and the region is further characterised by numerous geological faults and shear zones. The area forms part of the Namaqua Metamorphic Province and within the Bushmanland Terrane. The soils of the area are red-yellow apedal soils, freely drained, of the Ag and Ae land types. The study area itself does not contain any built up areas. No farmsteads, buildings or other structures occur on the site. A electrical transmission line is situated along the north eastern border of the site. No extensive infestation by exotic weeds and invaders occur in the study area although the exotic Mesquite Tree (Prosopis glandulosa) occurs sporadically along some of the

ephemeral streams and drainage lines. This species can become a serious invader along watercourses in the Northern Cape (Appendix B).

The vegetation type occurring in the study area is Bushmanland Arid Grassland (NKb 3). According to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) this vegetation type is considered to be of Least Concern (LC) (Map 3). It is not currently subjected to any pronounced transformation or development pressures. However, recently this area has been subjected to a high amount of solar project application and this may cause significant transformation pressures.

South Africa has a large amount of endemic species and in terms of biological diversity ranks third in the world. This has the result that many of the species are rare, highly localised and consequently endangered. It is our duty to protect our diverse natural resources.

During the site survey several protected species were also noted to occur within the study area. These include *Avonia albissima, Lithops julii* subsp. *fulleri, Aloe variegata, Hoodia gordonii* and *Euphorbia spinea.*

South Africa contains 19 known centres of endemism. These areas contain a high number of species endemic to this specific area. Due to the limited range of most of these species many are rare, protected or endangered. The mining area is situated within the Gariep Centre of Endemism. Many species occurring within this centre is unique and localised to this area. As a result the study area may contain such species which are of conservational importance.

4.2 Wetland Delineation

The study area consists of the solar facility site and contains several significant ephemeral streams and drainage lines (Map 2 & 3). These systems will be affected directly by the proposed solar facility and will be discussed below. The seasonal Sout River to the north west of the site (approximately 500 m) will also be discussed in brief as it is also likely to be affected indirectly by the facility in close proximity.

The term watercourse refers to a river, stream, wetland or pan. The National Water Act (NWA, 1998) includes rivers, streams, pans and wetlands in the definition of the term watercourse.

This definition follows:

Watercourse means:

- A river or spring.
- A natural channel in which water flows regularly or intermittently.
- A wetland, lake or dam into which water flows.
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Riparian habitat is an accepted indicator of watercourses used to delineate the extent of wetlands, rivers, streams and pans (Department of Water Affairs and Forestry 2005).

Obligate wetland vegetation was utilised to determine the presence and border of wetlands. The Sout River, streams and drainage lines are clearly defined and easily identifiable utilising the riparian vegetation.

The study area contains a high amount of drainage lines and a few significant streams which drain into the Sout River (Map 2 & 3). These drain from the plains south east of the river. The central significant stream has its origin within the site while the two significant streams adjacent to the northern and southern border only have their origins within the site. None of the streams or drainage lines contain any berms or artificial dams within their main channels. All watercourses within the site boundary as well as the Sout River are subjected to few impacts and are consequently considered to be largely natural. Due to the arid environment the riparian vegetation along the ephemeral stream and drainage lines are not the conventionally identified riparian species found in wetter eastern regions of the country but in this region can be reliably be considered obligate riparian species and utilised to identify watercourses. These riparian species include *Sasola glabrescens, S. aphylla, Tamarix usneoides, Atriplex vestita, Sporobolus ioclados, Eragrostis bicolor, Sueada fruticosa, Lycium pumilum, L. cinerium* and *Parkinsonia africana*. Of these species *T. usneoides* and *S. aphylla* are listed as obligate riparian speices (DWAF 2008). Additional species only associated with the Sout River is *Phragmites australis* and *Juncus rigidus*. Both of these species are listed as obligate wetland species, indicating that at least portions of the river must be considered wetland areas (DWAF 2008). The exotic invader Mesquite Tree (*Prosopis glandulosa*) occurs sporadically along watercourses and in this arid region it can also be used to some extent to indicate watercourses. Along sandy portions of the streams and drainage lines the grass, *Stipagrostis namaquensis*, also indicates riparian vegetation. The shrub, *Rhigozum trichotomum*, is closely associated with drainage lines in this area. As indicated by the vegetation no wetland conditions occur along the streams and drainage lines occurring on the site. However, wetland conditions do occur in areas along the Sout River and although the river is not located on the site it may still be affected by the solar facility. Riparian vegetation and topography allow easy identification of watercourses on the site. These watercourses also contain a distinct main channel which further simplifies identification.

No pans occur on the site. A small earth dam occurs in the northern corner of the site but is artificial and cannot be considered a pan system.

The marginal zone and banks of the Sout River can be characterised as a floodplain wetland (SANBI 2009):

A floodplain wetland and lowland river floodplain: the mostly flat or gently sloping wetland area adjacent to and formed by a lowland floodplain river and subject to periodic inundation by overtopping of the channel bank of the river. The location of the wetland adjacent to the river in the lowland floodplain zone is the key criterion for distinguishing a floodplain wetland from a channelled valley-bottom wetland. Water and sediment input to floodplain wetland areas is mainly via overtopping of a major channel, although there could be some overland or subsurface flow from adjacent valley side-slopes (if present). Water movement through the wetland is dominantly horizontal and bidirectional, in the form of diffuse surface flow and interflow, although there can be significant temporary containment of water in depressional areas (within which water movement is dominantly vertical and bidirectional). Water generally exits as diffuse surface flow and/or interflow, but infiltration and evaporation of water from a floodplain wetland can also be significant, particularly if there are a number of depressional areas within the wetland.

The above description accurately describes the wetland areas along the Sout River adjacent to the study area. These areas are situated adjacent to the Sout River which is a lowland river although seasonal in nature. From field observations these areas are moisture saturated for most of the year. These wetland area are reliably indicated by the obligate wetland species Phragmites australis and Juncus rigidus.

The Sout River is also characterised by high levels of salt content. As a result the riparian associated with it is also characteristic of high saline areas. These plants are also called halophytes indicating their ability to thrive in areas of high salt content. Their leaves often absorb the salts and they are often unpalatable to mammals.

The classification of stream orders from 1 to 3 can be illustrated by means of the Strahler 1952 classification:

Figure 1: The classification of stream orders from 1 to 3 (Strahler 1952)

Table 2 refers to the determination and categorisation of the Present Ecological State (PES; health or integrity) of various biophysical attributes of rivers relative to the natural or close to the natural reference condition. The purpose of the EcoClassification process is to gain insights and understanding into the causes and sources of the deviation of the PES of biophysical attributes from the reference condition. This provides the information needed to derive desirable and attainable future ecological objectives for the river (Kleynhans & Louw 2007).

	Table 3 refers to the Ecological Importance and Sensitivity (EIS) of wetlands. "Ecological importance" of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. "Ecological sensitivity" refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred. The Ecological Importance and Sensitivity (EIS) provides a guideline for determination of the Ecological Management Class (EMC). River systems can be divided into different riparian zones within the River systems can be divided into different riparian zones within the lateral section of the system. For the purpose of this study the central, most significant stream on the site will be described as a representative of the watercourses on the site. These zones are as follows: The **marginal zone** is the lowest zone and is always present in river systems while the other two zones may not always be present. The zone is situated from the water level at low flow, if present, up to the features that are hydrologically activated for the most of the year (Figure 2). The marginal zone within the stream is dominated by grass species which include Sporobolus ioclados, Eragrostis bicolor and Stipagrostis namaquensis. Wetland conditions are absent from this zone due to ephemeral flow. The main channel is largely devoid of vegetation but may contain a significant annual/pioneer vegetation component after significant rains. The stream only flows on an ephemeral basis, i.e. not on a seasonal basis and only during years of exceptional rains. The main channel consists predominately of sandy bed except in smaller drainage lines where the substrate is dominated by stony soils. The zone is considered largely natural although trampling and grazing by domestic stock is evident. The **lower zone** is characterised by seasonal features and extends from the marginal zone up to an area of marked elevation. This area may be accompanied by a change in species distribution patterns. The lower zone consists of geomorphic features that are activated on a seasonal basis (Figure 2). The lower zone can be distinguished by an increase in slope and the dominance of larger shrubs. The increase in slope is not drastic but is visible along the watercourse banks. This is a gradual increase in most areas and cause the boundary between the lower and upper zones to be more difficult to discern. The lower zone will be rarely inundated. The vegetation is dominated by larger (approximately 1 - 2 meters), often thorny, including Sasola glabrescens, S. aphylla, Atriplex vestita, Sueada fruticosa, Lycium pumilum and L. cinerium. Their composition changes as the salt content varies. Atriplex vestita and Sueada fruticosa dominates where high salt content of the soil occurs whilst the others are more dominant in areas with lower salt content. Several tree species also occur in this zone and include Tamarix usneoides and Parkinsonia africana. The exotic invader, Mesquite Tree (Prosopis glandulosa), can also be added to these tree species. These trees are all confined to the larger stream systems. The zone is considered largely natural although trampling and grazing by domestic stock is evident, the infestation by the exotic Mesquite Tree is low but still represents a low impact. The **upper zone** is characterised by ephemeral features as well as the presence of both riparian and terrestrial species. The zone extends from the lower zone to the riparian corridor. The upper zone contains geomorphic features that are hydrologically activated on an ephemeral basis (Figure 2). The upper is visible as a decrease in slope and an increase terrestrial species. Grass species increase and shrubs occurring in the lower zone decrease.

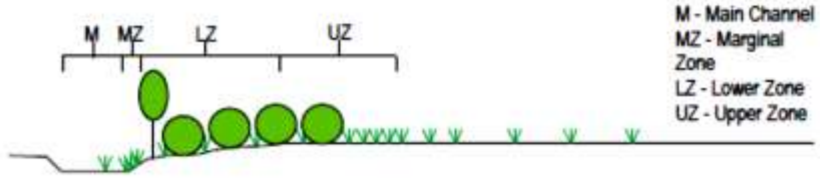
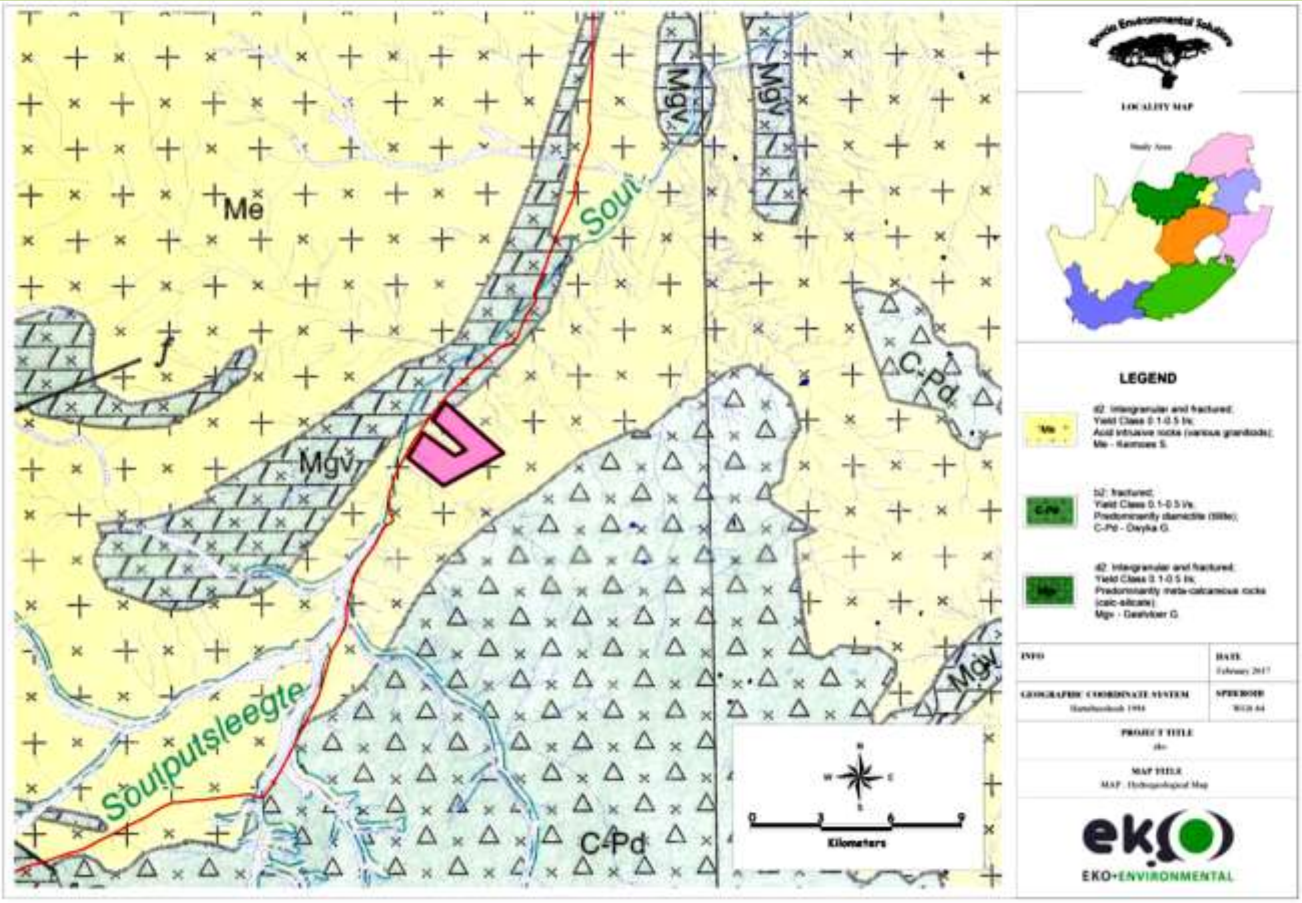


Figure 2: Illustration showing the different riparian zones of the significant stream within the study area.

1.12 GROUND WATER **1.12.1 Water use**	No boreholes occur on the proposed PVSP project site. Process and potable water will probably be obtained from boreholes and/or the Salt River via a desalination plant/ reservoir. **APPENDIX A: An Surface and Groundwater survey (DOC REF: 2017/BES/SR/07 & 2017/BES/SR/08) have been conducted by Eko Environmental, which will spell out recommendations in this regard.**
	Desktop Geohydrological study (DOC. REF: 2017/BES/SR/08) : **3.2.1 Groundwater Occurrences** Groundwater occurs in zones of weathering and in fractures or in the contact zones between different lithology's, such as granodiorite, granite, pegmatite and gneiss of the Keimoes Suite (Me), **Yield is generally less than 0.5 l/s.** Groundwater can be exploited from joints and fractures in calcsilicates and sub ordinated quartzites of theGeelvloer Group (Mgv). The calc silicates have known karstic aquifer properties and are not likely to facilitate groundwater occurrence. Refer to Figure 10 **3.3 Desktop Aquifer Classification** **3.3.1 Aquifer Classification** The aquifer(s) of the area under investigation is classified as a poor aquifer according to the map of Aquifer Classification of South Africa, 2012 and is depicted in Figure 11. The map indicates the aquifer classification system of South Africa. Blue represents the major aquifer region which is a high yielding system of good water quality. Green represents the minor aquifer region which is moderate yielding aquifer system of variable water quality. Pink represents the poor aquifer region which is low to negligible yielding aquifer system of moderate to poor water quality. **3.3.2 Aquifer Susceptibility** The aquifer susceptibility index is classed as low vulnerability and depicted on the map in Figure 12. The map indicates the qualitative measure of the relative ease with which a groundwater body can be potentially contaminated by anthropogenic activities and includes both aquifer vulnerability and the relative importance of the aquifer in terms of its classification. **3.3.3 Aquifer Vulnerability** The aquifer vulnerability for the study area indicates the least tendency for contamination if pollutants are discharge or leeched over the long term and is depicted on map in Figure 13. The map indicated the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer. Green represents the least vulnerable region that is only vulnerable to conservative pollutants in the long term when continuously discharged or leached. Yellow presents the moderately vulnerable region which is vulnerable to some pollutants, but only when continuously discharged or leached. Red presents the most vulnerable region, which is vulnerable to many pollutants except those strongly absorbed or readily transformed in many pollution scenarios.



4 FIELD INVESTIGATION

The field activities involved the locating, surveying, sampling, water level measurement and accumulation of
general borehole information.

The following table (refer to Table 1 and Figure 14) contains the general borehole information collected during
the field investigation.

Table 1. Sampled site near Proposed solar farm

Site Name	Type	Sampled	Latitude X	Longitude Y
Breipaal I	Borehole sampled at Dam	Yes	20.36258	-29.20427
Breipaal II	Borehole	Yes	20.33964	-29.18306
Breipaal III	River	Yes	20.36193	29.19806

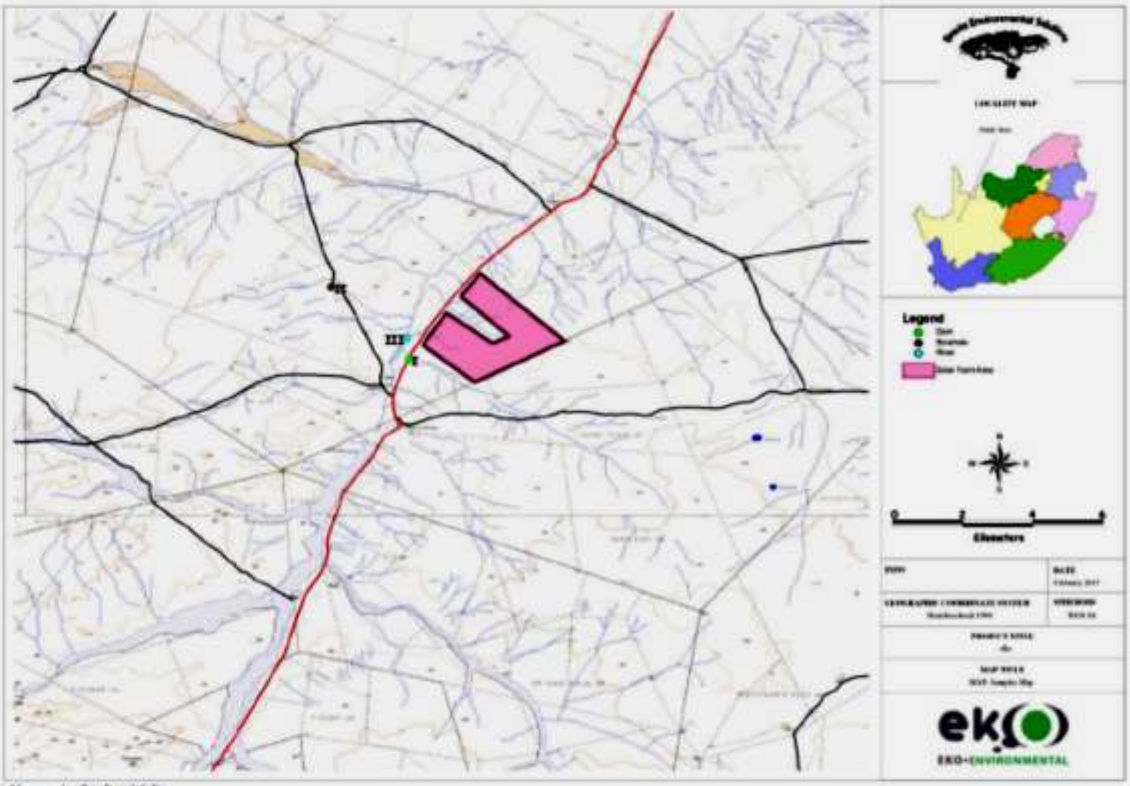


Figure 14. Location of sampled sites.

5 WATER QUALITY

Surface- and groundwater samples taken during the current monitoring phase were submitted to the IGS Laboratories for analyses of the different parameter concentrations. The results of the analyses are presented in this section by various graphical means and observations regarding the contamination status of the surface and groundwater are made.

5.1 Analysis Reliability

The most common way to evaluate the reliability of an analysis is an ion balance calculation. For any water analysis, the cations and anions should balance. Evaluation is done by calculation and the result is referred to as the ion balance error. A negative value indicates that anions predominate in the analysis and a positive value shows that the cations are more abundant. For the analysis to be considered reliable the ion balance error should not be greater than |5%|. A value outside this figure indicates that some major constituent or constituents were not analysed for or that there was an analytical error. Therefore, a full analysis is necessary. Exceptions to the above rule are found, especially in water with very low TDS. In this circumstance, an ion balance error may be due to the mathematical rounding-off of decimal values.

5.2 Data Tables and Water Quality Tables

5.2.1 Water Quality Tables

In this tables the water samples from each monitoring site are classified according to the "South Africa Water Quality Guidelines, Volume 1: Domestic Use, DWAF, First Edition 1993" and the "South Africa Water Quality Guidelines, Volume 1: Domestic Use, DWAF, Second Edition 1996", as well as according to the publication "Quality of Domestic Water Supplies, DWAF, Second Edition 1998" as well as "The South African National Standard (SANS 241:2006 Edition 6.1, SANS 241-1:2011 Edition 1 and SANS 241-1:2015 Edition 2)"according to the publication a description of the various classes is given in. A description of the various classes is given
in Table 2.

Table 2. Classification system used to evaluate water quality classes

1993,1996	South Africa Water Quality Guidelines, Volume 1: Domestic Use, DWA&F, First Edition 1993 & Second Edition 1996
NR	- **Target water quality range** - No risk.
IR	- **Good water quality** - Insignificant risk. Suitable for use, rare instances of negative effects.
LR	- **Marginal water quality** - Allowable low risk. Negative effects may occur in some sensitive groups
HR	- **Poor water quality** - Unsuitable for use without treatment. Chronic effects may occur.

2006	SABS South Africa National Standard: Drinking Water, SANS 241:2006 Edition 6.1
Class 1	- **Recommended operational limit** - Suitable for lifetime use.
Class 2	- **Maximum allowable limit** - Suitable for limited duration use only.
AMA	- **Above maximum allowable limit** - Unsuitable for human consumption.

2011	SABS South Africa National Standard: Drinking Water, SANS 241-2:2011 Edition 1
Class 1	- **Recommended standard limit** - Suitable for lifetime use.
ARS	- **Above recommended standard limit** - Unsuitable for lifetime human consumption.

2015	SABS South Africa National Standard: Drinking Water, SANS 241-1:2015 Edition 2
Class 1	- **Recommended standard limit** - Suitable for lifetime use.
ARS	- **Above recommended standard limit** - Unsuitable for lifetime human consumption.

Table 3. Water quality of sampled sites.

Site No.	Quality Class				pH	EC mS/m	TDS mg/L	Na mg/L	Ca mg/L	Mg mg/L	K mg/L	Cl mg/L	SO4 mg/L
Reference Standard:	1993,1996	2006	2011	2015	2015	2015	2015	2015	2006	2006	2006	2015	2015
Breipaal I	NR	AMA	Class 1	APS	6.7	896	6098	1710.0	441	44	26	2552.0	1195.0
Breipaal II	NR	AMA	Class 1	APS	6.7	830	5594	1588.0	407	40	23	2310.0	1080.0
Breipaal III	NR	AMA	Class 1	APS	7.2	4770	35942	10707.0	1313	367	213	18511.0	4522.0

* (Ae) - Aesthetic standards

F mg/L	NO_2N mg/L	NO_3N mg/L	PO_4 mg/L	Fe mg/L	Mn mg/L	As mg/L	Cu mg/L	Al mg/L	Zn mg/L
2015	2015	2015		2015	2015	2015	2015	2015	2015
1.81	0.20	7.92	<2	0.034	0.006	0.010	0.05	0.12	0.3
1.52	0.20	9.05	<2	0.028	0.002	0.010	0.04	0.12	0.3
1.01	1.00	5.00	<10	0.018	0.008	0.010	0.05	0.10	0.0

B mg/L	Ba mg/l	U mg/l	MALK mg/L	PALK mg/L	Calcium Hardness mg/L	Magnesium Hardness mg/L	Total Hardness as $CaCO_3$ mg/L	Bromide mg/L
2015	2015	2015						
2.09	0.010	0.010	86	0	1101	180	1281	11
1.93	0.010	0.010	97	0	1018	163	1181	11
10.84	0.054	0.010	276	0	3283	1505	4788	68

	6 CONCLUSION • The study area is located within the Lower Orange Management Area, Quaternary Drainage Area D53H. The non-perennial Sout river lays to the north-eastern boundary and run-off is in a north –eastern direction towards the Sout river. • **Groundwater occurs in zones of weathering and in fractures or in the contact zones between different lithology's**, such as granodiorite, granite, pegmatite and gneiss of the Keimoes Suite (Me), **Yield is generally less than 0.5 l/s**. **Groundwater can be exploited from joints and fractures in calcsilicates and sub ordinated quartzites of the Geelvloer Group (Mgv).** The calc silicates have known karstic aquifer properties and are not likely to facilitate groundwater occurrence. **• The aquifer(s) of the area under investigation is classified as a poor aquifer** according to the map of Aquifer Classification of South Africa, 2012. • The aquifer susceptibility index is classed as low vulnerability. • The aquifer vulnerability for the study area indicates the least tendency for contamination if pollutants are discharge or leeched over the long term. **• The water quality of sampled sites Breipaal I, Breipaal II and Breipaal III is classified as above the recommended standard and are not suitable for human consumption. These sites are classified above the recommended standard due to very high EC, TDS, Na, Ca,Cl, S04 and F concentrations.**

1.13 AIR QUALITY	The proposed PVSP project site will be situated in a broader rural area where the air quality is being affected by natural fires, dust storms, adjacent farming operations, vehicles travelling on the provincial gravel road, etc.
1.14 NOISE	Generators, vehicles, trucks, earth-moving equipment construction equipment, etc. will generate noise , especially during the construction phase. The operational phase the noise will be restricted to the immediate worker environment at the solar power plant and vehicles traveling the existing provincial road.

1.14 SITES OF ARCHAEOLOGICAL OF AND CULTURAL INTEREST

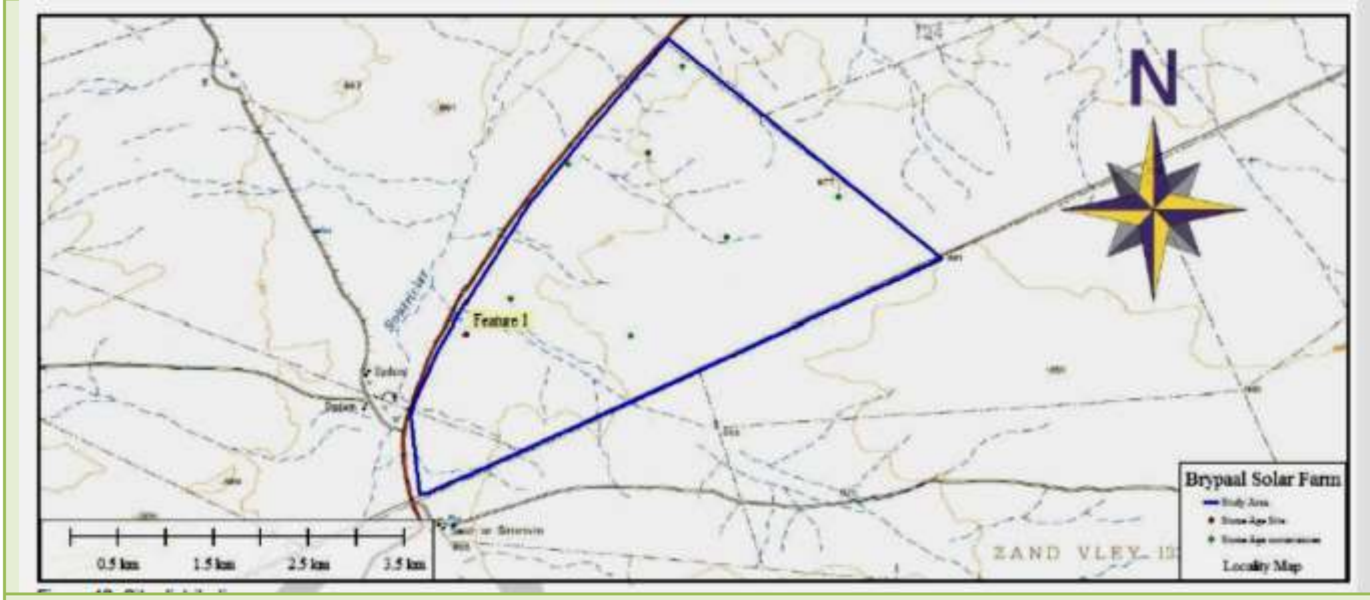
There are no known sites of graves on the proposed PVSP project site. The majority of surface area is already disturbed by agricultural activities.

SEE APPENDIX A : An HERITAGE IMPACT ASSESSMENT (DOC REF: 2017/BES/SR/09)

- **has been conducted on the proposed PVSP project site.**

8 Findings of the Survey

It is important to note that only the development footprint was surveyed. The farm measures approximately 720ha in size although approximately 645ha will be developed. The area is relatively flat with knee high grass in the east with the topography sloping slightly to the north and north east to the Soutrivier. Closer to the Soutrivier the area becomes rockier. In several areas the underlying calcrete strata protrudes through thin sandy surface layer .Some farming infrastructure occurs like fences and dirt roads. During the survey, several Middle Stone Age artefacts were found scattered over the area in varying densities. **In addition to these low density scatters a distinct archaeological site (Figure 12) of significance was identified at 29° 12' 21.6829" S, 20° 21' 49.8601" E. The site consists of several small stone packed circles with a high density of lithic scatters, ostrich eggshell (some are burned) and bone fragments.**



Description of Identified Heritage Resources (NHRA Section 34 -36):

9.1 Built Environment (Section 34 of the NHRA)
No standing structures older than 60 years occur in the study area.

9.2 Archaeological and palaeontological resources (Section 35 of the NHRA)
During the survey, several Middle Stone Age tools and artefacts were found scattered over the area in varying densities. Artefact density is no higher than 3 artefacts per m². No formal tools were observed and artefacts consist mostly of flakes with faceted platforms, several blades, a point and a possible scraper (Figure 13 - 16). The raw material for these artefacts are from Metaquartzite (sometimes glassy quartzite with a grey-green colour) and calcsilicates and quartzite schist (Piet van Deventer personal communication, May 23, 2017). According to Beaumont et al (1995) "thousands of square kilometres of Bushmanland are covered by a low density lithic scatter". These artefacts are scattered too sparsely to be of any significance apart from noting their presence, which has been done so in this report. These low-density scatters are of low significance.
Table 5: Co-ordinates of find spots

Table 5: Co-ordinates of find spots

Field Number	Longitude	Latitude	Elevation
704	20° 23' 55.4749" E	29° 11' 35.6496" S	868.398071
705	20° 23' 02.6340" E	29° 10' 51.5569" S	851.577698
706	20° 22' 50.9376" E	29° 11' 20.5909" S	854.482849
707	20° 22' 24.1824" E	29° 11' 24.7272" S	851.243958
708	20° 23' 17.6064" E	29° 11' 49.2467" S	861.090149
709	20° 22' 45.0227" E	29° 12' 21.9852" S	864.232361
710	20° 22' 04.6705" E	29° 12' 10.0981" S	855.756287
711	20° 21' 49.8601" E	29° 12' 21.6829" S	856.534607
712	20° 21' 50.0867" E	29° 12' 23.0471" S	857.343323
713	20° 21' 50.6881" E	29° 12' 23.1515" S	856.946472
714	20° 21' 51.1524" E	29° 12' 22.4173" S	857.186646
715	20° 21' 49.4497" E	29° 12' 21.3697" S	856.562439

In addition to these low scatters a distinct archaeological site (Feature 1) of significance was identified at 29° 12' 21.6829" S, 20° 21' 49.8601" E. The site consists of three stone circles measuring approximately 3 meters in diameter together with a scallop (half circle) (Figure 17). In the southern portion of the site is a small cluster with a concentration of ceramics, lithics (on milky quartz and calcsilicates), ostrich eggshell (some are burned) and bone fragments (Figure 18 – 21). Stone-built structures associated with the Holocene Later Stone Age are mostly identified as 'stone circles' distributed throughout the subcontinent (Sadr 2012). In the vicinity of the study area stone-built structures, described as ovals or circles in the literature, are known to occur at Jagt Pan 7, Droëgrond and Springbokoog. These features may representthe bases of huts, windbreaks or hunter's hides (Parsons 2004; Jacobson 2005; Lombard & Parsons 2008). These sites are linked to the historic /Xam communities of the area who followed a hunter-gatherer lifeway (Deacon 1986, 1988; Beaumont et al. 1995). However not all LSA stone walls are used for the control and movement of livestock. A previously recorded stone structure at the neighbouring farm Graafwater (Beaumont et al. 1995) is interpreted as being used for hunting (Beaumont et al. 1995; Sadr 2012). Therefore Feature 1 is of high significance and given a field rating of Generally Protected A.


Figure 13. Dorsal and ventral view of background scatter in the study area


Figure 14. Dorsal and ventral view of background scatter in the study area


Figure 15. Dorsal and ventral view of background scatter in the study area


Figure 16. Dorsal and ventral view of background scatter in the study area

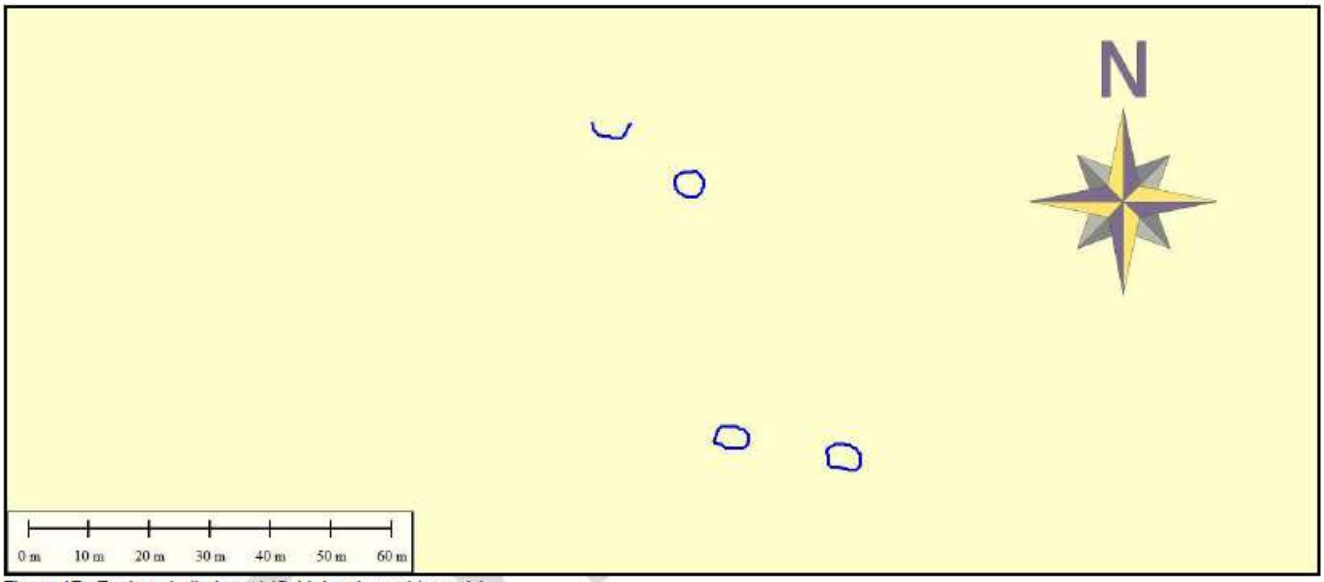


Figure 17. Feature 1 site layout (*field drawing not to scale*)


Figure 18. The site viewed from the south.


Figure 19. Stone circle


Figure 20. Ceramics and ostrich eggshell


Figure 21. Range of lithics

9.3 Burial Grounds and Graves (Section 36 of the NHRA)

In terms of Section 36 of the Act **no burial sites were recorded**. If any graves are located in future they should ideally be preserved in-situ or alternatively relocated according to existing legislation.

9.4 Cultural Landscapes, Intangible and Living Heritage.

The cultural landscape of the study area is related to agricultural activities especially livestock grazing. New elements related to electricity transmission, a quarry and a gravel road have however been added in recent years. The main elements of the cultural landscape are the wide-open spaces bisected by farm tracks and fences and occasional wind pumps as well as cement reservoirs and dams. The overall landscape character is very natural with rural elements due to the minimally developed landscape.

9.5 Palaeontological Resources (See also section 1.14.1 for reference to report compiled)

The paleontological component was addressed by Van Deventer (2017), he concluded that: "The main time frames for fossils in South Africa are the Carboniferous (Karoo), Cretaceous and Cainozoic (Tertiary and Quaternary periods) .
There are no Carboniferous or Cretaceous sediments present on the Brypaal site under discussion.

The Tertiary and Quarternary period sediments are typical calcretes and aeolian sands and to a lesser extent some fluvial sediments on the Brypaal site.
During deep excavations of >46 profile pits to a maximum depth of 3.5 m and surface geological mapping, no micro-organism, fauna or flora fossils were observed in neither the calcretes or the aeolian or fluvial sediment."

9.6 Battlefields and Concentration Camps

The discovery of diamonds and gold in the Northern provinces had very important consequences for South Africa. After the discovery of these resources, the British, who at the time had colonized the Cape and Natal, had intensions of expanding their territory into the northern Boer republics. This eventually led to the Anglo-Boer War, which took place between 1899 and 1902 in South Africa, and which was one of the most turbulent times in South Africa's history. Even before the outbreak of war in October 1899 British politicians, including Sir Alfred Milner and Mr. Chamberlain, had declared that should Britain's differences with the Z.A.R. result in violence, it would mean the end of republican independence. This decision was not immediately publicized, and as a consequence republican leaders based their assessment of British intentions on the more moderate public utterances of British leaders. Consequently, in March 1900, they asked Lord Salisbury to agree to peace on the basis of the status quo ante bellum. Salisbury's reply was a clear statement of British war aims. (Du Preez 1977).

In March 1900 Boer forces had taken Prieska, Kenhardt, Kakamas and Upington, attracting rebel support in the process. British columns were able to recapture the towns and the invasion had ended by June 1900. Local militias, including the Border Scouts (Upington), Bushmanland Borderers (Kenhardt) and Namaqualand Border Scouts (from the west) were established and patrolled the area.

Potential Impact:

The development footprint is sited approximately 500 meters away from <u>feature 1</u> resulting in no direct impact on the site (Figure 22). Furthermore, two find spots (Field number 707 & 708) is also located outside of the development footprint. Therefore, the impact on heritage sites by the proposed development is considered low. <u>Any direct impacts that may occur would be during the construction phase only and would be of very low significance.</u> Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. This and other projects in the area could have an indirect impact on the heritage landscape.

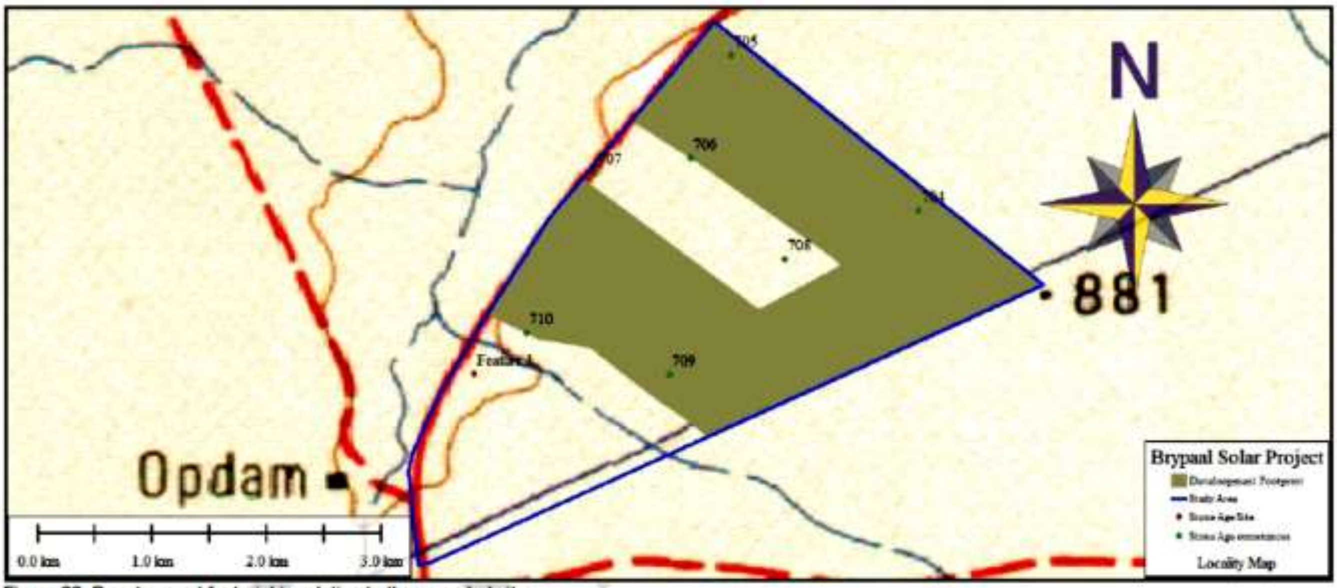


Figure 22. Development footprint in relation to the recorded sites.

1.14.1 PALAEONTOLOGICAL RESOURCES	**SEE APPENDIX A : Paleontological Report (DOC REF: 2017/BES/SR/10)** **- has been compiled for the proposed PVSP project site by Boscia Environmental Services.** **Results of assessments and discussions** **General:** **Major emphasis was placed on the geology because the most of the palaeontological sites in the Northern Cape are associated with specific geological formations and rock types** from the Cenozoic era (Kalahari Group) like calcrete, dorbank, gypcrete etc. Although there are a few sites associated with the Mokolian era (Bushmanland Group), it is mainly concentrated in weathered zones and or palaeo drainage systems. The last-mentioned type is from the Pleistocene Epoch which is still part of the Cenozoic Era. Occasional palaeontological findings in the Northern Cape are also associated with the following: • phoscrete (Langebaan) • terrestrial lakes (Alexander pan, Kimberley) (drainage depressions) • caves (Wonderwerk cave) • springs (Elandsfontein close to Langebaan) • coastal dunes (Hondeklipbaai) • palaeo drainage systems (Koa valley) Although the Karoo Supergroup **is not present on the study area**, there are a few fossils in the Dwyka Group south of the study area as well as glacial pavement at Douglas.
	6.2.1 Results of Geological Survey The study area falls within the geological province known as the Bushmanland Terrane which forms part of the Namaqua Sector within the Namaqua-Natal Metamorphic Province. The Namaqua-Natal Metamorphic Province is a large area of contiguous structural fabric which formed during a tectonic metamorphic event. The Bushmanland Terrane covers approximately 60 600 km2 and is known as the largest crustal block in the Namaqua Sector. It is comprised of granitic gneisses (~2000 Ma), supracrustal rocks of amphibolite to granulite grade (1600 – 1200 Ma) and granitoids (1200 – 1000 Ma). The Groothoek Thrust and Wortel Belt form the northern boundary of the Bushmanland Terrane, and the Hartbees River Thrust the eastern boundary (Cornell et al., 2006). The Bushmanland Terrane is divided into three age groups known as the Kheisian strata (1700 – 2050 Ma), the young, deformed supracrustal and plutonic rocks (1200, 1600 and ~1900) and the syn-tectonic and late-tectonic Namaquan intrusive rocks (Cornell et al., 2006; Moore et al., 1990; SACS, 1980; Thomas et al., 1994). Pegmatites of different ages intruded into these basement rocks. Surficial deposits such as calcrete, gypcrete, dorbank, alluvial as well as aeolian deposits and soils (all from the Cenozoic Era) dominate the surface. The origin of the soils of the area are from “mixed origin” as described by Brink (1985). The soils of mixed origin are a mixture in a variation of ratios between aeolian sand, alluvial deposits, residual soils (in situ weathered base rock) and also pedogenic material (mainly calcrete, gypcrete and dorbank). Calcrete outcrops are of limited depth (1.0 m) and no major excavations are present on the site. This particular area of interest lays south-west of the Kaapvaal Craton and west of the Hartbees River Thrust. The rock types which dominates the area are gneiss, meta-quartzite (with minor calc-silicates), pegmatites with calcrete and soils covered the major part of it. The calcrete and soils are intermixed with the outcrops but are more dominant in the south-eastern portion of the study area. Figure 10 illustrates the localities of identified geological outcrops. Based on the

information obtained during the geological survey a lithostratigraphic column was constructed for this area (Table 2).

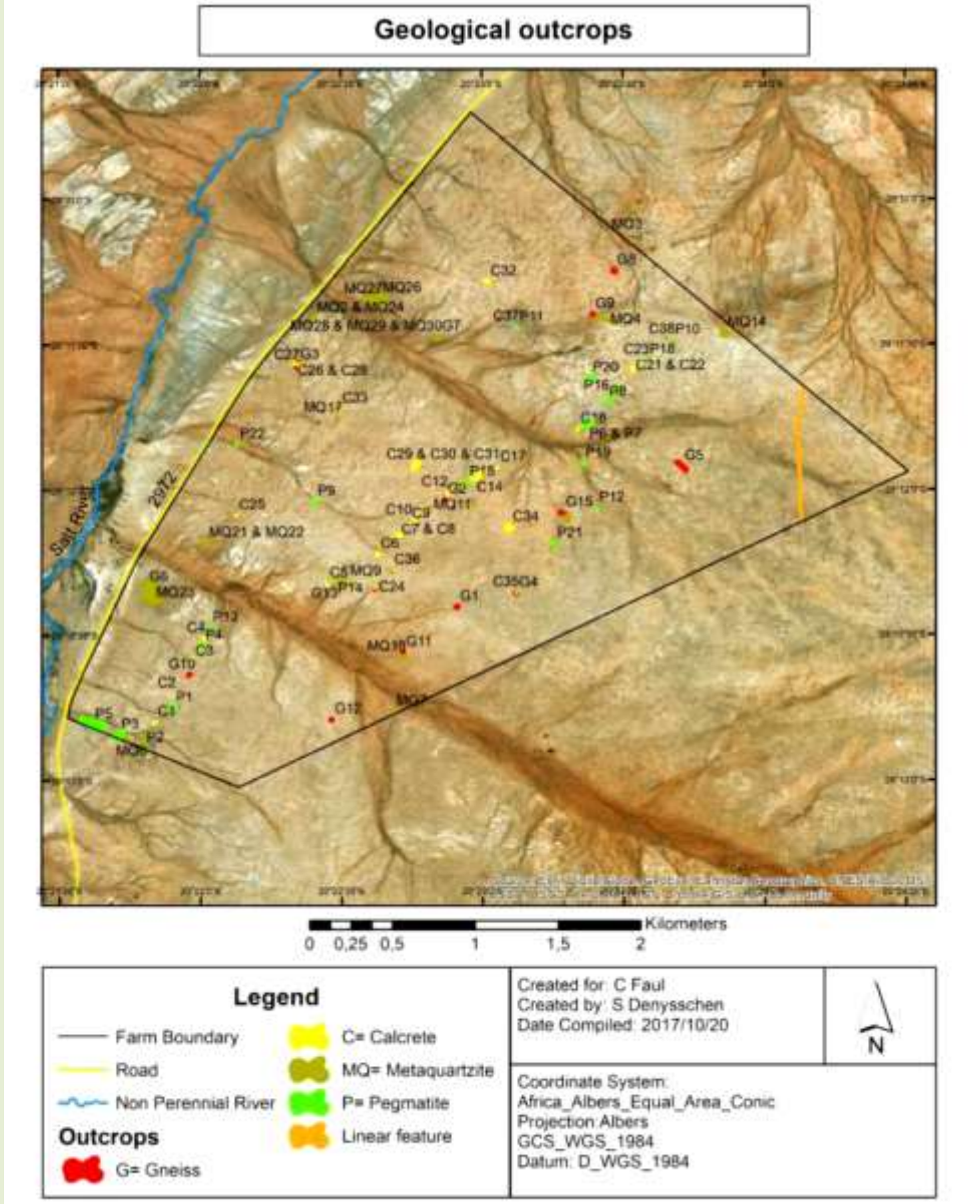


Figure 10: Map indicating the localities if identified geological outcrops (Google Earth, 2016).

Table 2: Lithostratigraphic column of the study area (Bailie *et al.*, 2007; Colliston *et al.*, 2008; Cornell *et al.*, 2009; Cornell *et al.*, 2006; Eglington, 2006; Haddon, 2005; McClung, 2006; Reid *et al.*, 1997; Von M Harmse & Holting, 2012; Watts, 1980).

Ma	Group	Subgroup	Formation	Intrusive Rocks	Lithological Description	Epoch	Period	Era	Eon	Ma
0 - 0.01	Kalahari Group				Kalahari calcrete, sandy material of mixed origin, lag deposit and gypsic deposits	Holocene	Quaternary	Cenozoic	Phanerozoic	0 – 0.01
0.01 – 1.6					Kalahari calcrete, sandy material of mixed origin, and lag deposit	Pleistocene				0.01 – 1.6
1.6 – 5.0					Kalahari calcrete (soft, hard bank, nodular, tabular)	Pliocene	Tertiary			1.6 – 5.0
~ 1130	Bushmanland Group	Kouboom Subgroup	Vaalkop Formation		Biotite-gneisses			Mokolian	Proterozoic	900 - 2050
			Driekop Formation		Metagreywacke comprised of grey quartzite					
			GeelVloer Formation		Biotite-schist hosting calc-silicate and carbonate rich rocks. Emplacement of pegmatites.					
			Broken Hill Quartzite Formation		Typical purplish-red to dark grey glassy quartzite and metaquartzite.					
~1640		Wortel Subgroup	Namies Schist Formation		Calc-silicate gneiss, biotite-rich schist, quartzite and metaquartzite.					
~ 1850				Hoogoor Suite	Pink gneiss					
1700-2050				Achab Gneiss	Migmatitic leucogneiss					

6.3 Palaeontological sites of interest

No fossils or any geological formation of any interest were found on the study area.

A desk top study of the sites of major concern in the Western Cape, Northern Cape and southern parts of Namibia reveal that very significant sites are present in the above-mentioned provinces and country. A summary of these findings is shown in Table 3 and the localities are shown in Figure 11.

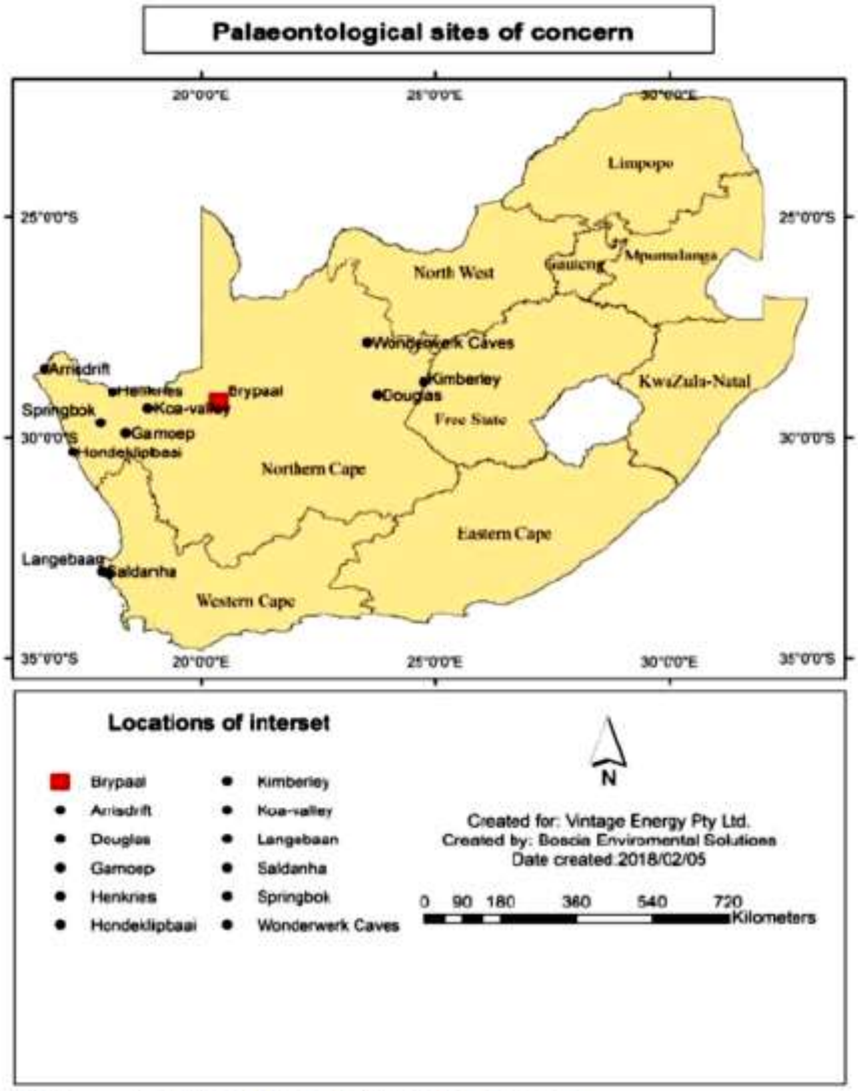


Figure 11: Localities of palaeontological sites of concern.

Table 3: Fossil record of sites in the Western Cape, Northern Cape and southern Namibia (refer to Figure 11) (Butzer, 1984; Deacon, 1984; Hendley, 1984; Klein, 1984a; Klein, 1984b; Rightmire, 1984; Scott, 1984; Volman, 1984).

Locality (from south to north to east in Figure 12)	Fossil type	Epoch/Era/ Age	Litho-type	Lithological formation/group/Supergroup
Saldanha	Homo sapiens	Cenozoic	Calcrete	Kalahari Group / Sandveld Group
Langebaan, Kraal Bay	Large assembly of plants, vertebrata, invertebrates	Pleistocene, Tertiary- Quartemary transition	Phoscrete, calcareous coastal dunes	Kalahari Group / Sandveld Group
Hondeklipbaai Kleinzee, Buffelsbank	vertebrate, fish, reptiles, mammals, plants	Tertiary – Quartemary transition	Coastal dunes and alluvial	Kalahari Group / Sandveld Group
Gamoep, Springbok	vertebrata	Tertiary – Quartemary transition	Palaeo drainage systems	Kalahari Group
Koa Valley	vertebrate and plants (mainly mammoth and giant buffalo)	Early to Middle Miocene	Palaeo drainage depressions	Kalahari Group
Henkries, Arrisdrift	Vertebrate, fish, reptiles,	Pleistocene and Tertiary – Quartemary transition	Palaeo drainage	Kalahari Group and pedocretes in Basin gneiss
South of Brypaal	Marine life, insects, invertebrate, glacial pavement	Jurassic	Glacial deposits / floor	Karoo Supergroup
Wonderwerk	Hominid and other mammals and vertebrate	Pleistocene	Cave deposit	Cave in dolomite
Douglas	insects, invertebrate, glacial pavement	Jurassic	Glacial deposits	Karoo Supergroup
Kimberley Alexanderpan	Insects, birds	Pleistocene	Drainage depression	Kalahari Group
Southern Namibia	Dinosaur remains	Cenozoic – Jurassic transition	Pedocretes	Pedocretes on northern edge of Bushmanland formation

- Many other small palaeontological sites are also present in the area, but are not shown in Table 3 and Figure 11.

	7 Conclusion Several walk-through routes were completed for geology, soils and vegetation surveys. On each route careful observations were made with respect to potential and probable palaeontological occurrence. **For the area under discussion no evidence was found of any palaeontological occurrences.**

1.15 **SENSITIVE LANDSCAPES**	None.
1.16 VISUAL ASPECTS	**SEE APPENDIX A : VISUAL IMPACT ASSESSMENT REPORT (DOC. REF: 2017/BES/SR/14)** **- has been conducted on the proposed PVSP project site by Boscia Environmental Services.**

Assessment of Visual Impacts

Potential Visual Exposure

Making use of the ASTGTM survey data, a terrain model was generated for the proposed project area as well as its surroundings. A viewshed was generated (Figure 12) foe the project site, making use of the height values as metres above point ground level as indicated in Table 3.

Table 1: Height values as metres above point ground level.

Infrastructure	**Metres above point ground l**
Photovoltaic manels and mountings	± 4 m
Substation	± 22 m

Four Viewpoints were selected in accordance with the identified Key Observation Points. Viewpoint 1 is situated at the home of Mr and Mrs Van Zyl. Viewpoint 2 is situated at the home of Mr and Mrs Stadler, while viewpoint 3 is situated at the home of Mr and Mrs Human. Those three Key Observation Points are the only viewpoints where permanently established receptors will be affected. Viewpoint 4 were selected based on its altitude on the accommodating road (No. 2972) and also the visibility of the proposed development from that road.

As indicated in Figure 12, from viewpoint 1 (home of Mr and Mrs Van Zyl) and viewpoint 3 (home of Mr and Mrs Human) none of the proposed development will be visible. From viewpoint 2 (home of Mr and Mrs Stadler) and viewpoint 4 (road), the south-western part of the development, which includes the access road, the laydown area during construction phase, the monitoring building as well as some PV panels and mountings, will be visible.

The viewshed generated from a landscape modification would be moderate. Modifications in the south-western section of the proposed development would be prominent within the low-lying scrub nature of the existing vegetation.

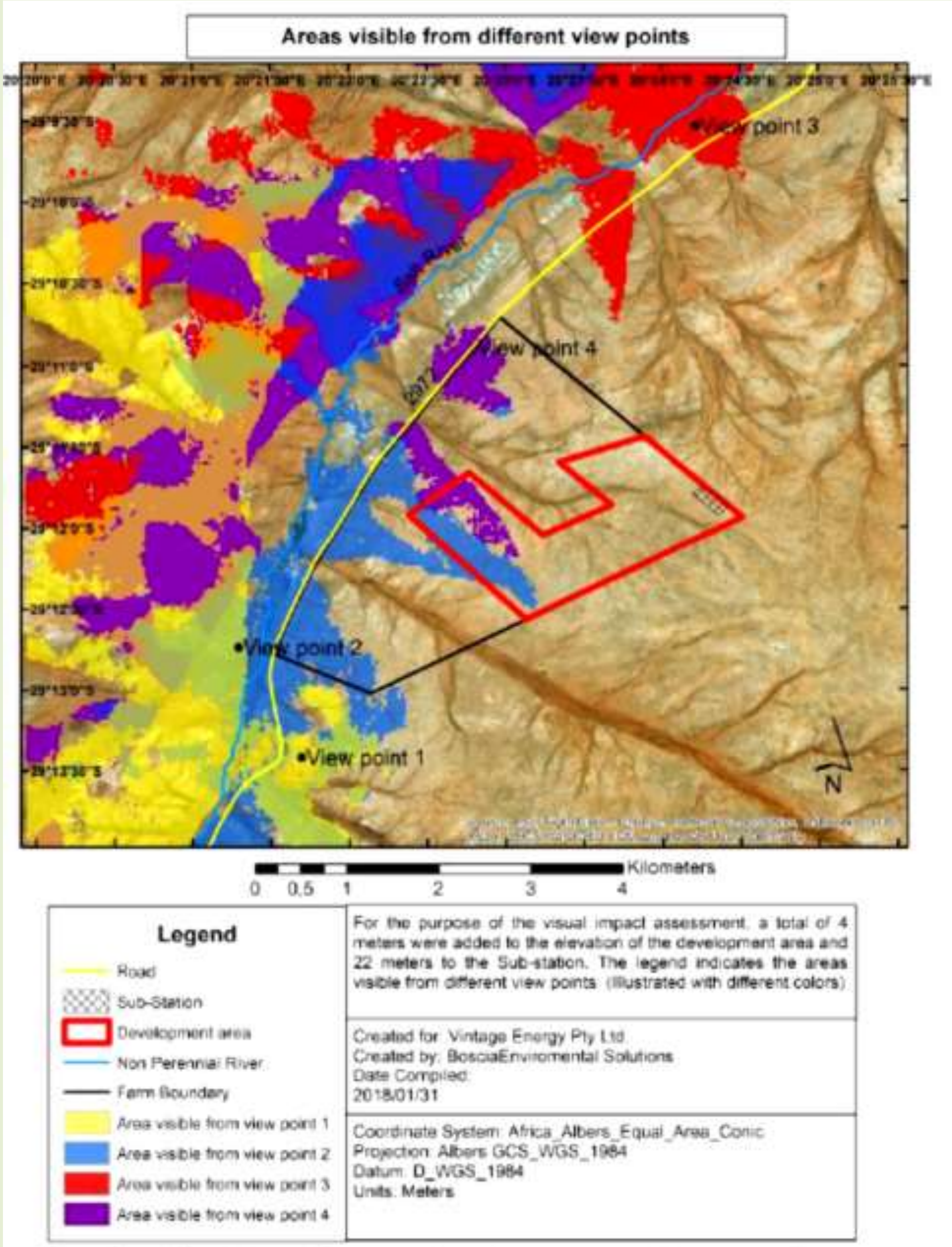


Figure 12: Viewshed map of the proposed development area as well as its surroundings.

Conclusion:

The construction and operation of the proposed PV Solar Facility and its associated infrastructure will have a visual impact on the natural scenic resources and rural of the immediate context, only within the limited view corridors within 0.5 km range of the proposed facility and from viewpoint 2. The moderating factors of the visual impact of the facility on the close range are the following:

- **The entire site cannot be viewed at once due to the topography.**
- **The orientation of the panels. North-facing PV viewed from the south from viewpoint 2.**

In light of the above-mentioned factors that reduce the impact of the facility, the visual impact is assessed as medium visual impact.

	The author is of the opinion that the facility has an advantage over the more conventional power generation plants (for instance coal-fired power stations) as it utilizes a renewable source of energy which is considered as an international and national priority to generate power and is therefore generally perceived in a more favourable light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers. **The project is deemed to be feasible from a visual impact assessment perspective and the following recommendations are made for the proposed PV Solar Power Facility:** • **The exterior of the invertor housing should be dark grey in order to reduce the visual impact of the structures.** • **Mast of less than 15 m high is situated adjacent to the pylons and specified as a lattice structure if possible.** • **The Betafence: Nylofor medium is the preferred option finished in a dark grey colour to a maximum height of 2030 mm.**

1.17 SOCIO –ECONOMICS	**SEE APPENDIX A : SOCIAL IMPACT ASSESSMENT (DOC REF: 2017/BES/** **- has been conducted on the proposed PVSP project site.**

	3.1 INTRODUCTION
	 Section 3 provides a baseline description of the study area with regard to:
	  The administrative context;
	  Provincial context;
	  Overview of district and local municipalities.
	
	 3.2 ADMINISTRATIVE CONTEXT
	 The proposed Brypaal CSP site is located within the Kai !Garib Local Municipality (KGLM), which forms part of the larger ZF Mgcawu District Municipality (ZFMDM)9(Figure 3.1). The main land uses in the area are linked to grape farming and agriculture along the Gariep River and livestock farming away from the river. The town of Keimoes serves as the administrative centre for the KGLM. A number of other solar energy projects proposed in the area.
	 Figure 3.1: Location of ZF Mgcawu District Municipality (left) and Kai !Garib Local Municipality (right) within the Northern Cape Province

	3.3 PROVINCIAL CONTEXT The proposed CSP facility is located in the Northern Cape Province, which is the largest province in South Africa and covers an area of 361,830 km2, and constitutes approximately 30% of South Africa. The province is divided into five district municipalities (DM), namely, Frances Baard, Karoo, Namakwa, ZF Mgcawu District Municipality (known before 1 July 2013 as Siyanda DM), and Kgalagadi DM, twenty-six Category B municipalities and five district management areas. The site itself is located in the Kai !Garib LM, which is one of eight local municipalities that fall within the greater ZF Mgcawu District Municipality (DC8). **Population** Despite having the largest surface area, the Northern Cape has the smallest population of 1 145 861 (Census 2011) or 2.28% of the population of South Africa. The population has increased from 991 919 in 2001. Of the five districts, Frances Baard has the largest population of 382 086. The other districts and their respective populations are, ZF Mgcawu District Municipality (236 783), John Taola Gaetsewe (224 799), Pixley ka Seme (186 351) and Namakwa (115 842). In terms of age, 30.1% are younger than 15 years of age and 64.2% fall within the economically active age group of 15-64 years of age (Census 2011). The female proportion makes up approximately 52.7% of the total with males making up the remaining 47.3% (Census 2011). **Education** Based on the information contained in the NCPSDF the average adult education attainment levels in the Northern Cape are lower than the adult education attainment levels of South Africa as a whole. Approximately 19.7% of the Northern Cape adults have no schooling in comparison to South Africa's 18.1%. The Northern Cape has the second lowest percentage of adult individuals (5.5%) that obtained a tertiary education in South Africa. The LED Strategy for the Northern Cape indicates that Pixley ka Seme has the lowest adult education attainment levels in the Northern Cape with 27.3% of the adult population having no form of schooling, whilst John Taolo Gaetsewe is second with 25.4% having no schooling. The highest number of the adult population with tertiary education (6.4%) is located in Frances Baard. The Northern Cape also has the smallest portion (11.1%) of highly skilled formal employees in South Africa and Gauteng has the highest (14.3%). Linked to this the Northern Cape has the second largest portion of semi and unskilled formal employees in the country. A lack of skilled people often results in both the public and the private sector being unable to implement planned growth strategies and achieve the desired productivity, service delivery and service quality (NCSDF, 2012).

	Economic development Over the past 8 years there has been little to no variance in the Human Development Index (HDI) figures for the Northern Cape, indicating no increase or decrease in the overall standard of living11. This trend is unlikely to change in the foreseeable future, mainly due to the marginal economic base of the poorer areas, and the consolidation of the economic base in the relatively better-off areas. It is important to note that the HDI for the Northern Cape (0.55) is substantially below the South African figure of 0.72. The HDI of 0.55 displays a pattern of semi-development, and there is a definite inequality between the different population groups, with the Whites having a higher development lifestyle than the African or Coloured groups. The percentage of Northern Cape people living below the poverty line has decreased from 40% in 1995 to 27% in 2011, while the poverty gap has decreased from 11% in 1995 to 8% in 2011 (Figure 3.2). The goal set by the province is to decrease the percentage of people living below the poverty line to 20% by 2015 NCSDF, 2012). The alleviation of poverty is one of the key challenges for economic development. Higher levels of economic growth are a key challenge for poverty eradication. Investment in people is pivotal to the eradication of poverty and inequality. Investment in people is also, to a large extent, about delivering social and economic infrastructure for education, welfare, health, housing, as well as transport and bulk infrastructure.

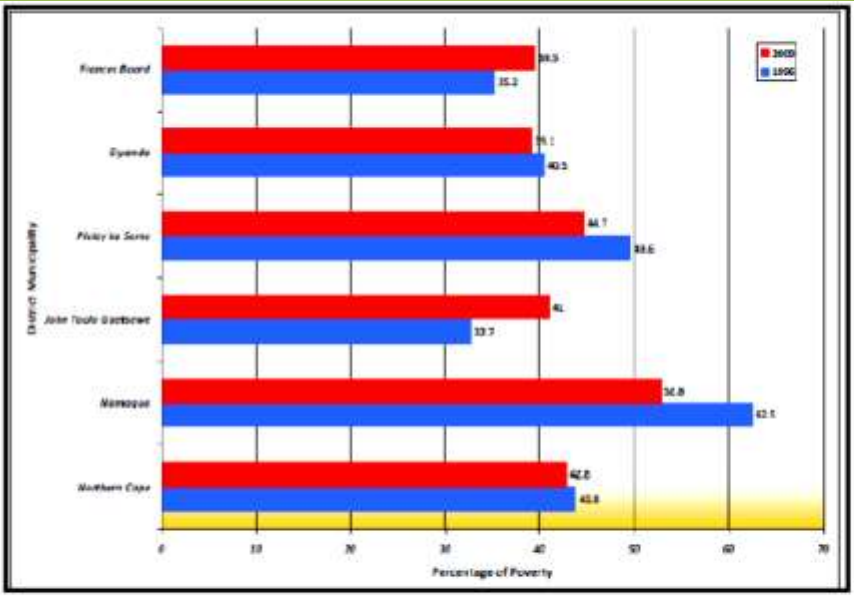


Figure 3.2: Percentage of people living in poverty in the Northern Cape (Source: Global Insight, 2009 as cited in the PGDS, July 2011)[12].

individuals live long, informed and comfortable lives. The HDI consists of three components: Longevity, which is measured by life expectancy at birth; Educational attainment, which is measured by two education variables, namely adult literacy and combined gross primary, secondary and tertiary enrolment ratio, and; Income, which is measured by gross domestic product (GDP) per capita. Performance in each dimension is expressed as a value between 0 and 1, and the HDI index gives an internationally accepted measure of the wellness (quality of life) of the population of the area under consideration. The closer the HDI is to 1.0, the higher the level of "living condition". For example, Sweden has an index of 0.91 defined as high, South Africa at 0.72 is defined as middle and Lesotho at 0.47 is defined as low.

12 Siyanda DM is now called the ZF Mgcawu DM.

In terms of per capita income, the Northern Cape Province has the third highest per capita income of all nine provinces, however, income distribution is extremely skewed, with a high percentage of the population living in extreme poverty. The measure used in the PGDS document to measure poverty is the percentage of people living below the poverty line or breadline is used13. The poverty line indicates a lack of economic resources to meet basic food needs. Figure 3.3 indicates the percentage of household income below the poverty breadline of R800 in the Northern Cape Province, the highest being Karoo at 48% and the lowest being Namakwa at 36%.

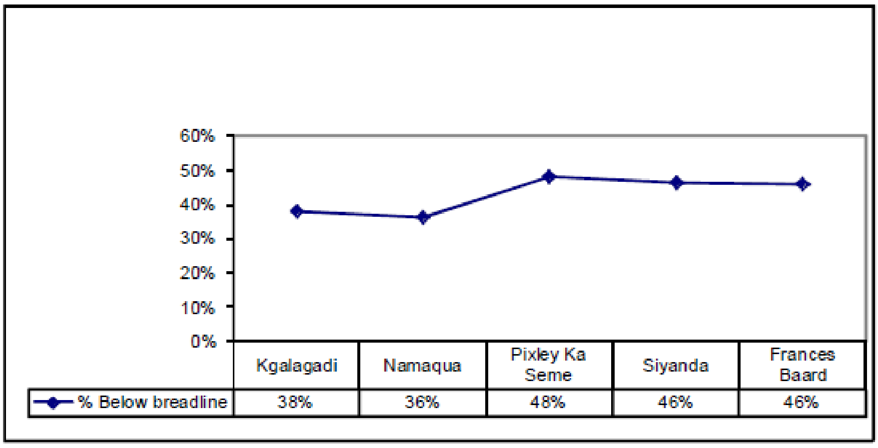


Figure 3.3: Percentage of household income below the poverty breadline by district (*Source: Northern Cape PGDS*)

Economic sectors

The Northern Cape economy has shown significant recovery since 2000/2001 when it had a negative economic growth rate of -1.5% (LED Strategy). The provincial economy reached a peak of 3.7% in 2003/2004 and remained the lowest of all provinces. The Northern Cape is the smallest contributing province to South Africa's economy (only 2% to South Africa GDP per region in 2007).

The mining sector is the largest contributor to the provincial GDP, contributing 28.9% to the GDP in 2002 and 27.6% in 2008. The mining sector is also important at a national level. In this regard the Northern Cape produces approximately 37% of South Africa's diamond output, 44% of its zinc, 70% of its silver, 84% of its iron-ore, 93% of its lead and 99% if its manganese.

Agriculture and agri-processing sector is also a key economic sector. Approximately 2% of the province is used for crop farming, mainly under irrigation in the Orange River Valley and Vaalharts Irrigation Scheme. Approximately 96% of the land is used for stock farming, including beef cattle and sheep or goats, as well as game farming. The agricultural sector contributed 5.8% to the Northern Cape GDP per region in 2007 which was approximately R1.3 billion, and it employs approximately 19.5% of the total formally employed individuals (NCSDF, 2012). The sector is experiencing significant growth in value-added activities, including game-farming. Food production and processing for the local and export market is also growing significantly.

The main agricultural produce of the Northern Cape include:

- High-value horticultural products such as table grapes, sultanas and wine grapes, dates, nuts, cotton, fodder, and cereal crops are grown along the Orange River.
- Wheat, fruit, groudnuts, maize and cotton in the Vaalharts irrigation scheme in the vicinity of Hartswater and Jan Kempdorp.
- Vegetables and cereal crops at the confluence of the Vaal River and the Orange Rivers in the vicinity of Douglas.
- Wool, mohair, karakul, Karoo lamb, ostrich meat and leather, and venison throughout most of the province.

Economic development in the Northern Cape is hampered by the vastness of the area and the remoteness of its communities in rural areas. Development is also hampered by the low education and skills levels in the province. As a result unemployment in the Northern Cape presents a major challenge.

Employment

According to Statistics South Africa Labour (2012) the community and social services sector is the largest employer in the province at 29%, followed by the agricultural sector (16%), wholesale and retail trade (14%), finance (8%) manufacturing (6%) and mining (6%), etc. (Figure 3.4).

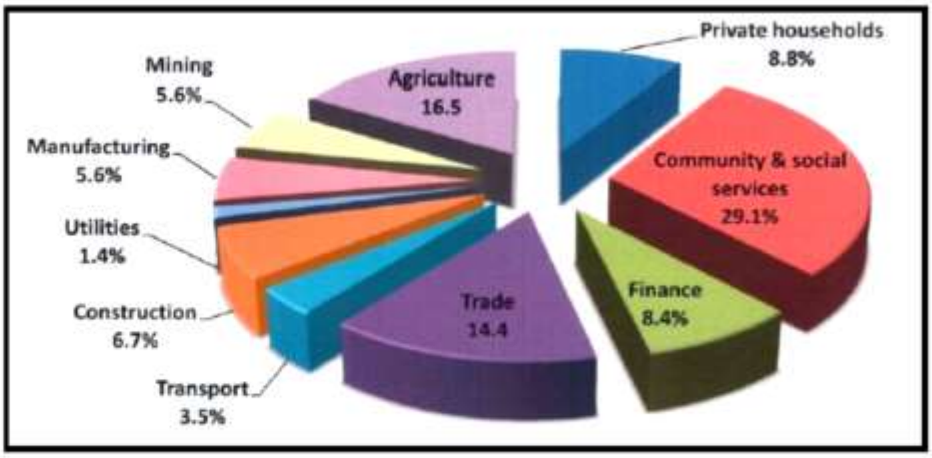


Figure 3.4: Employment by Economic Sector and Industry (Source: Statistics South Africa 2012).

3.4 ZF MGCAWU DISTRICT MUNICIPALITY

The ZF Mgcawu District Municipality (ZFMDM) consists of six Local Municipalities namely, Mier; Kai !Garib; //Khara Hais; Tsantsabane, !Kheis and Kgatelopele, and covers an area of more than 100 000 km2 (almost 30% of the Northern Cape Province). Of this total, 65% (65 000 km2) is made up of the Kalahari Desert, Kgalagadi Transfrontier Park and the former Bushman Land. The largest town in the region is Upington, which also functions as the district municipal capital. Following the municipal elections in 2011, Riemvasmaak (Sending and Vredesvallei) were included within the KGLM. The Riemvasmaak Community is located ~ 60 km west of Kakamas. Based on Census 2011 data the total population of the ZFMDM is in in the region of 236 763 people. The KHLM and KGLM are home to ~ 67 % of the ZFMDM population (Table 3.1).

Table 3.1: Population of Local Municipalities within the ZFMDM

Local Municipality	Population	Percentage
//Khara Hais	93 494	39.5%
Kai !Garib	65 869	27.8%
Tsantsabane	35 093	14.8%
!Kheis	16 637	7.0%
Kgatelopele	18 687	7.9%
Mier	7 003	2.9%

Source: Census 2011

The Coloured population group make up the dominant group in both the ZFMDM, followed by Black Afrikaans and Whites (12%). In terms of language, Afrikaans, followed by Setswana and IsiXhosa are the three main languages spoken in the area.

The ZFMDM accounts for ~ 30% of the Northern Cape economy. Agriculture plays a key role in the local economy and is strongly linked to irrigation along the Gariep River (Orange River). The Orange River is perennial with a flow which varies between 50 and 1800 cubic meter per second (cum/s) depending on the season. The flow of the river is largely controlled by the releases of the dams upstream, like the Bloemhof, Gariep and Van der Kloof dams. Agriculture in the ZFMDM is dominated by grape production for table grapes, which is mainly exported to Europe, as well as livestock and game farming.

The Orange River over area delivers a major part is that South Africa's table grape production. More than 90% of Africa's total dried vine fruit arm production is produced through 1250 sultana grape growers in the Northern Cape who produced more than 50,000 tons in 2010. The sultanas produced comprise more than 80% of that which is exported primarily to Europe and other eastern countries (ZFMDM IDP 2013-1014). SAD Vine Fruit Pty (Ltd) is located in Upington and owns the largest dried vine fruit processing and packaging plant in South Africa, employing more than 350 persons. It has intakes at Groblershoop, Mylpaal, Louisvaleweg, Keimoes, Kakamas and Vredendal. The Orange River Wine Cellars Co-op, also based in Upington, is the second largest winemaking cooperative in the world and has wine cellars are at Groblershoop, Grootdrink, Upington, Keimoes and Kakamas. This co-op has more than 740 members who produce wine grapes and 445 farmers who produce grape juice (ZFMDM IDP 2013-1014).

Livestock farming occurs mainly on large farms where farming is extensive. The majority of the farms are privately owned. The central parts of the region consist mainly of semi-desert areas and are therefore, with a few exceptions, mainly suitable for extensive livestock farming. In terms of employment, the most important economic sectors are Agriculture, followed by Community, Social and Personal, and Private Households.

Tourism represents one of the most important economic sectors in the Northern Cape as well as within the ZFMDM. In this regard the ZFMDM IDP indicates that tourism is the fastest growing component of the economy. Key tourism assets include the world famous Kgalagadi Transfrontier Park, Augrabies National Park and Pitskop Nature Reserve near Upington.

Minerals and mining also plays an important role in the local economy of the ZFMDM. Key mining activities include copper and zinc of Areachap north of Upington. Various small concentrations of calcite, lead, fluorspar, barite, wolfram and amethyst. Salt is also being mined at two pans, namely Groot Witpan, 95 km northwest of Upington and at Witpan, 115km northwest of Upington. In terms of social well-being the ZFMDM's greatest social problems are illiteracy and poverty and low education levels.

3.5 KAI! GARIB MUNICIPALITY

3.5.1 Introduction

The proposed facility is located in the KGLM, a category-B municipality14. The municipality is approximately 7 445 km² in size (~7.2% of the ZFMDM) and is bordered to the north, south and west by a District Management Area (NCDMA08) and in the east by the //Khara Hais and !Kheis Local Municipalities. In terms of land use, the Kai! Garib Local Municipality is largely rural and agricultural with three urban/semi-urban nodes at Kakamas, the designated administrative centre of the municipality, Keimoes and Kenhardt.

The Orange River (Gariep River) plays a key role in the day to day life of most the inhabitants in the KGLM and is critical to the areas economic well-being. The main towns of Kakamas and Keimoes are situated in the midst of an intensive irrigation farming community stretching from Groblershoop in the east up to Blouputs in the west. Farming includes crops such as vineyards, pecan nut- and citrus plantations. Local areas within the KGLM where intensive irrigation is undertaken include Blouputs, Eksteenskuil, Riemvasmaak and Cannon Island.

The KGLM also has two unique trust communities that in many ways functions differently than other communities. The first is Riemvasmaak which is located ~ 60 km west from Kakamas and falls with Ward 1 of the municipality. The Riemvasmaak community consists of ~ 250 households and were forcefully removed from their land in 1973 and returned in 1994. The Riemvasmaak Community Trust is divided in two sections namely Vredesvallei and Mission.

The second Trust community is the Blocuso Trust Community, which consists of 3 farms, namely, Bloemsmond, Curriescamp and Soverby. These farms are located in Ward 8, ~ 10 km north east of Keimoes. The farms were handed over to the three families by Queen Victoria in 1886. However, the properties were forcefully resold to white farmers in 1914 and the previous owners became farm workers. The Independent church of Gordonia under the leadership of Ds Saul Damon bought back the farmers between 1914 and 1934. In 2000 the government assisted the 466 families on the three farms to buy the farms from the church. The communities established the Blocuso Trust and used the government subsidies to buy the farms and provide basic services like electricity and clean water. Since the Blocuso Trust was established the government have provided the trust with great assistance in terms of infrastructure projects.

The Municipal Area is divided into 9 wards (Table 3.2). The proposed SEF is located in Ward 9, Kenhardt and Southern Farms.

Table 3.2: List of Wards in the KGLM

Ward	Areas
1	Augrabies, Noudonsies, Zeekoeisteek, Blouput Riemvasmaak
2	Cillie, Marchand, Perde-eiland, Omdraai
3	Kakamas Dorp, Alheit, Bloukamp, Truterkamp
4	Kromhout Boerdery, Kakamas Oos (Langverwag), Neus
5	Lennertsville, Koms, Keimoes Dorp, Akasia Park
6	Gardenia, Whalsig, Noodkamp, Vaaldriehoek
7	Lutzburg, Friersdale, Warmsand, Eenduin, , Swartbooisberg, Bloemsmond,
8	Eksteenskuil Eilande, Soverby, McTaggerscamp, Curriescamp, Blaauwsekop, Kanoneiland
9	Kenhardt, Southern Farms

(Demarcation Board 2012)

3.5.2 Demographics

Population

As indicated in Table 3.3, the population of the KGLM increased from 58 671 to 65 869 over the period 2001-2011, which represents an increase of ~ 12%. The increase in the population in the KGLM was linked to an increase in the 15-64 age group. There were decreases in the less than 15 and 65+ age groups. In terms of breakdown, the majority of the population are Coloured (62.2%), followed by Black African (28.3%) and Whites (6.3%). The dominant language was Afrikaans (71.1%), followed by Setswana (23.9%), and English (1.2%). The total population in Ward 9 in 2011, where the CSP site is located, was 6 679.

As expected, the number of households in the KGLM increased from 14 032 to 16 703. The average household size decreased marginally from 3.0 to 2.9 (Table 3.3). The number of formal dwellings also decreased from 90% to 88.4%. This implies that a number of the increased households in the KGLM are informal dwellings, which is a concern in terms of service delivery. The increase in the number of informal dwellings is likely to be linked to an influx of people into the urban areas from the rural areas. Brypaal CSP Social Impact Assessment May 2017 48

The dependency ratio in the KGLM decreased from 48.6 to 41.9. The improvement indicates that there are fewer people who are dependent the economically active 15-64 age group. This represents a positive socio-economic improvement. The dependency ratio in the KGLM is also significantly lower than the ratio for the ZFMDM, which was 50.5 in 2011. The age dependency ratio is the ratio of dependents, people younger than 15 or older than 64, to the working, age population, those ages 15-64. The age dependency ratio (% of working-age population) in South Africa in 2010 was 53.29. Over the past 50 years, the value for this indicator has fluctuated between 84.43 in 1966 and 53.29 in 2010.

Household income

Based on the data from the 2011 Census, 6.1% of the population of the KGLM have no formal income, 2.3% earn between 1 and R 4 800, 4.5% earn between R 4 801 and R 9 600 per annum, 25.7% between R 9 601 and 19 600 per annum and 26.7% between R 19 600 and R 38 200 per annum (Census 2011).

The poverty gap indicator produced by the World Bank Development Research Group measures poverty using information from household per capita income/consumption. This indicator illustrates the average shortfall of the total population from the poverty line. This measurement is used to reflect the intensity of poverty, which is based on living on less than R3 200 per month for an average sized household. Based on this measure 65.3% of the households in the KGLM live close to or below the poverty line. The low-income levels reflect the limited formal employment opportunities in the KGLM and the dependence on the agricultural sector. The low income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low income levels also result in reduced spending in the local economy and less tax and rates revenue for the district and local municipality.

Employment

In terms of employment, the official unemployment rate in the KGLM decreased for the ten year period between 2001 and 2011, falling from 16.1 to 10% of the economically active population. Youth unemployment in the KGLM also dropped over the same period, from 17.7 to 10% (Table 3.3). While unemployment figures appear to be low, specifically within the context of the figures for the Northern Cape Province as a whole (27.4% unemployment and 34.5% youth unemployment in 2011), they do not reflect the fact that the majority of the employment in the KGLM is seasonal and linked to the agricultural sector.

Education

Education levels in the KGLM improved between 2001 and 2011 with the percentage of the population over 20 years of age with no schooling dropping from 14.7% to 9.0%. The percentage of the population over the age of 20 with matric also increased from 11.2 to 15.5%. Despite this increase the percentage of the population in the KGLM over the age of 20 with matric is still lower than the ZFMDM (21.7%) and the Northern Cape (22.7%). Overall education levels in the KGLM are therefor still low.

Table 3.3: Overview of key demographic indicators for the ZFMDM and KGLM

ASPECT	ZFMDM 2001	ZFMDM 2011	KGLM 2001	KGLM 2011
Population	202160	236763	58671	65869
% Population <15 years	30.8	28.4	27.4	24.4
% Population 15-64	64.1	66.4	63.7	70.5
% Population 65+	5.1	5.1	5.4	5.1
Households	48100	61097	14032	16703
Household size (average)	3.7	3.5	3.0	2.9
Formal Dwellings %	83.9	79.4	90.0	88.4
Dependency ratio per 100 (15-64)	56.0	50.5	48.6	41.9
Unemployment rate (official) - % of economically active population	26.5	19.2	16.1	10.0
Youth unemployment rate (official) - % of economically active population 15-34	32.1	22.7	17.7	10.0
No schooling - % of population 20+	16.8	9.5	14.7	9.0
Higher Education - % of population 20+	4.8	6.3	3.7	3.9
Matric - % of population 20+	16.1	21.7	11.2	15.5

Source: Compiled from StatsSA Census 2011 Municipal Fact Sheet

Table 3.4: Population per Ward in the KGLM

Ward	Areas	Population
1	Augrabies, Noudonsies, Zeekoeisteek, Blouput Riemvasmaak	11 408
2	Cillie, Marchand, Perde-eiland, Omdraai	8 191
3	Kakamas Dorp, Alheit, Bloukamp, Truterkamp	9 317
4	Kromhout Boerdery, Kakamas Oos (Langverwag), Neus	6 375
5	Lennertsville, Koms, Keimoes Dorp, Akasia Park	5 499
6	Gardenia, Whalsig, Noodkamp, Vaaldriehoek	7 684
7	Lutzburg, Friersdale, Warmsand, Eenduin, , Swartbooisberg, Bloemsmond,	4 856
8	Eksteenskuil Eilande, Soverby, McTaggerscamp, Curriescamp, Blaauwsekop, Kanoneiland	5 660
9	Kenhardt, Southern Farms	6 679

(Stats SA: Census 2011)

3.5.3 Municipal services

As indicated in Table 3.5, with the exception of a decrease in the percentage of households in the KGLM with piped water inside the dwelling, the access municipal services as measured in terms of flush toilets', refuse removal and electricity, has improved in the KGLM. The decrease in number of households with piped water inside the dwelling is likely to be linked to the increase in the number of informal dwellings in the KGLM between 2001 and 2011. Despite the improvement in municipal service the levels in the KGLM remain lower than the levels for the ZFMDM and the Northern Cape Province (with the exception of households that use electricity).

Table 3.5: Overview of access to basic services in the ZFMDM and KGLM

ASPECT	ZFMDM 2001	ZFMDM 2011	KGLM 2001	KGLM 2011
% households with access to flush toilet	58.1	63.9	50.2	59.6
% households with weekly municipal refuse removal	58.6	70.3	38.3	53.8
% households with piped water inside dwelling	37.2	48.5	36.7	41.0
% households which uses electricity for lighting	73.5	86.6	75.6	87.4

Source: Compiled from StatsSA Census 2011 Municipal Fact Sheet

The KGLM IDP also lists challenges facing education, health and policing.

Education and schools

- Travelling distances between communities and schools, especially relating to Secondary and High schools;
- The quality of transport for school children as many of the busses are not roadworthy;
- Availability of good quality sport and recreational facilities at some of the smaller schools;
- Lack of sufficient teachers and classrooms for the number of pupils/ for subject like maths and science;
- De-motivated teachers.

Health

- HIV/AIDS increase & TB increase;
- High rate of teenage pregnancies;
- Lack of sufficient and qualified staff and limited skills amongst current nurses and nursing sisters to make correct diagnosis and prescribe correct medicine accordingly;
- Lack of sufficient facilities to render a proper health service to all communities in the KGLM;
- Irregular and insufficient service rendered by mobile clinics;
- Lack of necessary health equipment and medication at clinics.

Safety and crime challenges

- Lack of sufficient police vehicles;
- Lack of accommodation for police officials;
- Increase in crime, i.e. family abuse and robberies, related to alcohol and drug abuse
- Need for houses of safety for victims of violence against woman and children, and domestic violence.

3.5.4 Economic overview

The Orange River (Gariep River) plays a key economic role in the KGLM, with most of the economic activities linked to and located adjacent to the river. In addition, the majority of towns and settlements are located within close proximity to and or adjacent to the river. The economy of the area is heavily depended on the Agricultural Sector, both intensive and extensive. However the major roads (N14, R27 and R359) assist in the growth the municipal area experience.

The renewable energy sector is also recognized as a key sector. The IDP notes that new opportunities have opened up for KGLM area since the need to facilitate the generation of sustainable energy was introduced in South Africa by Eskom and the South African government. The IDP notes that there are a number of solar projects proposed in the area and that the economic benefits from these projects are eagerly anticipated. In this regard the IDP lists 15 projects in the KGLM (Table 3.6).

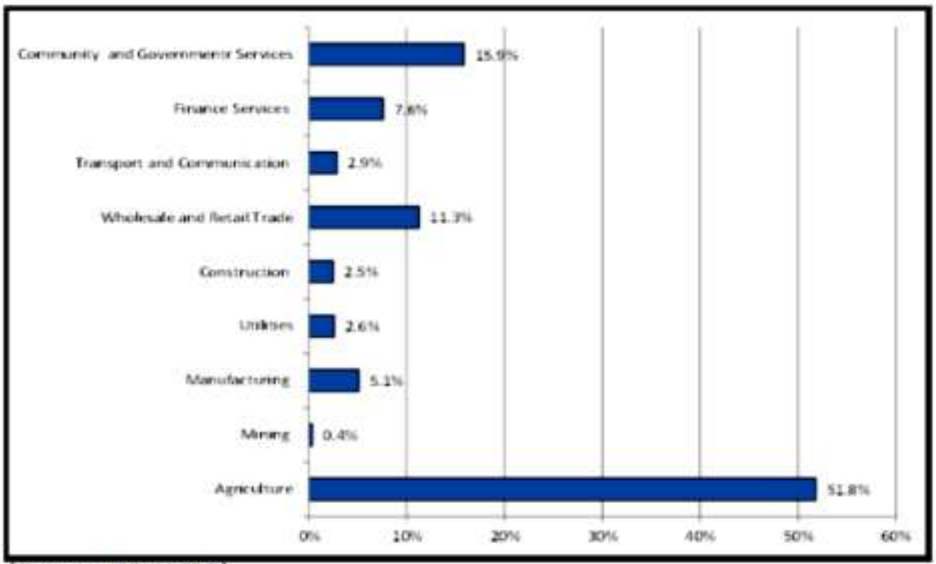
Table 3.6: List of renewable energy projects in the KGLM (KGLM IDP 2016/17)

	Developer
1	Abengoa
2	Sub Solar
3	Biotherm Renewable Energy
4	S28 Energy
5	S28 Energy
6	S28 Energy
7	Solek Renewable Energy Engineers
8	Solek Renewable Energy Engineers
9	Aurora Power Solutions
10	Southern Cross Game Reserve
11	Orlight SA
12	Southern Cross Game reserve
13	Aurora Power Solutions
14	Inca Kakamas Solar
15	AEP Bloemsmond Solar PV1 & 2 Facilities

In terms of contribution to local GDP the most important economic sector is Agriculture (51.8%), followed by Community and Government Services (15.9%) and Wholesale and Retail Trade (11.3%). The key economic sectors are listed in Figure 3.5.

The Agriculture sector is also a major employer in the Municipality, providing 66.5% of all formal employment. It is also the sector with the largest potential for economic growth. The majority of the agricultural activity is linked to the Orange River, and includes table and wine grapes. Citrus fruit is also becoming more prevalent in the area. There are three wine cellars located in the area in Keimoes, Kakamas and Kanoneiland. Emerging farmers in the area tend to focus more on small stock farming, lucern, cotton, corn, and nuts which are cultivated under irrigation from the Orange River. The IDP identifies a number of constraints facing the agricultural sector, these include, poor quality access roads to and from farms, low farming skills amongst the youth and finances for emerging farmers. The opportunities in the agricultural sector include the expansion of the production of lucern and citrus fruits as well as the possible establishment of ostrich farming. Other sectors that show potential within the sector are agri-tourism.

The tourism sector also plays an important role in the local economy and has been identified a key sector in terms of future growth. The key tourism attractions in the area include the Augrabies Falls, Kokerboom Route, Tierberg Nature Reserve, heritage sites and ancient rock art in Kenhardt, historical routes between islands/ Island Route, water tunnels in Kakamas, Rooibergdam in Kenhardt and Riemvasmaak historical and cultural values. The N14 is also an important route providing access to the Cape in the South and the Kalahari National Park in the north. The tourism accommodation facilities in the area are also of high standard and available in all major towns.



(Source: KGLM IDP)

Figure 3.5: Key economic sectors in the KGLM

3.6 KHARA HAIS LOCAL MUNICIPALITY

While the town of Upington falls outside of the KGLM, it functions as a key economic center for the area and is the administrative center of the KHLM and the ZFMDM. The key demographic indicators for the KHLM are therefore also provided, as is an overview of the local economic profile.

3.6.1 Demographics

Population

As indicated in Table 3.7, the population of the KHLM increased from 77919 to 93 494 over the period 2001-2011, which represents an increase of almost 20%. The increase in the population in the KHLM was linked to an increase in the 15-64 and 65 + age groups. There was a decrease in the less than 15 age group. In terms of breakdown, the majority of the population are Coloured (65%), followed by Black African (23%) and Whites (10%).

As expected, the number of households in the KHLM increased from 17 934 to 23 245. The average household size decreased from 4.1 to 3.9. The number of formal dwellings also decreased from 81.2% to 75.2%. This implies that a number of the increased households in the KHLM are informal dwellings, which is a concern in terms of service delivery. The increase in the number of informal dwellings is likely to be linked to an influx of people into the urban areas from the rural areas.

The dependency ratio in the KHLM decreased from 58.7 to 54.7. The improvement indicates that there are fewer people who are dependent the economically active 15-64 age group. This represents a positive socio-economic improvement. However, the dependency ratio in the KHLM is lower than the ratio for the ZFMDM, which was 50.5 in 2011. The age dependency ratio is the ratio of dependents, people younger than 15 or older than 64, to the working, age population, those ages 15-64. The age dependency ratio (% of working-age population) in South Africa in 2010 was 53.29. Over the past 50 years, the value for this indicator has fluctuated between 84.43 in 1966 and 53.29 in 2010.

Household income

Based on the data from the 2011 Census, 10.5% of the population of the KHLM have no formal income, 2.6% earn between 1 and R 4 800, 4.3% earn between R 4 801 and R 9 600 per annum, 16.3% between R 9 601 and 19 600 per annum and 21.2% between R 19 600 and R 38 200 per annum (Census 2011).

The poverty gap indicator produced by the World Bank Development Research Group measures poverty using information from household per capita income/consumption. This indicator illustrates the average shortfall of the total population from the poverty line. This measurement is used to reflect the intensity of poverty, which is based on living on less than R3 200 per month for an average sized household. Based on this measure 55% of the households in the KHLM live close to or below the poverty line. The low-income levels reflect the limited formal employment opportunities in the KHLM and the dependence on the agricultural sector. The low income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low income levels also result in reduced spending in the local economy and less tax and rates revenue for the district and local municipality.

Employment

In terms of employment, the official unemployment rate in the KHLM decreased for the ten year period between 2001 and 2011, falling from 34.0 to 22.1% of the economically active population. Youth unemployment in the KHLM also dropped over the same period, from 42.3 to 29%. While unemployment figures appear to be low, specifically within the context of the figures for the Northern Cape Province as a whole (27.4% unemployment and 34.5% youth unemployment in 2011), they do not reflect the fact that the majority of the employment in the KHLM is seasonal and linked to the agricultural sector.

Education

Education levels in the KHLM improved between 2001 and 2011 with the percentage of the population over 20 years of age with no schooling dropping from 13.6% to 7.1%. The percentage of the population over the age of 20 with matric also increased from 20.9 to 26.0%. This is higher than the average for the ZFMDM (21.7%) and the Northern Cape (22.7%). This is linked to the important economic role played by the town of Upington and the associated well developed education facilities in the town.

Table 3.7: Overview of key demographic indicators for the ZFMDM and KHLM

ASPECT	ZFMDM		KHLM	
	2001	2011	2001	2011
Population	202160	236763	77919	93494
% Population <15 years	30.8	28.4	31.7	29.8
% Population 15-64	64.1	66.4	63.0	64.6
% Population 65+	5.1	5.1	5.3	5.4
Households	48100	61097	17934	23245
Household size (average)	3.7	3.5	4.1	3.9
Formal Dwellings %	83.9	79.4	81.2	75.2
Dependency ratio per 100 (15-64)	56.0	50.5	58.7	54.7
Unemployment rate (official) - % of economically active population	26.5	19.2	34.0	22.1
Youth unemployment rate (official) - % of economically active population 15-34	32.1	22.7	42.3	29.0
No schooling - % of population 20+	16.8	9.5	13.6	7.1
Higher Education - % of population 20+	4.8	6.3	5.9	7.8
Matric - % of population 20+	16.1	21.7	20.9	26.0

Source: Compiled from StatsSA Census 2011 Municipal Fact Sheet

3.6.2 Municipal services

As indicated in Table 3.8, there has been a decrease in the percentage of households with access to flush toilets and households with access to weekly municipal refuse removal. For the other two categories (piped water inside dwelling and households that use electricity) there was an improvement in the access municipal services. The decrease in number of households with flush toilets and households with access to weekly municipal refuse is likely to be linked to the increase in the number of informal dwellings in the KHLM between 2001 and 2011. The level of services in the KHLM is higher than the levels for the ZFMDM and the Northern Cape Province.

Table 3.8: Overview of access to basic services in the ZFMDM and KHLM

Municipal Services	ZFMDM		KHLM	
	2001	2011	2001	2011
% households with access to flush toilet	58.1	63.9	68.6	68.3
% households with weekly municipal refuse removal	58.6	70.3	79.3	87.2
% households with piped water inside dwelling	37.2	48.5	38.7	56.0
% households which uses electricity for lighting	73.5	86.6	73.6	91.1

Source: Compiled from StatsSA Census 2011 Municipal Fact Sheet

3.6.3 Economic profile

Upington is the main town of the //Khara Hais Municipality and has, since its inception, been the hub of activities in the region. In terms of its economic role the town serves as:

- Agricultural hub of the Northern Cape.
- Portal to Namibia and vice versa.
- Frontier to the Kalahari and Kgalagadi Transfrontier Park.
- Portal to the Kalahari's hunting grounds.

In terms of economic indicators, the Municipality enjoys comparative advantages in all of the economic sectors, except mining, compared to the other local municipalities that make up the ZFMDM. The fastest growing sectors in the Municipality are agriculture, electricity and water, and mining sectors. The IDP notes that the current growth occurring in these sectors should be exploited to ensure the creation of new job opportunities for local people.

The IDP makes reference to the SDF and refers to a number of anchor projects approved by Council. The Upington Solar Park proposed by Eskom is located adjacent to the site and is therefore of specific relevance to the proposed STPs. The IDP notes that the establishment of a solar park will place pressure on the municipality in terms of providing the necessary infrastructure.

Agricultural sector

The agricultural sector is largely linked to irrigation along the Orange River (Gariep), specifically table and wine grapes. In this regard the //Khara Hais region accounts for ~ 40% of South Africa's grape exports. Most of Upington's wines are produced by Orange River Wine Cellars (OWC). The company has six depots in the area (all of them located adjacent to the Orange River) at Upington, Kanoneiland, Grootdrink, Kakamas, Keimoes and Groblershoop. The wines from OWC are exported, inter alia, to Europe and the USA. A number of privately owned cellars also exist in the area.

In terms of the agricultural sector there are 7 smaller rural settlements and various farms. Settlements include: Lambrechtsdrift, Karos, Leerkrans, Leseding, Raaswater, Sesbrugge and Klippunt, and Kalksloot. The inhabitants of these settlements are mainly reliant upon agricultural activities for their livelihoods.

Tourism sector

Upington is well situated as a base for exploration of the region, and has an outstanding infrastructure in the form of accommodation. Various areas are classified as nature conservation areas. Spitskop Nature Reserve lies 13 km north of Upington. This nature reserve, of approximately 6 000 hectares, supports gemsbok, zebra, springbok, ostrich, eland, blue wildebeest, as well as smaller game, and can be viewed from a circular route running through the park. Other nature areas within the jurisdiction of //Khara Hais are Gariep Lodge and Uizip. The Kalahari Oranje Museum Complex has the status of a regional- and provincial museum. There are also a number of declared national monuments, including:

- Roman Catholic Church in Le Roux Street (still in use);
- NG Mother Community in Schroder Street (still in use);
- Hortentia water mill;
- Missionary complex in Schroder Street (building is being used as a museum).

Business sector

The central business district of Upington is located along the northern bank of the Orange River (then Gariep River). Due to certain physical limitations, such as the Orange River to the south and south-east and the railway line to the north, the business district has expanded westwards. Smaller suburban shopping centres are found in all residential areas. Both industrial areas on the northern and the south-western sides of the town (Updustria & Laboria) have railway facilities. Due to the unique spatial manifestation of the municipality, both the first and second economy is mostly located around the CBD and farms. Upington has a well-defined business centre with numerous residential areas. Secondary activities in the study area are mainly light industrial, warehousing, and light engineering works. Main traffic routes connect Upington, the hub of activities in the region, to cities like Kimberley, Johannesburg, Cape Town and Namibia. Upington also serves as the 'Portal' to Namibia and vice versa, the 'Frontier' to the Kalahari and the Kgalagadi Transfrontier Park, the 'Oasis' in the desert', the Agricultural hub of the Northern Cape, and the 'Portal to the Kalahari's hunting ground. Furthermore, two major national parks are situated within a few hours' drive from Upington.

Although there are a large variety of industries, there is a shortage of manufacturing industries. In this regard the KHLM's economy is centred on the trade and retail sector, due to its strong tourism sector, leaving the local economy fairly vulnerable for any significant changes in this industry. The IDP therefore highlights the need for the KHLM to diversify its economy into other sectors. The development of the renewable energy sector will create opportunities to diversify the local economy. The IDP also indicates that the manufacturing sector is one of the lowest performing sectors of the local economy. As a result much in the municipality has to be sourced from outside of the municipal boundaries, resulting in money flowing out of the local economy. Despite the current poor performance of the manufacturing sector there are a number of potential opportunities linked to the agro-processing and other activities.

The IDP identifies a number of potential development constraints and challenges facing the KHLM. Of relevance to the proposed STPs these include a shortage of job opportunities in the area. As a result job seekers are forced to seek employment opportunities outside of the Municipality (e.g. Kimberley), etc. Despite this the employment rate for the Municipality is relatively high, with as much as 75% of people of working age who are actively seeking employment being able to secure a job. However, the majority of the employed population is found in elementary occupations, which require little or no skills. This is also reflected in the low education levels of the local population, with as much as 12% of the population aged 20 years and older having no form of education whatsoever. This, to some extent, constrains the development potential of the Municipality in the development of more advanced industries. The level of employment and type of occupations taken up by the population of the Municipality also directly affects their income levels. The low income levels also impact on buying power and the creation of business opportunities (KHLM IDP 20130-2014 Review).

In terms of opportunities, Upington Airport has been identified as an alternative or supplement for the O.R Tambo International Airport for cargo traffic, as there is less congestion and quicker airport turnaround times, shorter-to-market timeframes which

	would enhance product freshness by one day, and improved supply-chain performance, therefore offering greater benefits for cargo airlines and both importers and exporters of goods. The long runway and the strategically advantageous location of the Upington Airport make it ideal to serve the African continent. Due to this, the establishment of an Industrial Development Zone (IDZ) at the airport was proposed to (KHLM IDP 2013-2014 Review). However, the establishment of an IDZ (Industrial Development Zone) has been replaced by the proposed establishment of a SEZ's (Special Economic Zone). New IDZ's are only established at ports and bigger manufacturing hubs. The proposed Upington IDZ (± 400 ha) will be a purpose-built industrial estate linked to the Upington Airport. The IDZ will leverage fixed direct investments in value added and export-oriented manufacturing industries.

(v) the **impacts and risks** identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts-

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources; and

(cc) can be avoided, managed or mitigated;

Potential environmental impacts associated with solar projects:

The potential environmental impacts associated with solar power (land use and habitat loss, water use, and the use of hazardous materials in manufacturing) vary greatly depending on the technology to be used. In broad terms the range of potential impacts could include:

- **Land use:** Depending on their location, larger utility-scale solar facilities can raise concerns about land degradation and habitat loss. Total land area requirements estimates for utility-scale PV systems range from 1.5 to 4 ha per megawatt, while estimates for CSP facilities are between 0.65 and 2.7 ha per megawatt[3] ;
- **Water use**: Solar PV cells do not use water for generating electricity. However, as in all manufacturing processes, some water is used to manufacture solar PV components. CSP in common with all thermal electric plants, require water for cooling. Water use depends on the plant design, plant location, and the type of cooling system;
- **Hazardous materials:** The PV cell manufacturing process includes a number of hazardous materials, most of which are used to clean and purify the semiconductor surface. These chemicals (similar to those used in the general semiconductor industry) include hydrochloric acid, sulphuric acid, nitric acid, hydrogen fluoride, 1,1,1- trichloroethane, and acetone. The amount and type of chemicals used depends on the type of cell, the amount of cleaning that is needed, and the size of silicon wafer;
- Other impacts in terms of noise, visual issues, electromagnetics and aircraft interference.

The below **Table A** will give a list of the main activities that will be performed under each aspect.

Table A : Impact identification matrix for PVSP Solar project operations

	PHASE	Environmental Components	ABIOTIC									BIOTIC			VISUAL	SOCIO-ECONOMIC		
		Impacts	Geology	Topography	Soil	Land capability	Land use potential	Surface water	Ground water	Air quality	Noise	Vegetation	Wildlife	Sensitive landscapes	Visual impact	Archaeological & cultural sites	Socio-economic impacts	Affected parties
		Activity, Product or Service																
	Construction phase	**GN R325: Description of project activity that triggers listed activity:**																
1		**Activity 1:** The construction of a **PHOTOVOLTAIC SOLAR POWER (PVSP) facility (with associated infrastructure)** for the generation of electricity from a renewable resource (solar radiation) where the electricity output is 100MW in total.	X	X	X	X	X	X	X	X	X	X	X		X		X	X
		Activty 9: The construction of substation (transformers) and power lines (400 kV) up to the Eskom connection (main substation outside the project site, property).			X						X	X	X		X		X	X
2		**Activity 15**: The clearance of an footprint area of up to probable 500ha of a total of 1032 hectares of indigenous vegetation during site preparation for the establishment of the indicated activities under Activity (1) –			X	X	X	X		X	X	X	X		X		X	X
		GN R327: Description of project activity that triggers listed activity:																

	PHASE	Environmental Components	ABIOTIC									BIOTIC			VISUAL	SOCIO-ECONOMIC		
		Impacts	Geology	Topography	Soil	Land capability	Land use potential	Surface water	Ground water	Air quality	Noise	Vegetation	Wildlife	Sensitive landscapes	Visual impact	Archaeological & cultural	Socio-economic impacts	Affected parties
		Activity, Product or Service																
4		**Activty12 :** Possible the construction of the following: (i) canals exceeding ………… square metres in size; (ii) channels exceeding ……….. square metres in size; (iii) bridges exceeding ……………square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, ……….. square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, ……… square metres in size; (vi) bulk storm water outlet(s) structures exceeding …………square metres in size; (x) buildings exceeding ……………square metres in size; (xii) infrastructure or structures with a physical footprint of ……………… square metres or more; a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	X	X	X	X	X	X		X	X	X	X		X		X	X
5		**Activty 13:** The PVSP project utilizes kl/ annum water from a desalination plant, as process water during steam generation (turbine house) and also drinking water, dust suppression, cleaning, etc. Reservoir (tanks) would be constructed with a capacity of …………… kl . Water will be recycled via lined collection dam facilities. Surface run-off that ends-up in the dirty environment would be captured via a collection of trenches/canals and channeled to a evaporation pond (capacity …………..kl) .	X	X	X	X	X	X	X	X	X	X	X		X		X	X

	PHASE	Environmental Components	ABIOTIC									BIOTIC			VISUAL	SOCIO-ECONOMIC		
		Impacts	Geology	Topography	Soil	Land capability	Land use potential	Surface water	Ground water	Air quality	Noise	Vegetation	Wildlife	Sensitive landscapes	Visual impact	Archaeological & cultural sites	Socio-economic impacts	Affected parties
		Activity, Product or Service																
6		**Activty 14:**																
		The construction of temporary diesel tank storage facilities (bunded) as part of the contractor lay down site. (Capacity…………L) **Environmental Components** (See activities identified under Listing Notice 2).	X (ABIOTIC)	X	X	X	X	X	X	X	X	X (BIOTIC)	X		X (VISUAL)	(SOCIO-ECONOMIC)	X	X
		Impacts	Geology	Topography	Soil	Land capability	Land use potential	Surface water	Ground water	Air quality	Noise	Vegetation	Wildlife	Sensitive landscapes	Visual impact	Archaeological & cultural sites	Socio-economic impacts	Affected parties
		Activity, Product or Service																
7		**Activity 19:** 1) During initial site preparation operation the site will be surveyed and levelled for particular project (infrastructure) components (listed activities). This will involve vegetation clearance, topsoil/overburden removal & stockpiling at dedicated stockpile areas. 2) Dedicated quarries will be mechanically excavated for obtaining construction infill/backfill material (weathered overburden material). Prior to removal of material the topsoil need to be stockpiled in a dedicated stockpile next to the quarry. The material will be loaded onto trucks and transport to construction site where required for infilling, backfilling, terraces, benches, etc. 3) Surface run-off control trenches/canals/evaporation dam sites//culverts/energy dissipating structures, etc. need to be excavated/constructed.	X	X	X	X	X	X	X	X	X	X	X		X		X	

	PHASE	Environmental Components	ABIOTIC									BIOTIC			VISUAL	SOCIO-ECONOMIC		
		Impacts	Geology	Topography	Soil	Land capability	Land use potential	Surface water	Ground water	Air quality	Noise	Vegetation	Wildlife	Sensitive landscapes	Visual impact	Archaeological & cultural sites	Socio-economic impacts	Affected parties
		Activity, Product or Service																
		Activty 28 = See activity 1 & 15 of GN 325																
		GN R324: Description of project activity that triggers listed activity:																
8		**Activty 1:** During the construction phase information/ identification of the project/ safety information billboards/ safety warning signs will be provided on site.													X			
9		**Activity 4:** An **access road** will be constructed on site to give access to the contactors initially and eventually where required a permanent road on site for easy access during the operational phase of the PVSP project. An access road is also needed as along the border fence for security reasons and also act as a fire-break.	X	X	X	X	X	X		X	X	X	X		X		X	

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

A. Assessment and evaluation of potential impacts.

A.1. **List of each potential impact** identified in paragraphs 3 and 6 above. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)

A

A.2. Concomitant **impact rating** for each potential impact listed in paragraph 7.1 above in terms of its <u>nature, extent, duration, probability and significance.</u>(Provide a definition of the criteria used for each of the variables used for rating potential impacts and ensure that the potential impacts are rated specifically with the assumption that no mitigation measures are applied).

A.2

A.3. Indication of the **phases** (construction, operational, decommissioning) and estimated time frames in relation to the potential impacts rated.

A.3

Impact assessment involves the consideration of physical, biological, socio-economic and cultural information to estimate the likely characteristics and parameters of the impact. The aim of impact assessment is to provide a basis for determining the likely significance of each impact with sufficient accuracy to develop appropriate mitigation measures.

4

10

INTRODUCTION:
This chapter describes and evaluates the effects of the PV Solar Project and the associated activities on the natural and social environments.

The different environmental components, on which the project (can) have an impact, are:

1. Geology
2. Topography
3. Soil
4. Land Capability
5. Land Use
6. Vegetation

7. Wildlife
8. Surface Water
9. Ground Water
10. Air Quality
11. Noise
12. Archaeological and Cultural sites
13. Sensitive Landscapes
14. Visual Aspects
15. Socio-economic Structure
16. Interested and Affected Parties

IMPACT ASSESSMENT

		Activity, Product or Service
	Construction phase	**GN R325: Description of project activity that triggers listed activity:**
1		**Activity 1:** The construction of a **PHOTOVOLTAIC SOLAR POWER (PVSP) facility (with associated infrastructure**) for the generation of electricity from a renewable resource (solar radiation) where the electricity output is 100MW in total.
		Activty 9: The construction of substation (transformers) and power lines (400 kV) up to the Eskom connection (main substation outside the project site,property).
2		**Activity 15**: The clearance of an footprint area of up to probable 500ha of a total of 1032 hectares of indigenous vegetation during site preparation for the establishment of the indicated activities under Activity (1) –
		GN R327: Description of project activity that triggers listed activity:

Before the impact assessment could be done the different project activities/infrastructure components were identified:

PROJECT ACTIVITIES/INFRASTRUCTURE COMPONENTS:

5		**Activty 13:** The PVSP project utilizes kl/ annum water from a desalination plant, as process water during steam generation (turbine house) and also drinking water, dust suppression, cleaning, etc. Reservoir (tanks) would be constructed with a capacity of …………… kl . Water will be recycled via lined collection dam facilities. Surface run-off that ends-up in the dirty environment would be captured via a collection of trenches/canals and channeled to a evaporation pond (capacity …………..kl) .

6		**Activty 14:** The construction of temporary diesel tank storage facilities (bunded) as part of the contractor lay down site. (Capacity…………L)

4		**Activty12 :** Possible the construction of the following: (i) canals exceeding ………… square metres in size; (ii) channels exceeding ……….. square metres in size; (iii) bridges exceeding ……………square metres in size; **(iv) dams, where the dam, including infrastructure and water surface area, ……….. square metres in size;** (v) weirs, where the weir, including infrastructure and water surface area, ……… square metres in size; (vi) bulk storm water outlet(s) structures exceeding …………square metres in size; (x) buildings exceeding ……………square metres in size; (xii) infrastructure or structures with a physical footprint of ………………. square metres or more; a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;

7		**Activity 19:** 1) During initial site preparation operation the site will be surveyed and levelled for particular project (infrastructure) components (listed activities). This will involve vegetation clearance, topsoil/overburden removal & stockpiling at dedicated stockpile areas. 2) Dedicated quarries will be mechanically excavated for obtaining construction infill/backfill material (weathered overburden material). Prior to removal of material the topsoil need to be stockpiled in a dedicated stockpile next to the quarry. The material will be loaded onto trucks and transport to construction site where required for infilling, backfilling, terraces, benches, etc. 3) Surface run-off control trenches/canals/evaporation dam sites//culverts/energy dissipating structures, etc. need to be excavated/constructed.

		Activty 28 = See activity 1 & 15 of GN 325
		GN R324: Description of project activity that triggers listed activity:
8		Activty 1: During the construction phase information/ identification of the project/ safety information **billboards/ safety warning signs** will be provided on site.
9		**Activity 4:** An **access road** will be constructed on site to give access to the contactors initially and eventually where required a permanent road on site for easy access during the operational phase of the PVSP project. An access road is also needed as along the border fence for security reasons and also act as a fire-break.

- **Assessment of the impacts created by the PVSP PROJECT activities**

Before any assessment can be made the following evaluation criteria need to be described:

*Explanation of **probability** of impact occurrence*

Probability of impact occurrence	Explanation of probability
Very low	<20% sure of particular fact or likelihood of impact occurring.
Low	20 to 39% sure of particular fact or likelihood of impact occurring.
Moderate	40 to 59% sure of particular fact or likelihood of impact occurring.
High	60 to 79% sure of particular fact or likelihood of impact occurring.
Very high	80 to 99% sure of particular fact or likelihood of impact occurring.
Definite	100% sure of particular fact or likelihood of impact occurring.

*Explanation of **extend** of impact*

Extend of impact	Explanation of extend
Site specific	Direct and indirect impacts limited to site of impact only.
Local	Direct and indirect impacts affecting environmental elements within the Kakamas area.
Regional	Direct and indirect impacts affecting environmental elements within Northern Cape Province.
National	Direct and indirect impacts affecting environmental elements on a national level.
Global	Direct and indirect impacts affecting environmental elements on a global level.

*Explanation of **duration** of impact*

Duration of impact	Explanation of duration
Very short	Less than 1 year
Short	1 to 5 years
Medium	6 to 12 years
Long	13 to 50 years
Very long	Longer than 50 years
Permanent	Permanent

*Explanation of impact **significance***

Impact significance	Explanation of significance
No impact	There would be no impact at all - not even a very low impact on the system or any of its parts.
Very low	Impact would be negligible. In the case of negative impacts, almost no mitigation and/or remedial activity would be needed, and any minor steps, which might be needed, would be easy, cheap and simple. In the case of positive impacts, alternative means would almost all likely to be better, in one or a number of ways, than this means of achieving the benefit.
Low	Impact would be of a low order and with little real effect. In the case of negative impacts, mitigation and/or remedial activity would be either easily achieved or little would be required, or both. In case of positive impacts, alternative means for achieving this benefit would likely be easier, cheaper, more effective, less time-consuming, or some combination of these.
Moderate significance	Impact would be real but not substantial within the bounds of those which could occur. In the case of negative impacts, mitigation and/or remedial activity would be both feasible and fairly easily possible. In the case of positive impacts, other means of achieving these benefits would be about equal in time, cost and effort.

High significance	Impacts of a substantial order. In the case of negative impacts, mitigation and/or remedial activity would be feasible but difficult, expensive, time-consuming or some combination of these. In the case of positive impacts, other means of achieving this benefit would be feasible, but these would be more difficult, expensive, time-consuming or some combination of these.
Very high significance	Of the highest order possible within the bounds of impacts which could occur. In the case of negative impacts, there would be no possible mitigation and/or remedial activity to offset the impact at the spatial or time scale for which it was predicted. In the case of positive impacts, there is no real alternative to achieving the benefit.

ASSESSMENT OF THE NATURE, EXTENT, DURATION, PROBABILITY AND SIGNIFICANCE OF THE POTENTIAL ENVIRONMENTAL, SOCIAL AND CULTURAL IMPACTS OF THE PROPOSED SOLAR OPERATION, INCLUDING THE CUMULATIVE ENVIRONMENTAL IMPACTS.

Assessment and evaluation of potential impacts KEY

1. Environmental Component	**IMPACTS (Nature of the impact)**				**CUMULATIVE IMPACTS**
Actions, activities or processes, including any NEMA EIA Regulation listed activities					
See list of activities and associated environmental components that are being impacted on, as being spelled out in Table 1 (Impact identification matrix for the proposed Brypaal PVSP project).	**A.1**				
Extent	Site				
Duration	Permanent	**A.2**			
Probability	Definite				
Significance	High				
Phase responsible for the impact	Const	Operation	Decommissioning	Closure	
			A.3		

(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;

SEE TABLE ON NEXT PAGE:

Table B.1 : Positive and Negative impacts that the proposed activity and alternatives will have on the environment:

	PHASE	Environmental Components	ABIOTIC									BIOTIC			VISUAL	SOCIO-ECONOMIC		
		Impacts	Geology	Topography	Soil	Land capability	Land use potential	Surface water	Ground water	Air quality	Noise	Vegetation	Wildlife	Sensitive landscapes	Visual impact	Archaeological & cultural sites	Socio-economic impacts	Affected parties
		Activity, Product or Service																
	Construction phase	**GN R325: Description of project activity that triggers listed activity:**																
1		**Activity 1:** The construction of a **PHOTOVOLTAIC SOLAR POWER (PVSP) facility (with associated infrastructure**) for the generation of electricity from a renewable resource (solar radiation) where the electricity output is 100MW in total.	H-	H-	H-	H-	H-	M-	H-	L	L-	H-	H-		L-		H+	H+
		Activty 9: The construction of substation (transformers) and power lines (400 kV) up to the Eskom connection (main substation outside the project site,property).			H-						L-	H-	L-		L-		H+	L-
2		**Activity 15**: The clearance of an footprint area of probable 500 ha of an available surface area of 1032 hectares of indigenous vegetation during site preparation for the establishment of the indicated activities under Activity (1) The actual project footprint will depend on the surface areas required for the different components of the project.			H-	H-	H-	H-		L-	L-	H-	H-		L-		H-	H-
		GN R327: Description of project activity that triggers listed activity:																

4		**Activty12 :** Possible the construction of the following: (i) canals exceeding ………… square metres in size; (ii) channels exceeding ……….. square metres in size; (iii) bridges exceeding …………..square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, ……….. square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, ……… square metres in size; (vi) bulk storm water outlet(s) structures exceeding …………square metres in size; (x) buildings exceeding ……………square metres in size; (xii) infrastructure or structures with a physical footprint of ……………… square metres or more; a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	**H-**	**H-**	H-	**H-**	**H-**	**H-**		**L-**	**L-**	**H-**	**H-**		**L-**		**H+**	**H+**
5		**Activty 13:** The PVSP project utilizes kl/ annum water from a desalination plant, as process water for dust suppression, cleaning, construction, etc. Reservoir (tanks) would be constructed with a capacity of ………….. kl . Water will be recycled via lined collection dam facilities. Surface run-off that ends-up in the dirty environment would be captured via a collection of trenches/canals and channeled to a evaporation pond (capacity ………….kl) .	**H-**	**H-**	**H-**	**H-**	**H-**	**H-**	**H-**	**L-**	**L-**	**H-**	**H-**		**L-**		**H+**	**X**

	PHASE	Environmental Components	ABIOTIC									BIOTIC			VISUAL	SOCIO-ECONOMIC		
		Impacts	Geology	Topography	Soil	Land capability	Land use potential	Surface water	Ground water	Air quality	Noise	Vegetation	Wildlife	Sensitive landscapes	Visual impact	Archaeological & cultural sites	Socio-economic impacts	Affected parties
		Activity, Product or Service																
6		**Activty 14:** The construction of temporary diesel tank storage facilities (bunded) as part of the contractor lay down site. (Capacity…………..L)	H-	H-	H-	H-	H-	H-	H-	L-	L-	H-	H-		L-		H+	H+
7		**Activity 19:** 1) During initial site preparation operation the site will be surveyed and levelled for particular project (infrastructure) components (listed activities). This will involve vegetation clearance, topsoil/overburden removal & stockpiling at dedicated stockpile areas. 2) Dedicated quarries will be mechanically excavated for obtaining construction infill/backfill material (weathered overburden material). Prior to removal of material the topsoil need to be stockpiled in a dedicated stockpile next to the quarry. The material will be loaded onto trucks and transport to construction site where required for infilling, backfilling, terraces, benches, etc. 3) Surface run-off control trenches/canals/evaporation dam sites//culverts/energy dissipating structures, etc. need to be excavated/constructed.	H-	H-	H-	H-	H-	H-	L-	L-	L-	H-	H-		L-		H+ & -	

	PHASE	Environmental Components	ABIOTIC									BIOTIC			VISUAL	SOCIO-ECONOMIC		
		Impacts	Geology	Topography	Soil	Land capability	Land use potential	Surface water	Ground water	Air quality	Noise	Vegetation	Wildlife	Sensitive landscapes	Visual impact	Archaeological & cultural sites	Socio-economic impacts	Affected parties
		Activity, Product or Service																
		Activty 28 = See activity 1 & 15 of GN 325																
		GN R324: Description of project activity that triggers listed activity:																
8		Activty 1: During the construction phase information/ identification of the project/ safety information **billboards/ safety warning signs** will be provided on site.													L-			
9		**Activity 4:** An **access road** will be constructed on site to give access to the contactors initially and eventually where required a permanent road on site for easy access during the operational phase of the PVSP project. An access road is also needed as along the border fence for security reasons and also act as a fire-break.	H-	H-	H-	H-	H-	H-		L-	L-	H-	H-		L-		H+	

KEY:

L- LOW

M-MEDIUM

H- HIGH **VH – VERY HIGH** **+ POSITIVE** **- NEGATIVE**

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

Impacts Mitigation

Assuming an IPP project triggers the need for Basic Assessment (BA) or scoping environmental Impact Assessment (S&EIA) under the EIA regulations, included in the assessment process is the preparation of an environmental management programme (EMPr). Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be informed by good industry practice and are to be included in the EMP. An independent environmental assessment practitioner will be employed by the applicant to prepare the BA, S&EIR, and EMPr to applicable standards.

Potential mitigation measures for solar energy projects include but are not limited to:

- Conduct pre-disturbance surveys as appropriate to assess the presence of sensitive areas, fauna, flora and sensitive habitats;
- Plan visual impact reduction measures such as natural (vegetation and topography) and engineered (berms, fences, and shades, etc.) screens and buffers;
- Utilise existing roads and servitudes as much as possible to minimize project footprint;
- Site projects to avoid construction too near pristine natural areas and communities;
- Locate developments away from important habitat for faunal species, particularly species which are threatened or have restricted ranges, and are collision-prone or vulnerable to disturbance, displacement and/or habitat loss;
- Fence sites as appropriate to ensure safe restricted access;
- Ensure dust abatement measures are in place during and post construction;
- Develop and implement a storm water management plan;
- Develop and implement waste management plan; and
- Re-vegetation with appropriate indigenous species to prevent dust and erosion, as well as establishment of alien species.

NOTE: The **Environmental Management Programme (EMPR) (PART B)** will summarise the potential impacts of various aspects of the development in all its stages, from construction, through operations to eventual decommissioning and closure, together with the appropriate mitigation measures to manage the identified impacts. Responsibilities for implementing the mitigation measures will be identified and the frequencies with which the results of the various measures are to be monitored will be stated.

The mitigation measures and technical management action plans which address potential impacts are discussed below:

Environmental Component	Geology
Environmental Management/Mitigation Measures/Action Plans/Commitments	
• Geology (underlying rock material) is going to be destroyed to a certain extent during the construction phase of the PVSP project. Construction material will be obtained from newly established quarries on site that is going to be used as filling material during initial ground works on the proposed PVSP project site. It is expected that some cut and fill will take place in the construction of certain project components. • The location of the quarries will be determined as part of the Geo-Technical survey done by BES. • Once the construction of the PVSP facility has been completed the quarries will be rehabilitated with replacing the initial stockpiled topsoil (restricted resource on site) on top of sloped quarries. • Care must be taken that the removal of construction material by means of earthmoving equipment is restricted to what is really necessary to achieve the objective.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
Optimal excavation of the construction material resource in order to ensure to facilitate better rehabilitation planning. The overburden and topsoil (where available) must be replaced in a responsible and planned manner in order to achieve some conformity with the surrounding undisturbed area.	

Environmental Component	Topography
Environmental Management/Mitigation Measures/Action Plans/Commitments	
• The surface area required for the PV project and associated infrastructure should be selected and demarcated by a surveyor with definite beacons and which is correlated with a project plan. • No surface should be disturbed unnecessarily. • Disturbed surface areas should be rehabilitated. No silt from such areas should be allowed to end-up in dry stream courses. Berm walls need to be put in place. • Daily inspections required during the construction phase. • Disturbed surface areas should be rehabilitated. No silt (soil), as the result of erosion of newly disturbed surface areas, should be allowed to end-up in dry stream courses. Berm walls need to be put in place. • Topographical features that need to be avoided are “dry stream water courses” that are draining towards the Salt River. Rehabilitation of the new topographical landscape in such a way that it would blend in with the surrounding landscape and allow normal controlled surface drainage to continue. As soon as a section of the site would not be excavated anymore it should be rehabilitated (planned and phased manner).	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
Rehabilitation of the new topographical landscape in such a way that it would blend in with the surrounding landscape and allow normal surface drainage to continue. Rehabilitation in such a way that the new landscape features would be stable and would not pose any safety hazard to human and animal anymore.	

Environmental Component	Soil (topsoil & access roads)
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Handling of topsoil as a natural resource: Any excavations or construction of infrastructure should be preceded by the removal of all available topsoil. The surface of any new areas to be disturbed must be kept to a minimum. All available topsoil (top 30 cm-layer) should be removed and stockpiled for rehabilitation purposes. **Access roads, etc:** The clearing of soil surface areas would be restricted to what is really necessary for the construction of infrastructure. Wherever possible all topsoil should be removed and stockpiled for rehabilitation purposes. Overburden material should also be stockpiled separately if practically possible. Topsoil and overburden material should be transported to an area earmarked for rehabilitation.	
EMP Performance Assessment & Monitoring Reporting	

To be included in EMP/EIA.
Closure Objective
The topsoil removed in the site preparation process should be replaced during the rehabilitation exercise.

Environmental Component	**Soil (soil compaction)**
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Soil compaction: The PV Solar operation should only be restricted to what is really required (demarcated area) within the fenced-off area. Access roads towards the sites would be restricted only to the roads (exiting farm roads & roads established in consultation with the surface owner). No land would be disturbed unnecessarily. Construction & rehabilitation should be done in a well-planned manner and in the process ensuring that activities are only restricted to surface areas really required. Compaction of soil surface areas would be alleviated once rehabilitation of certain area starts. Certain roads would probably remain for access (in consultation with the surface owner). Those that would not be required would be ripped and rehabilitated.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
Alleviation of compaction of soils would be done during rehabilitation of the mining terrain, including roads.	

Environmental Component	**Soil (Soil erosion)**
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Soil Erosion: To take preventive steps against land disturbance like erosion. Implement and maintain cut-off trenches/berms to prevent erosion. Ensuring that as little surface disturbance as possible occurs. Where vegetation is removed for construction, specific measures would need to be out in place like the minimal removal of vegetation, soil conservation measures, re-vegetation as soon as possible, and the regular monitoring of erosion. **Re-vegetation** of exposed soil surfaces (man-made surfaces, disturb surfaces in excavated sites, roads, etc.) should happen as soon as a particular activity has ceased in order to act as a sufficient erosion prevention measure.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
No soil erosion must be visible and no potential for soil erosion must be present at closure.	

Environmental Component	Soil (Soil contamination)
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Potential for soil contamination: Vehicles to be inspected to ensure no oil and hydraulic fluid leaks occur. All oil spills on soil to be removed and bio-remediate immediately (certain commercial products are available such as Terrasorb or it could be rehabilitated by means of the application of fertilizer and turn with a spade from time to time in order to enhance the natural occurring soil microbial activity). No servicing of vehicles must occur except on a concrete floor or over PVC lined area in an area allocated for that. Training w.r.t pollution hazards and their impact on the environment must be given as part of induction training. An incidence register for this purpose must be kept. Drip trays must be available and used where emergency repairs is done. Maintain vehicles, prevent, and address spillages.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
No soil contamination must be visible or known before closure can be given.	

Environmental Component	Soil (Soil structure)
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Change in Soil structure: Ensure that all available (if any) topsoil is carefully removed in different areas (where required for construction of infrastructure). The soil must also be compacted as backfilling is done. No unnecessary driving outside the active project area is allowed due to soil compaction that may occur. Use organic material e.g. manure to restore the soil structure during rehabilitation. Ensure that the rehabilitation plan makes provision for ripping of roads and spreading of organic material and that this is used during rehabilitation.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
No compaction of any roads or any other area must be present during closure. If the soil structure is disturbed mitigation measures e.g. the use of organic material, lime and fertilizers must be implemented to restore the soil structure.	

Environmental Component	Soil (Soil fertility)
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Soil fertility: Little can be done to preserve the moisture status of the soil once it is exposed. The soil must be used for rehabilitation as quickly as possible. The soil on the area earmarked for rehabilitation must be analysed to determine the deficiencies and fertilizer and lime must be ploughed into the soil to restore its fertility, if necessary. Ensure that stockpiled soil is kept clean and where possible ensure that the topsoil is treated with organic material (compost, manure) and fertilized. Do not use stockpiled soil for any other purpose but for rehabilitation. Do not use topsoil to construct roads. Ensure the rehabilitation plan makes provision for fertiliser. Make sure rehabilitated topsoil is analyzed in a laboratory. The type of fertilizer would depend on a soil analyses and fertilizer recommendation.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
The soil must be fertile enough to sustain vegetation.	

Environmental Component	Land Capability
Environmental Management/Mitigation Measures/Action Plans/Commitments	
The disturbance of land must be restricted (kept to a minimum) to the planned fenced-off, project site only. All new areas: Remove topsoil where it is available. Take care that roads needed are restricted to one entry to the project . . All rehabilitation will be done according to the final rehabilitation plan after approval by the DEA. Topsoil will be placed in areas where it was removed and the areas will be re-vegetated accordingly after being appropriately ameliorated . Ensure that the rehabilitation plan is implemented.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
Rehabilitated to the state that it is suitable for the predetermined and agreed land capability.	

Environmental Component	Land Use
Environmental Management/Mitigation Measures/Action Plans/Commitments	
• Ensuring that as little surface disturbance as possible occurs. • Avoid all drainage lines/systems. Care must be taken with excavation into soils. • Implement effective erosion control measures and an Erosion Management Plan. • Rehabilitate construction site by using indigenous grasses. • Where vegetation is removed for construction, specific measures would need to be out in place like the minimal removal of vegetation, soil conservation measures, re-vegetation as soon as possible, and the regular monitoring of erosion. • The disturbance of land must be restricted (kept to a minimum) to the planned active, fenced-off project site only. Remove topsoil where it is available. • Take care that roads are the only areas used to enter the area for project purposes. If new land is used for roads to enter the area it must be done in consultation with surface owner. • All rehabilitation will be done according to the final rehabilitation plans. Topsoil will be placed in areas where it was removed and the areas will be re-vegetated accordingly will be appropriately ameliorated . Ensure that the rehabilitation plan is implemented. Without mitigation the loss of agricultural land might be permanent. Mitigation will include rehabilitation of construction site and re-establishment of natural vegetation. Ensuring that as little surface disturbance as possible occurs, is crucial. It is also important to avoid al drainage systems in the site, as these areas are more prone to erosion.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
The replacement of topsoil would ensure that the land is able to support some grazing.	

Environmental Component	**Vegetation**
Environmental Management/Mitigation Measures/Action Plans/Commitments	
No mitigation exists except to replace the vegetation by reseeding of grasses and natural growth. Construction should be done in a well-planned manner and in the process ensuring that activities are only restricted to surface areas really required.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
During rehabilitation indigenous vegetation cover comprising of local plant species should be established in order to ensure a well-adapted sustainable plant cover that would be able to prevent erosion of the replaced topsoil on the disturbed mining site exposed surfaces, tailings dumps, etc.).	

Environmental Component	**Vegetation**

Environmental Management/Mitigation Measures/Action Plans/Commitments

Habitat change, loss of species, spread of alien and invasive species:
No mitigation exists except to replace the vegetation by reseeding of grasses.
Construction should be done in a well-planned manner and in the process ensuring that activities are only restricted to surface areas really required.

Develop and implement an invasive and alien control programme to control the spread of weeds and other invasive species.
Eradicate exotic weeds and invader species if it invades the terrain. All illegal invader plants and weeds shall be eradicated as required in terms of Regulation 15 & 16 of the Act on Conservation of Agricultural Resources, 1983 (Act no. 43 of 1983) which list the plants.
An invasive and alien control programme must be implemented by the company.

No associated infrastructures are to be placed in drainage lines with stream order 3, as well as their buffer areas.

- The placement of the following infrastructure, within these drainage lines, is prohibited:
  - On-site substation;
  - On-site water storage tanks/reservoirs;
  - Plant assembly facility;
  - Offices and workshop areas;
  - Temporary laydown.

- No stockpiling of any material within a 35m buffer area for the drainage lines.
- It is critical to encourage a natural vegetation cover within the 35m buffer area.
- No roads crossing these drainage lines are allowed.
- Any erosion problems observed should be inspected, rectified, and monitored.
- Revegetate bare areas, which formed as a result of development, with locally occurring species.
- Regular monitoring of roads and disturbed areas, for erosion problems, as well as assessment of remediation success.
- Where there is any possibility of topsoil erosion, silt traps should be used.
- Phased development and vegetation clearing where practical, so that cleared areas are not left un-vegetated and vulnerable to erosion for long periods.
- Necessary construction of stabilisation features for erosion prevention where applicable.
- After large rainfall events, when soils are wet, reduce activities on site and prevent driving off hardened roads.

It is recommended that all invasive plants on the site, be removed prior to construction, and it is important that alien plants be monitored.
- When occurring, all alien plants should be controlled and cleared to ensure that the problem does not re-occur. The recommended control measures for each species should be used.
- Disturbance should be kept to a minimum, by using the correct clearing methods.
- When rehabilitation takes place, no planting or importing of any alien species are allowed.

- It is important that **regular monitoring of the footprint area** be conducted for **potential erosion problems and the presence of invasive plant species.**
- Revegetate bare areas, which formed as a result of development, with locally occurring species.
- All mitigation measures regarding erosion should be implemented and promptly executed.
- All mitigation measures regarding the establishment and spread of declared weeds and alien invader plant species, should be implemented and promptly executed.

EMP Performance Assessment & Monitoring Reporting

To be included in EMP/EIA.

Closure Objective

No invasive and alien species must be present after closure. A post-closure control program must also be implemented.

Environmental Component	Vegetation
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Ensure that all roads and the immediate area around the construction site (utilized by construction vehicles) are daily sprayed with water to control **dust.** Site inspections to ensure the spraying are done. **Preconstruction walk-through of the final development footprint for species of conservation concern that would be affected and that can be translocated**. – Most of the protected individuals occur on the south-eastern parts of the study area, and can be ignored if option 1 is chosen for the layout of the development. Since the protected species is classified as a succulent species (Hoodia gordonii), the potential for successful translocation is high. Before construction commences individuals of listed species within the development footprint that would be affected, should be counted, and marked and translocated where deemed necessary by the ecologist conducting the **pre-construction walk-through survey,** and according to the recommended ratios. Permits from the relevant provincial authorities, i.e. the Northern Cape Department of Environmental Affairs and Nature Conservation, will be required **to relocate and/or disturb listed plant species**. - Vegetation clearing to commence only after walk through has been conducted and **necessary permits obtained**. – **Preconstruction environmental induction for all construction staff** on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. - ECO and/or Contractor's EO to provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment, especially at the initiation of the project, when most vegetation clearing is taking place. - **Vegetation clearing** to be kept to a minimum. No unnecessary vegetation to be cleared. - All construction vehicles should adhere to clearly defined and demarcated roads and no off-road driving are allowed. - Regular dust suppression during construction, if deemed necessary, especially along access roads. - **Temporary lay-down areas** should be located within the development footprint or within areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
No excessive dust must be present during the normal growth season after closure.	

Environmental Component	Wildlife (habitat)
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Wildlife or wildlife habitat destruction /change / disturbance : To take care that no new or unnecessary destruction of habitats, other than the demarcated project site should take place. **Restoration of habitat:** - Ensure the rehabilitation plan is implemented.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
The animal life habitat must be restored after decommissioning. Success will be measured against the extent to which the animals return to the area.	

Environmental Component	Wildlife (Injury and death)
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Injury and death to wildlife: Re-establish trees and grass cover as soon as possible during and after mining. Fence area off to ensure that no person can enter without permission. Ensure that the rehabilitation plan is compiled and executed. Keep incidence register on killings and disturbances.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
The animal life habitat must be restored after decommissioning. Success will be measured against the extent to which the animals return to the area.	

Environmental Component	Wildlife
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Wildlife (Injury and death): Re-establish trees and grass cover as soon as possible during and after closure of the PV Solar Project. Fence area off to ensure that no person can enter without permission. Ensure that the rehabilitation plan is compiled and executed. Keep incidence register on killings and disturbances. Make game catching, traps, snares, poaching and any other unnecessary disturbance of animals a disciplinary offence. All staff must undergo basic environmental awareness lecture during induction training. Machine operators and drivers to undergo appropriate level of environmental impact training to ensure they understand their impact on the environment. Ensure all staff working on the project undergo basic lecture during induction phase. Introduce the actions as listed above into disciplinary code as offence.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
The post-closure phase must be suitable for further restoration of the newly man-made animal habitat. The area must be stable and acceptable for the return of animal- and plant life.	

Environmental Component	Wildlife
Environmental Management/Mitigation Measures/Action Plans/Commitments	
The following mitigation measures are proposed to address the identified perceived impacts as listed : • Project design Option 2 is the preferred option. • No trapping or hunting of any faunal species are to take place during the construction and operational phase, within the study area or within the surrounding area. • In general, the contractor and staff must not cause any undue interferences with fauna species within the project area and on roads leading to the project area. • Security at the entrance of the property must assess each vehicle and person entering and / or leaving the site for the position of carcasses / fauna species, traps, snares or weapons which could be used for poaching." • Informal fires by personnel within the study area should be prohibited. • If required, fires are only to be made within specific designated areas." • "Natural" or "conservation significant" areas should be demarcated on all project plans as "no-go" areas. • Clear access routes should be mapped out and the necessary signage placed to guide onsite vehicles. • Enforce a speed limit for vehicles (e.g. 80km/h on main road and 40km/h within project area) along route alternatives to reduce collision of vehicles with fauna. • Only essential staff members (e.g. security and maintenance) may travel at night, and no construction vehicles may be active after sunset. This is to reduce night time collisions with birds and other nocturnal faunal species. " • Where ever practical the new development should avoid drainage lines, which are a key driver to ecological diversity within the project area. • Proper storm water management structures and practices should be applied to ensure the flow regime and downstream habitat within the drainage lines are not to severely altered. • Rescue and relocate fauna encountered within the construction footprint with special mention of slower moving species such as • tortoises. •"Natural" or "conservation significant" areas should be demarcated on all project plans as "no-go" areas." • Excessive noise should be managed on site at all times. • Upon completion of construction activities, it must be ensured that no bare areas remain and that indigenous flora species are reintroduced (where possible). • Employees and contractors must be made aware of the value of the natural environment. • Upon finalisation of the project scale and infrastructure, it is recommended that the impact of the project on the local and regional fauna should be evaluated. After which, applicable mitigation measures should be established. • Consultation with the Percy FitzPatrick Institute at the University of Cape Town, should be undertaken regarding the conservation and mitigation of potential threats to the Ludwig's Bustard (Neotis ludwigii). The following contact details can be used to contact the Percy FitzPatrick Institute: o Contact Peter Ryan, Director, Percy FitzPatrick Institute and DST/NRF Centre of Excellence o E-mail fitz@uct.ac.za o Tel. +27 21 650 3291 o Fax +27 21 650 3295 o Website www.fitzpatrick.uct.ac.za • Continue to raise awareness to stop hunting, and to encourage the public to report mortality from power lines etc. • All new infrastructure (e.g. if power lines are to be used) should be sited and mitigated appropriately, and dangerous sections of line should be retrofitted with appropriate mitigation. RECOMMENDATIONS Finding a balance between economic growth and the protection of the environment will always remain a challenge. However, although all attempts should be made to support the growth of South African's economy, we must be aware that the integrity of our natural environment and its systems are vital to the survival of us all. Therefore, the common goal should be to promote sustainable economic growth while ensuring the protection of our natural resources and it's processes. To achieve this, the mitigation measures as indicated above should be incorporated into the project design and implemented: In conclusion, due to the Bushmanland arid grassland being regarded as "Least Threatened", with very little of the area being transformed, if the required mitigation measures are implemented and the boundary of the project is controlled it is not foreseen that a significant change in the surrounding ecology would occur. However, this depends on the scale and associated impacts of the project. **Based on the information available during the compilation of this report, it is recommended that project design Option 2 be implemented, as this will have the least impact on the fauna of the project area.**	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
The post-closure phase must be suitable for further restoration of the newly man-made animal habitat. The area must be stable and acceptable for the return of animal- and plant life.	

Environmental Component	Surface Water (quality)
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Change in surface water quality: Storm water control measures must be implemented to divert clean water away from the site and keep contaminated water contained. Water control structures must be well designed and constructed to ensure a minimum down wash of topsoil. Vegetation disturbance must be as little as possible. Re-vegetation to be done as quickly as possible. Final re-vegetation to be done as per rehabilitation plan.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
The post closure water run-off may in no circumstance impact negatively on the water quality.	

Environmental Component	Surface Water (quantity)
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Change in surface water quantity: Once the area is rehabilitated the controlled surface run-off (series of berms/ contour walls)will be restored and normal clean water run-off will end-up in the drainage system. Once the area is rehabilitated the normal surface run-off drainage will be restored according to rehabilitation plan. The disturbed surface area must be rehabilitated to ensure some normal drainage. Minimal run-off should end-up in trenches. Final rehabilitation will be done according to the final rehabilitation plans after approval by the DEA.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
Ultimately rehabilitation of the disturbed mining site and the construction of run-off control structures in a planned and phased manner would ensure normal drainage and stability of rehabilitated site.	

The proposed solar facility will undoubtedly cause several significant impacts on the Sout River and its tributaries. As a result strict mitigation measures will have to be implemented to ensure that these impacts are kept to a minimum. **Predicted impacts include increased sedimentation due to increased erosion, increased establishment of exotic invaders and some alteration to flood and flow regimes.**
The solar facility will likely require levelling of the layout area. This will require some drainage lines being levelled or disturbed through construction (Map 2). The construction phase will disturbed the soil surface and will allow sediments to be mobilised by runoff which will then **increase the sediment load within the ephemeral streams and ultimately the Sout River**. The disturbance of the drainage lines will also increase the sediment load. It is therefore important to limit the sediment input to the ephemeral streams and Sout River. **Measures which can be utilised should include contouring the site so that runoff velocity is decreased and contours can also be bermed to capture sediment**. **Furthermore it is recommended that attenuation structures be implemented where affected drainage lines enter the ephemeral streams. The central significant stream will be excluded from the site as per layout plans.** However, the upstream section of the stream will be included in the layout and here attenuation structures should also be implemented.

Due to the disturbance caused by construction coupled with the sandy soils of the area erosion monitoring will have to form a critical part of the construction and operational phases. **Adequate erosion measures will have to be implemented where this is necessary.**

Within the study area survey it was determined that the **exotic invader, Mesquite Tree (Prosopis glandulosa**), occurs sporadically within the study area (Appendix B). Disturbance during construction is likely to cause susceptible condition for increased establishment of this exotic. The ability of the species to invade watercourses in this arid region is well known, i.e. Ongers River, and this should be prevented**. It is therefore recommended that all specimens on the site be removed prior to construction and that monitoring of establishment of the species on the site be done throughout the operational phase.** Any seedlings or established trees should be removed throughout the operational phase. Although the Sout River does not form part of the site it should also be monitored as there is a high risk that specimens from the site may invade this watercourse.

Due to the clearing of vegetation, levelling of the site, contouring and attenuation structures the runoff will be altered and in so doing the input volumes into the ephemeral streams and Sout River. This will therefore alter the flow regime within these watercourses.
During previous studies (Burch et al 2014), it has been shown that through construction soil compaction occurs which decreases infiltration and increases runoff. **Furthermore, the rain shadow caused by the panels cause an are not utilised for infiltration thus increasing runoff**. This will also affect the inflow into the ephemeral streams and thus alter the flow regime.

As per the layout plans it is also recommended that the central, significant ephemeral stream be excluded from the facility.

Environmental Component	**Ground Water (quality)**
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Reduction of groundwater quality: Storm water control measures must be implemented to divert clean water away from the site and keep (silt) contaminated water contained. Vehicles to be inspected to ensure no oil and hydraulic fluid leaks occur. All oil spills on soil to be removed and bio-remediate immediately. No servicing of vehicles must occur except at the workshops. Training w.r.t pollution hazards and their impact on the environment must be given as part of induction training. Storage of fuel and oil should be done according to best practices, within a bunded area and in containers of which the integrity is sound. The mining processes will not introduce any harmful or toxic substances and the most likely sources of pollution to the groundwater system would be associated with the infrastructure and / or workshop area. The most likely contaminants is therefore nitrate and bacteria (from sewage / pit latrines), as well as hydrocarbons (from vehicle accidents, diesel storage and the workshop area). An incidence register for this purpose must be kept. Drip trays must be available and used where emergency repairs is done. All waste must be stored according to best practices and disposed at an authorized waste disposal facility.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
Post water quality need to indicate a positive trend/improvement.	

Environmental Component	**Ground Water (quantity)**
Environmental Management/Mitigation Measures/Action Plans/Commitments	
• The study area is located within the Lower Orange Management Area, Quaternary Drainage Area D53H. The non-perennial Sout river lays to the north-eastern boundary and run-off is in a north –eastern direction towards the Sout river. • Groundwater occurs in zones of weathering and in fractures or in the contact zones between different lithology's, such as granodiorite, granite, pegmatite and gneiss of the Keimoes Suite (Me), Yield is generally less than 0.5 l/s. Groundwater can be exploited from joints and fractures in calcsilicates and sub ordinated quartzites of the Geelvloer Group (Mgv). The calc silicates have known karstic aquifer properties and are not likely to facilitate groundwater occurrence. Refer to Figure 10 • **The aquifer(s) of the area under investigation is classified as a poor aquifer according** to the map of Aquifer Classification of South Africa, 2012 and is depicted in Figure 11. • The aquifer susceptibility index is classed as low vulnerability and depicted on the map in Figure 12. • The aquifer vulnerability for the study area indicates the least tendency for contamination if pollutants are discharge or leeched over the long term and is depicted on map in Figure 13. **• The water quality of sampled sites Breipaal I, Breipaal II and Breipaal III is classified as above the recommended standard and are not suitable for human consumption. These sites are classified above the recommended standard due to very high EC, TDS, Na, Ca,Cl, S04 and F concentrations.**	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
Post water quality need to indicate a positive trend/improvement.	

Environmental Component	Air Quality
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Dust: Ensure that road surfaces are moist during maximum vehicle movement periods. Use existing roads as far as possible and minimise impact on undisturbed ground. Daily spraying of roads and office /storage/workshop areas with water. Inspection should be done on a daily basis. If new roads are constructed, in coordination with surface owner, dust pollution must be mitigated by means of spraying the roads with water. The main access road on site will be provided with permanent cover. The public road will be provided with a temporary Dustex cover for the duration of the construction phase. Only the public road for the length of the project site will be provided with the temporary cover that need to be applied several times for the duration of the construction phase of 18 months.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
Rehabilitation of the project site would ensure that no dust is generated from exposed surfaces.	

Environmental Component	Noise
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Ensure the required silencers are placed on all engines and compressors. No mitigation to reverse hooters is allowed due to safety standards. Inspection of vehicles and machinery to ensure silencers are fitted. Ensure that a complaints register is created, managed and maintained. Vehicles and earthmoving equipment should be equipped with the necessary silencers and regularly maintained in a good working condition.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
No noise attributed to solar project will be generated from the site after closure anymore. During decommissioning and closure phase some earth moving equipment and trucks would be utilized for rehabilitation.	

Environmental Component	Archaeological and Cultural Sites
Environmental Management/Mitigation Measures/Action Plans/Commitments	
All grave yard needs to be avoided if found However, the potential occurrence of unmarked graves or subsurface finds not recorded during this survey can never be excluded, so it is advised that SAHRA and a qualified archaeologist are informed immediately if archaeological objects are uncovered. **The impact of the proposed project on heritage resources is considered low and it is recommended that the proposed project can commence on the condition that the following recommendations are implemented as part of the EMPr and based on approval from SAHRA.** **• Implementation of a chance find procedure.** **• Although the Later Stone Age site (Feature 1) will not be impacted on directly the site should be preserved with a 50-m buffer zone.** **10.1 Chance Find Procedures** The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP. A short summary of chance find procedures is discussed below. This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below. • If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. • It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area. • The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a	

professional archaeologist for an assessment of the finds who will notify the SAHRA. 10.2 Reasoned Opinion The impact of the proposed project on heritage resources is considered low and no further pre-construction mitigation in terms of archaeological resources is required based on approval from SAHRA. Furthermore, the socio-economic benefits also outweigh the possible impacts of the development if the correct mitigation measures (i.e. chance find procedure and avoidance of sites) are implemented for the project.
EMP Performance Assessment & Monitoring Reporting
To be included in EMP/EIA.
Closure Objective
No site of archaeological importance should be disturbed or damaged until the necessary permit from SAHRA has been issued.

Environmental Component	**Sensitive Landscapes**
Environmental Management/Mitigation Measures/Action Plans/Commitments	
The Sout River and associated ephemeral dry water courses should be avoided. No construction activity should take place closer than 5 from the dry water course. See Surface water section.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
The Sout River and associated ephemeral dry water courses should be avoided. Surface run-off should return to normal after rehabilitation of the site.	

Environmental Component	**Visual Aspects**
Environmental Management/Mitigation Measures/Action Plans/Commitments	
Visual impact would be addressed by means of; * re-vegetation of disturbed areas with grasses; * removal of any temporary building, scrap, domestic waste, etc. that would otherwise contribute to a negative visual impact. Concurrent rehabilitation should be done simultaneously as mining activities progress.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
No residual visual impacts will remain after closure. The terrain should blend in with the surrounding landscape.	

Environmental Component	Socio-Economics
Environmental Management/Mitigation Measures/Action Plans/Commitments	
There will be a very small increase in Socio – economic activity at local level, because of the size of this mining activity. CONCLUSIONS AND RECOMMENDATIONS The findings of the SIA indicate that the development of the proposed Brypaal CSPF will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximse the potential benefits. The significance of this impact is rated as High Positive. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives. The establishment of the proposed Brypaal CSPF is therefore supported by the findings of the SIA. Due the number of other renewable energy projects proposed in the KGLM, it is recommended that the KGLM liaise with the proponents to investigate how best the Community Trusts can be established and managed so as to promote and support local, socio-economic development in the region as a whole. However, the potential impacts associated with large, solar energy facilities on an areas sense of place and landscape cannot be ignored. These impacts are an issue that will need to be addressed by the relevant environmental authorities, specifically given the large number of applications for solar facilities in the area.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
The economic development must deliver a multiplier effect that will contribute to the local economy long after closure.	

Environmental Component	Interested and Affected Parties
Environmental Management/Mitigation Measures/Action Plans/Commitments	
The main impact on the landowner is visual impact and the PVSP project area of smaller than 1032ha that will not be available for agricultural activities (grazing for sheep) at any given time for the next 20-25 years. **According to the I & AP's job creation is one of the main issues that need to be addressed by the project. Other issues that are of concern is safety (due to the influx of workers) on farms; maintenance of the main access road (gravel road), water sources for the project, socio-economic support for schools, training opportunities/skills development for workers at the solar facility. See Issues and Response report (Appendix B).** Communication with local Business Chamber: - The Chamber will be used for communication in order to get the message out and to educate the rest of the community.	
EMP Performance Assessment & Monitoring Reporting	
To be included in EMP/EIA.	
Closure Objective	
Not to be an economic, social or environmental liability to the local community or the state now or in the future. The company will ensure that the interest of all interested and affected parties will be considered.	

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

	Preferred alternatives and location of PV Solar Project:
	For more info , see also section h (i), of the document regarding the process up to now.
	A total surface area of 1032 ha is available for the project. • This more than enough as the PV project will probably **require less than 400ha** for the solar field and additional ±100ha for supporting infrastructure such as roads , buildings, etc. • Given the fact that sufficient surface area is available, alternative location of project infrastructure components could be best planned for. • Planning need to take place with environmental limitations (if any) also in mind as identified in environmental specialist studies as part of the EIA.

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

	Preferred alternatives and location of PV Solar Project:
	For more info , see also section h (i), page 30 of the document regarding the process up to now.
	A total surface area of 1032 ha is available for the project. • This more than enough as the PV project will probably require **less than 400ha** for the solar field and additional ±100ha for supporting infrastructure such as roads , buildings, etc. • Given the fact that sufficient surface area is available, alternative location of project infrastructure components could be best planned for. • Planning need to take place with environmental limitations (if any) also in mind as identified in environmental specialist studies as part of the EIA.

I) FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE (IN RESPECT OF THE FINAL SITE LAYOUT PLAN) THROUGH THE LIFE OF THE PROJECT ACTIVITY (Including (i) a description of all environmental issues and risks that are identified during the environmental impact assessment 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.)

<table>
<tr><td>ASPECT</td><td colspan="7" rowspan="2">IMPACTS</td></tr>
<tr><td>1. GEOLOGY</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">Geology (underlying rock material) is going to be destroyed to a certain extent during the construction phase of the PVSP project. Construction material will be obtained from newly established quarries on site that is going to be used as filling material during initial ground works on the proposed PVSP project site. It is expected that some cut and fill will take place in the construction of certain project components.

The location of the quarries will be determined as part of the Geo-Technical survey done by BES.

Once the construction of the PVSP facility has been completed the quarries will be rehabilitated with replacing the initial stockpiled topsoil (restricted resource on site) on top of sloped quarries.

From the Geo-Technical survey the underlying geology seems to be order as to act as foundation for the PV facility and associated infrastructure.</td></tr>
<tr><td>Extent</td><td colspan="4">Site</td><td colspan="3">Listed Activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Permanent</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13,14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">High</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td></td><td></td><td></td></tr>
</table>

<table>
<tr><td>ASPECT
2. TOPOGRAPHY</td><td colspan="4">IMPACTS</td></tr>
<tr><td>Nature of the impact</td><td colspan="4">* Change in landform :
The existing topography is described as flat with some rock outcrops (rock plates) and the majority of infrastructure required for the PVSP project would have an permanent impact on topography. Some infrastructure (contractor lay–down area) will be temporary on site. Construction rock material and topsoil will be stored in temporary stockpiles for construction purposes.

An terraced landscape will be created (where required) to serve as the footprint of the different components of the PVSP project.

* Disturbance of the surface drainage:
Construction material will be obtained from newly established quarries on site that is going to be used as filling material during initial ground works on the proposed PVSP project site. It is expected that some cut and fill workings will take place in the construction of certain project components (trenches, canals, evaporation dams, access roads, etc. Quarries , trenches, canals , will act as that act as depressions in the environment that captures run-off (standing water).

Normal surface drainage will be disturbed at a given point. Run-off if will be diverted away from the site (surface run-off control structures).

The majority of infrastructure will remain for a estimated project life of 20-25 years. During closure the site will be rehabilitated and all infrastructure demolished. At closure certain infrastructure components could possible identified to be used in the future by the land owner .

Existing impacts are related to farming with particular reference to the utilization of the site for grazing for sheep. An small piece of the site is being occupied by a quarry (provincial roads department), resulting in a change in topography through the creation of a depression.
The topography on the focus area for the PV solar project will be altered to a minimum as the topography is flat and will involve the minimum earth works during site preparation.

It is important to describe the topography of the PV project focus area as certain limitation such as ,steep slope surface areas prone to erosion (high surface run-off), can hamper the construction of the facility. Flatter slope surface areas are being preferred.

According to the Terrain morphological map of Southern Africa (G.P.Kruger , Dept. of Agriculture, Pretoria: 1983) the PV focus surface area occurs within the terrain morphological class A(1) that is being described “ Flat plains with low relief”. The percentage of area with slope less than 5% is more than 80%.
The majority of the surface area is described a flat (see GOOGLE EARTH SLOPE ANALYSES OF THE PROJECT AREA USING SATTELITE IMAGERY) with average slopes of 0,3%, 0,8% and 0,9 % etc. (See part B). This makes the project site an ideal focus area for the PV solar project.

Topographical features that need to be avoided are “dry stream water courses” that are draining towards the Salt River.

The majority of the proposed project area (study area) lies between 860-880m above sea level and sloping towards the western side with a height of 860m towards 840m above sea level. The project area on the western side is more dissected by dry water courses, draining the project surface area towards the Sout River.</td></tr>
<tr><td>Extent</td><td>Site</td><td colspan="3">Listed activity causing the</td></tr>
<tr><td>Duration</td><td>Very long to Permanent</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td>Definite</td><td rowspan="2">1,9,15</td><td rowspan="2">12,13
14, 19</td><td rowspan="2">4</td></tr>
<tr><td>Significance</td><td>High</td></tr>
</table>

Phase responsible for the impact	Construction	Operational	Decommissioning	Closure			
	X	X					

3. SOIL	IMPACTS						
Nature of the impact	This is a proposed new PVSP project site. The soils in the whole study area were found to be of the hard rock outcrops and shallow **Coega soil form.** Deeper soil (Hutton) is associated with dry stream tributaries(natural depression areas) that have been filled-up with aeolian deposits with time. Any future construction of infrastructure should be preceded by the removal of all available topsoil/overburden material (although limited). Topsoil removal during site preparation earmarked for the proposed PVSP project. In the process of removing topsoil the soil layers are mixed and the structure may be disturbed. Proceeding with quarrying without proper removal of topsoil and stockpiling.						
Extent	Site				Listed activity causing the impact:		
Duration	Long				GN325	GN327	GN324
Probability	Definite				1,9,15	12,13 14, 19	4
Significance	High						
Phase responsible for the impact	Construction	Operational	Decommissioning	Closure			
	X	X					

3. SOIL	**IMPACTS**						
Nature of the impact	The initial site preparation for and establishment of infrastructure components such as access roads, PV solar field, contractor laydown area ,etc. cause compaction of soil, the loss of a growth medium resource and the alienation of a particular surface area. The majority of the proposed PVSP project site is already disturbed by agricultural activity (grazing by sheep). The establishment, construction, operation and eventually rehabilitation (demolition) of listed structures would cause compaction of soil. All activities will be concentrated on the application area.						
Extent	Site				Listed activity causing the impact:		
Duration	Long				GN325	GN327	GN324
Probability	Definite				1,9,15	12,13 14, 19	4
Significance	High						
Phase responsible for the impact	Construction	Operational	Decommissioning	Closure			
	X	X					

A list of the activities and forms of soil degradation. **Activity**	**Form of Degradation**	**Geographic Extent**
Construction Phase		
Construction of solar panels and associated mountings	Physical (surface) degradation	Two dimensional
Construction of associated infrastructure	Physical (compound) degradation	Two dimensional
Construction of roads	Physical (compound) degradation	Two dimensional
Construction and Operational Phase		
Vehicle operation on site	Physical and chemical (hydrocarbon spills) degradation	Point and one dimensional
Dust generation	Physical degradation	Two dimensional

<table>
<tr><td>ASPECT</td><td colspan="7" rowspan="2">IMPACTS</td></tr>
<tr><td>3. SOIL</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">Soil erosion: Due to the fact that certain surface areas would become compacted and this would lead to lesser infiltration of rainwater and more run-off that could cause erosion on bare disturbed surfaces. Erosion would always be possible until such time a vegetation cover is provided during rehabilitation phase.

When removing topsoil during site preparation, little storm water control structures are in place. If a severe storm hits the area, it may lead to erosion on site. Topsoil stockpiles may be prone to erosion due to lack of vegetation cover. Water control structures may fail or severe rainstorms may cause excessive run-off. Surface compaction due to activities taking place.</td></tr>
<tr><td>Extent</td><td colspan="4">Site</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Long</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="5">1,9,15</td><td rowspan="5">12,13
14, 19</td><td rowspan="5">4</td></tr>
<tr><td>Significance</td><td colspan="4">High</td></tr>
<tr><td rowspan="3">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td></td><td></td></tr>
</table>

ADDITIONALLY ACCORDING TO THE :- Soil Specialist Impact Assessment Appendix A (DOC REF : 2017/BES/SR/03))

Impact Nature: Loss of soil resources as a result of erosion during all phases.		
Without Mitigation		**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	MEDIUM (36)	LOW (21)
Status	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation	***Ensuring that as little surface disturbance as possible occurs. Where vegetation is removed for construction, specific measures would need to be out in place like the minimal removal of vegetation, soil conservation measures, re-vegetation as soon as possible, and the regular monitoring of erosion.***	
Cumulative Impacts	Due to the erosion effect beyond the initial disturbed area and on vulnerable soil types, there is a cumulative effect within the surrounding environment. Therefore, the spread of erosion will continue into intact areas even with good vegetation cover present.	
Residual Impacts	Unless appropriate mitigation is implemented, loss of topsoil through erosion can occur. Loss of soil resources is irreversible.	

<table>
<tr><td>ASPECT</td><td colspan="7" rowspan="2">IMPACTS</td></tr>
<tr><td>3. SOIL</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">Potential of soil contamination.

Vehicles/trucks/cranes/ earth moving equipment breakages and oil/lubricant /diesel spills may contaminate soil.

The temporary workshop may contaminate soil due to spillages and bad management. Bad surface water management may divert contaminated run-off water on soil and thereby contaminating it.</td></tr>
<tr><td>Extent</td><td colspan="4">Site</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Long</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">High</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td></td><td></td></tr>
</table>

ADDITIONALLY ACCORDING TO THE :- Soil Specialist Impact Assessment

Impact 4: Vehicle operation on site

Impact Nature: This activity entails the operation of vehicles on site and their associated impacts in terms of spillages of lubricants and petroleum products		
Without Mitigation		**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short (2)	Short (2)
Magnitude	Low (4)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	LOW (28)	LOW (10)
Status	Negative	Negative
Reversibility	Irreversible	Reversible
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation	Maintain vehicles, prevent, and address spillages.	
Cumulative Impacts	The cumulative impact of this activity will be small if manage.	
Residual Impacts	Unless appropriate mitigation is implemented, this activity can become problematic to the environments and hazardous to human health.	

ASPECT	IMPACTS						
3. SOIL							
Nature of the impact	Loss of soil structure In the process of removing topsoil the soil layers are mixed and the structure may be disturbed.						
Extent	Site				Listed activity causing the impact:		
Duration	Long				GN325	GN327	GN324
Probability	Definite				1,9,15	12,13 14, 19	4
Significance	Moderate						
Phase responsible for the impact	Construction	Operational	Decommissioning	Closure			
	X	X					

ASPECT	IMPACTS						
3.SOIL							
Nature of the impact	Loss of soil fertility The mixing of soil during site preparation, compaction and potential pollution (spillages form oil etc.) all may cause this situation.						
Extent	Site				Listed activity causing the impact:		
Duration	Short				GN325	GN327	GN324
Probability	Definite				1,9,15	12,13 14, 19	4
Significance	High						
Phase responsible for the impact	Construction	Operational	Decommissioning	Closure			
	X	X					

<table>
<tr><td>ASPECT</td><td colspan="7" rowspan="2">IMPACTS</td></tr>
<tr><td>4.LAND CAPABILITY</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">Temporary loss of land capability to support grazing:

Temporary loss of land capability to support grazing (20-25 years). The area where the infrastructure will be constructed will thus be alienated, until the area is rehabilitated. Some structures could probable remain if an alternative use is being found.</td></tr>
<tr><td>Extent</td><td colspan="4">Site</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Long</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">High</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td></td><td></td></tr>
</table>

<table>
<tr><td>ASPECT</td><td colspan="7" rowspan="2">IMPACTS</td></tr>
<tr><td>5. LAND USE</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">Temporary loss of land capability to support grazing (20-25 years). The area where the infrastructure will be constructed will thus be alienated, until the area is rehabilitated. Some structures could probable remain if an alternative use is found.</td></tr>
<tr><td>Extent</td><td colspan="4">Site</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Long to permanent</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">High</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td></td><td></td></tr>
</table>

ADDITIONALLY ACCORDING TO THE :- Soil Specialist Impact Assessment

Impact Nature: Land that is no longer able to be utilized due to the construction. This impact is expected to be of low significance as a result of the limited agricultural potential of the site.		
Without Mitigation		**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	MEDIUM (32)	LOW (21)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation	***Without mitigation the loss of agricultural land might be permanent. Mitigation will include rehabilitation of construction site and re-establishment of natural vegetation. Ensuring that as little surface disturbance as possible occurs, is crucial. It is also important to avoid al drainage systems in the site, as these areas are more prone to erosion.***	
Cumulative Impacts	The cumulative impact is expected to be low, due to the limited agricultural potential, as a result of limited water ad low rainfall.	
Residual Impacts	Minor residual risks: the recovery of the land to original potential might however take decades in these arid climates.	

Agricultural Potential

The agricultural potential of the site is determined mainly by the climate in that the rainfall effectively excludes any form of crop production. Therefore the site is suited to extensive grazing. Due to the bad water quality and restricted availability, no crop production is possible. Even if water was available for irrigation, due to the finer texture of the subsoils within the level terrain area, the long-term viability of irrigated agriculture will be limited through the limited potential of irrigation induced salt leaching. As a result, a large enough footprint area, around the development area is recommend for field rotations and shift for problematic salt build-up.

Overall Soil and Land Impacts

The impacts on soils and agriculture is expected to be low, due to the **low agricultural potential** as well as the variable rainfall in this environment if:

- Erosion prevention and storm water management measures are implemented; and

- A large enough footprint area around the development area is left open.

Impact 5: Cumulative impact of the loss of agricultural land **Impact Nature:** Land that is no longer able to be utilised.		
The impact of the proposed project in isolation		**The cumulative impact of the project together with other projects within the area**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long term (4)
Magnitude	Low (3)	Low (2)
Probability	Definite (4)	Definite (4)
Significance	MEDIUM (32)	LOW (28)
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation	***Ensuring that as little surface disturbance as possible occurs. Avoid all drainage lines/systems. Care must be taken with excavation into soils. Rehabilitate construction site by using indigenous grasses. Implement effective erosion control measures and an Erosion Management Plan.***	

Discussions and Conclusion

The **arid climate** of the study area **coupled with the shallow soils** limits the **agricultural potential to low intensity grazing**. **Therefore, the impact of the proposed development on agricultural resources is considered to be small. The cumulative impact of the facility on agricultural resources and production will be relatively small due to the low agricultural potential of the land.**

The management of salts can be considered as problematic with regards to long-term challenges. It can be managed through adequate field rotation and application of a leaching requirement. Some important aspects have to be managed on this site. **Erosion** must be controlled through appropriate mitigation and control structures. Impacts from vehicles, such as spillages, should be prevented and mitigated. **Dust** generation should be mitigated and minimised. In perspective, the impacts of the proposed facility can be motivated as necessary in decreasing the impacts in areas where agriculture potential plays a more significant role. The importance of generating cleaner energy in and for South Africa cannot be overemphasised.

<table>
<tr><td>ASPECT</td><td colspan="7" rowspan="2">IMPACTS</td></tr>
<tr><td>6.VEGETATION</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">During the initial site preparation and construction of the PVSP project vegetation clearance, disturbance of the ecosystem, habitat and trampling will happen. Destruction of habitats for vegetation. Due to a disturbed ecosystem, bare ground and invasion of exotics and further spreading of exotics can follow.

The vegetation needs to be cleared to remove the topsoil.</td></tr>
<tr><td>Extent</td><td colspan="4">Site</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Long</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">High</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td></td><td></td></tr>
</table>

<table>
<tr><td>ASPECT</td><td colspan="7" rowspan="2">IMPACTS</td></tr>
<tr><td>6.VEGETATION</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">Habitat change, loss of species, spread of alien and invasive species.

The change in the current habitat will be mitigated during replacement of topsoil and eventually final rehabilitation of the site.</td></tr>
<tr><td>Extent</td><td colspan="4">Site</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Permanent</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">High</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td></td><td></td></tr>
</table>

ADDITIONALLY ACCORDING TO THE :- Flora Specialist Impact Assessment APPENDIX A (DOC. REF: 2017/BES/SR/05)

Identification and Nature of Impacts

Some of the impacts that will result during/after the development of the proposed PV Solar Facility, include the distribution, loss, and transformation of intact vegetation. The following impacts are identified as major impacts, and will be assessed for the preconstruction, construction, and operational phases of development:

Impact 1: The impacts on vegetation and protected plant species.
Some loss of vegetation is an inevitable consequence of the development. Some consequences of the impact occurring may include:
- General loss of habitat;
- Loss in variation within sensitive habitat due to loss of portions of it;
- General reduction in biodiversity;
- Increased fragmentation (depending on the location of impact);
- Disturbance to processes maintaining biodiversity and ecosystem goods and services; and
- Loss of ecosystem goods and services.

Only one plant species, protected under the Northern Cape Nature Conservation Act of 2009, has been recorded. This species is likely to be impacted by the development. In addition, the total number of affected individuals is likely to be low (would be less than 100 plants). Since *Hoodia gordonii* is not listed by the SIBIS database, as indigenous to the quarter degree square 2920 AB, and due to its limited distribution here, it is not a common phenomenon to see this species in this area.

It is advised that Option 1 (figure X) for the development layout remain the first option, as the distribution of the *Hoodia gordonii* population lies more to the south-eastern parts of the study area. Therefore, it is possible to retain this *Hoodia* population without mitigation measures.

Impact 2: Soil erosion and associated degradation of ecosystems.
The site will be vulnerable to soil erosion after the during and after the construction phase due to vegetation clearing and disturbance. Service roads and installed infrastructure will generate increased direct runoff during intense rainfall events and may exacerbate the loss of topsoil and the effects of erosion. Overall erosion can be regarded as moderate to low with most of the erosion-prone areas excluded from the development footprint. With effective mitigation measures, the occurrence, spread and potential cumulative effects of erosion may be limited to a minimum.

Impact 3: Impacts on Drainage Lines
Construction may lead to potential indirect loss of or damage to drainage lines. This may potentially lead to localised loss of habitat and biodiversity. Where these habitats are already stresses due to degradation and transformation, the loss may lead to increased vulnerability of habitat. Physical alterations to these drainage systems will lead to:
- Increased soil loss;
- Fragmentation of sensitive habitats.

However, all major drainage lines are located outside the proposed development area, with some upper sections of smaller drainage lines located within and near the proposed development area. By implementing mitigation measures. Including appropriate buffers, these habitat.

Impact 4: Alien Plant Invasions
Habitat disturbance and associated destruction of indigenous vegetation are some of the major factors contributing to invasion by alien invader plants. This may lead to:
- A change in vegetation structure, consequently changing various habitat characteristics and the loss of indigenous vegetation;
- Reduction in grazing capacity due to the replacement of palatable species with unpalatable species;
- Change in plant species composition;
- Change in soil chemistry properties;
- Fragmentation of sensitive habitats;
- Disturbance/loss of individual plants regarded as rare, endangered, endemic and/or protected;
- Change in flammability of vegetation, depending on alien species.

Although the area is currently characterised by a low level of invasive alien plants (mostly *Prosopis* species in the main drainage lines), the potential severity of this impact may lead to major problems if left unattended. This can easily be managed and mitigated through regular alien monitoring and control.

Impact 5: Cumulative Impacts

Due to the high density of proposed renewable energy facilities in the area, there is a high potential for cumulative impacts, both at a broad landscape scale and locally.

- Ecological processes and ecological functioning of important habitats could be transformed, consequently leading to the contribution to the fragmentation of the landscape, and the disruption of landscape connectivity.
- This is important for drainage lines, important microhabitats, and corridor zones for faunal movement.
- The loss of unprotected vegetation types on a cumulative basis may impact the countries' ability to meet its conservation targets.
- Due to the extent of the impacted vegetation type and the amount of intact habitat still present, the cumulative impact is regarded as low. types can largely retain their character and functionality.

Assessment of Impacts

Planning and Construction Phase Impacts

Construction Impact 1: The impacts on vegetation and protected plant species **Impact Nature:** Impacts on vegetation and protected plant species will occur due to vegetation clearing and disturbance associated with the construction of the facility and associated infrastructure. This is the most likely and significant impact and may lead to direct loss of vegetation. Refer to Identification and Nature of Impacts.		
Without Mitigation		**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	MEDIUM (36)	LOW (21)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes, to a large extent.	
Mitigation	- Preconstruction walk-through of the final development footprint for species of conservation concern that would be affected and that can be translocated. - Most of the protected individuals occur on the south-eastern parts of the study area, and can be ignored if option 1 is chosen for the layout of the development. Since the protected species is classified as a succulent species (*Hoodia gordonii*), the potential for successful translocation is high. Before construction commences individuals of listed species within the development footprint that would be affected, should be counted, and marked and translocated where deemed necessary by the ecologist conducting the pre-construction walk-through survey, and according to the recommended ratios. Permits from the relevant provincial authorities, i.e. the Northern Cape Department of Environmental Affairs and Nature Conservation, will be required to relocate and/or disturb listed plant species. - Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained. - Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc. - ECO and/or Contractor's EO to provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment, especially at the initiation of the project, when most vegetation clearing is taking place. - Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. - All construction vehicles should adhere to clearly defined and demarcated roads and no off-road driving are allowed. - Regular dust suppression during construction, if deemed necessary, especially along access roads. - Temporary lay-down areas should be located within the development footprint or within areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.	
Cumulative Impacts	Cumulative impacts on vegetation are likely to be low of mitigation measures are followed and impacted areas that can be rehabilitated are done in an accurate and affective manner.	

Residual Impacts	With appropriate avoidance and mitigation residual impacts will be very low.

Construction Impact 2: Soil erosion and associated degradation of ecosystems. **Impact Nature:** Increased erosion risk as a result of soil disturbance and loss of vegetation cover, as well as increased runoff generated by the PV area and access roads. Erosion is probably one of the greatest risk factors associated with the development. The need for proper erosion control structures and the maintenance thereof is critically important		
Without Mitigation		**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	MEDIUM (32)	LOW (15)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	Potential loss of important resources.	No
Can impacts be mitigated?	Yes	
Mitigation	- Rectification and monitoring of erosion problems. - For limitation of erosion potential, all bare areas affected by development need to be revegetated with locally occurring species. - Roads and other disturbed areas should be monitored and assessed for the success of the remediation. - Where there is a danger of topsoil eroding, silt traps should be used. - According to the design specifications, the proposed mounting structures will be a ground mount system, therefore there is no need for topsoil to be removed and stored separately. - Cleared areas should not be left unvegetated and vulnerable to erosion for extended periods of time. - Necessary construction of stabilisation features for erosion prevention where applicable. - After large rainfall events, when soils are wet, reduce activities on site and prevent driving off hardened roads.	
Cumulative Impacts	Due to the erosion effect beyond the initial disturbed area and on vulnerable soil types, there is a cumulative effect within the surrounding environment. Therefore, the spread of erosion will continue into intact areas even with good vegetation cover present.	
Residual Impacts	Residual impacts will be very low with the necessary avoidance and mitigation.	

Impact Nature: The catchment of the identified drainage line (intersecting with the proposed layout) may be affected by some direct or indirect loss or damage to the drainage, due to construction. This may lead to the increased loss of soil and the disturbance or loss of vegetation associated with these drainage lines.		
Without Mitigation		**With Mitigation**
Extent	Local – Regional (3)	Local (1)
Duration	Long-term (4)	Very Short-term (0)
Magnitude	Moderate (7)	Small (1)
Probability	Probable (3)	Improbable (2)
Significance	MEDIUM (42)	LOW (4)
Status	Negative	Neutral
Reversibility	Low	High
Irreplaceable loss of resources	Potential loss of resources	No
Can impacts be mitigated?	Yes	
Mitigation	- No associated infrastructures are to be placed in drainage lines with stream order 3, as well as their buffer areas. - The placement of the following infrastructure, within these drainage lines, is prohibited: o On-site substation; o On-site water storage tanks/reservoirs; o Plant assembly facility; o Offices and workshop areas; o Temporary laydown. - No stockpiling of any material within a 35m buffer area for the drainage lines. - It is critical to encourage a natural vegetation cover within the 35m buffer area. - No roads crossing these drainage lines are allowed. - Any erosion problems observed should be inspected, rectified, and monitored. - Revegetate bare areas, which formed as a result of development, with locally occurring species. - Regular monitoring of roads and disturbed areas, for erosion problems, as well as assessment of remediation success. - Where there is any possibility of topsoil erosion, silt traps should be used. - Phased development and vegetation clearing where practical, so that cleared areas are not left un-vegetated and vulnerable to erosion for long periods. - Necessary construction of stabilisation features for erosion prevention where applicable. - After large rainfall events, when soils are wet, reduce activities on site and prevent driving off hardened roads.	
Cumulative Impacts	Eroded material may have a significant impact on these drainage systems. Disturbance of these areas may lead to increased invasion by alien plants like *Prosopis glandulosa*. By diligently implementing the recommended mitigation measures, the likelihood of these cumulative impacts occurring can be highly unlikely.	
Residual Impacts	If development is to occur within these highly sensitive drainage lines, most of the impacts mentioned can be permanent. The likelihood of these impacts occurring can be regarded as low to unlikely.	

Construction Impact 4: Alien Plant Invasions **Impact Nature:** The site would be left vulnerable to alien plant invasion if not managed. According to the National Environmental Management Biodiversity Act (Act No. 10 of 2004) and the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all listed alien species must be controlled in accordance with the Act.		
Without Mitigation		**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Short-term (1)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly Probable (4)	Probable (3)
Significance	MEDIUM (52)	LOW (12)
Status	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources	Invasion of alien plants will result in a decrease in natural vegetation, thus leading to potential loss of resources.	No
Can impacts be mitigated?	Yes	
Mitigation	- It is recommended that all invasive plants on the site, be removed prior to construction, and it is important that alien plants be monitored. - When occurring, all alien plants should be controlled and cleared to ensure that the problem does not re-occur. The recommended control measures for each species should be used. - Disturbance should be kept to a minimum, by using the correct clearing methods. - When rehabilitation takes place, no planting or importing of any alien species are allowed.	
Cumulative Impacts	The exist a cumulative impact due to the spread and settlement of alien invasive species beyond the initial distributed area. This could lead to the replacement of natural indigenous vegetation.	
Residual Impacts	With the right mitigation measurements and avoidance, these residual impacts will be very low.	

Operational Phase :

Operation Impact 1: The disturbance or loss of natural vegetation and protected plant species		
Impact Nature: According to the design specifications, the proposed mounting structures will be a ground mount system, therefore there is no need for topsoil to be removed and stored separately, and there will be no need for land levelling. Vegetation will be trimmed to maintain an acceptable height, and no clearing of vegetation underneath the trough mirrors will be needed. The remaining infrastructure (including access roads, buildings etc.) will create: - Areas of altered surface characteristics; - Rainfall interception patterns; and - Shade that will not be tolerated by most of the species naturally present on site. Consequently, changes in species composition and topsoil characteristics will be expected. Changes in vegetation composition, together with altered surface characteristics and runoff may lead to: - Increased vegetation vulnerability with regards to erosion; - Alterations of habitat characteristics; - Increased fragmentation (depending on location of impact); and - The loss of ecosystem services.		
Without Mitigation		**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly Probable (4)	Probable (3)
Significance	MEDIUM (44)	LOW (18)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation	- It is important that regular monitoring of the footprint area be conducted for potential erosion problems and the presence of invasive plant species. - Revegetate bare areas, which formed as a result of development, with locally occurring species. - All mitigation measures regarding erosion should be implemented and promptly executed. - All mitigation measures regarding the establishment and spread of declared weeds and alien invader plant species, should be implemented and promptly executed.	
Cumulative Impacts	If mitigation measures are correctly followed, and rehabilitation are done in an accurate and affective manner, the cumulative impacts on vegetation would be low.	
Residual Impacts	The residual impacts will be low, with the appropriate avoidance and mitigation measures.	

Operation Impact 2: High levels of erosion due to altered runoff patterns caused by rainfall interception by infrastructure and compacted areas. **Impact Nature:** The presence of hardened surface tends to generate increased runoff, posing a significant erosion risk, if not properly managed. It is important to build proper erosion control structures and maintain it over the lifespan of the project.		
Without Mitigation		**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Short-term (0)
Magnitude	High (8)	Low (1)
Probability	Highly probable (4)	Improbable (2)
Significance	MEDIUM (56)	LOW (4)
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources	Potential loss of important resources.	No
Can impacts be mitigated?	Yes	
Mitigation	- Rectification and monitoring of erosion problems, in particular after large summer thunder storms. - Vegetation will take longer to establish due to the higher level of shade, created by the troughs, therefore the monitoring of the re-establishment of vegetation is important for erosion control. - During rehabilitation, where vegetation establishment seems impossible, there might be a need for rock cladding, where the area is covered with rocks/gravel, to decrease runoff and prevent wind- and water-erosion. - It is important to monitor the area close to the troughs after heavy rainfall, in order to rehabilitate appropriately where erosion is initiated. - Landscaping and rehabilitation is crucial to contain accelerated erosion, due to the fixed nature and topography of the troughs. - Roads and other disturbed areas should be monitored and assessed for the success of the remediation.	
Cumulative Impacts	Due to the erosion effect beyond the initial disturbed area and on vulnerable soil types, there is a cumulative effect within the surrounding environment. Therefore, the spread of erosion will continue into intact areas even with good vegetation cover present.	
Residual Impacts	Residual impacts will be very low with the necessary avoidance and mitigation.	

Operation Impact 3: Impacts on Drainage Lines **Impact Nature:** If mitigation measures are not implemented adequately, drainage systems on site will be influenced as follows:		
If accidental spills of harmful substances are not contained and mitigated immediately and appropriately, these substances may be washed into mentioned drainage systems and end up in the Sout River, after heavy rainfall events. - The runoff characteristics of the environments will be altered due to the changes in surface characteristics and rainfall interception patterns, as a result of the new development and troughs. - A loss of habitat may occur as a result of changes in geohydrology, erosion susceptibility and erosion rates of the landscape.		
Without Mitigation		**With Mitigation**
Extent	Local – Regional (3)	Local (1)
Duration	Permanent (5)	Short-term (1)
Magnitude	Moderate (6)	Small (0)
Probability	Probable (3)	Improbable (2)
Significance	MEDIUM (42)	LOW (4)
Status	Negative	Neutral
Reversibility	Low	High
Irreplaceable loss of resources	Potential loss of resources	No
Can impacts be mitigated?	Yes	
Mitigation	- Regular monitoring of roads and disturbed areas, for erosion problems, as well as assessment of remediation success. - All mitigation measures regarding erosion and the impact on drainage lines during construction phase, should be adhered and promptly executed. - Any accidental spillage of harmful or hazardous substances can be contained effectively due to the low gradient of the whole area. In the case of accidental spillage, the adequate actions must be taken in order to prevent the spillage from spreading.	
Cumulative Impacts	Eroded material may have a significant impact on these drainage systems. Disturbance of these areas may lead to increased invasion by alien plants like *Prosopis glandulosa*. By diligently implementing the recommended mitigation measures, the likelihood of these cumulative impacts occurring can be highly unlikely.	
Residual Impacts	- Changes in topsoil characteristics; - Changes in vegetation cover; - Loss of microhabitats; and - Increased possibility of invasive plant species.	

Operation Impact 4: Increases in Alien Plant Invasions **Impact Nature:** The site would be left vulnerable to alien plant invasion, after construction, if not managed. According to the National Environmental Management Biodiversity Act (Act No. 10 of 2004) and the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all listed alien species must be controlled in accordance with the Act.		
Without Mitigation		**With Mitigation**
Extent	Local (3)	Local (1)
Duration	Permanent (5)	Short-term (1)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly Probable (4)	Probable (3)
Significance	MEDIUM (56)	LOW (12)
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources	Invasion of alien plants will result in a decrease in natural vegetation, thus leading to potential loss of resources.	
Can impacts be mitigated?	Yes	
Mitigation	- It is recommended that the site be monitored for the occurrence of invasive plant species, together with erosion monitoring. - When occurring, all alien plants should be controlled and cleared to ensure that the problem does not re-occur. The recommended control measures for each species should be used. - Disturbance should be kept to a minimum, by using the correct clearing methods. - When rehabilitation takes place, no planting or importing of any alien species are allowed.	
Cumulative Impacts	The exist a cumulative impact due to the spread and settlement of alien invasive species beyond the initial distributed area. This could lead to the replacement of natural indigenous vegetation.	
Residual Impacts	With the right mitigation measurements and avoidance, these residual impacts will be very low.	

Cumulative Impacts

Cumulative Impact 1: Decreased ability to meet conservation targets **Impact Nature:** The country's ability to meet its conservation targets, may be influenced by the loss of unprotected vegetation types on a cumulative basis.		
The impact of the proposed project in isolation		**The cumulative impact of the project together with other projects within the area**
Extent	Local (1)	Regional (3)
Duration	Long-term (4)	Permanent (5)
Magnitude	Small (1)	Moderate (6)
Probability	Improbable (2)	Probable (3)
Significance	LOW (12)	MEDIUM (42)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	No	Likely
Can impacts be mitigated?	The transformation of semi-natural intact vegetation cannot be avoided.	
Mitigation	- Natural vegetation should be encouraged to return to disturbed areas. - The management of biodiversity for the proposed site as well as the adjacent area is important. - Within a sensitive habitat, the footprint should be reduced to a minimum.	

Cumulative Impact 2: Compromising ecological processes and ecological functioning of habitats **Impact Nature:** The compromising of ecological processes and ecological functioning of habitats will consequently contribute to the fragmentation of landscape and potentially disrupt the connectivity of landscapes, disrupting their ability to respond to environmental fluctuations.		
The impact of the proposed project in isolation		**The cumulative impact of the project together with other projects within the area**
Extent	Local (1)	Regional (2)
Duration	Long-term (4)	Long term (4)
Magnitude	Small (1)	Moderate (6)
Probability	Improbable (2)	Improbable (2)
Significance	LOW (12)	LOW (24)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	No	Likely
Can impacts be mitigated?	The transformation of semi-natural intact vegetation cannot be avoided.	
Mitigation	- Natural vegetation should be encouraged to return to disturbed areas. - The management of biodiversity for the proposed site as well as the adjacent area is important. - Within a sensitive habitat, the footprint should be reduced to a minimum.	

<table>
<tr><td>ASPECT

7. WILDLIFE</td><td colspan="7">IMPACTS</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">Wildlife or wildlife habitat destruction /change / disturbance.

The flora which normally serves as habitat for animals would be destroyed during site preparation. The increase in activity will temporarily scare other animals. The area will serve as a new habitat after rehabilitation.</td></tr>
<tr><td>Extent</td><td colspan="4">Site</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Medium</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">Low</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td></td><td></td></tr>
</table>

ADDITIONALLY ACCORDING TO THE :- Fauna Specialist Impact Assessment APPENDIX A (DOC. REF: 2017/BES/SR/06)

Existing impacts

The following existing environmental impacts were identified during the site assessment:

- Overgrazing of certain areas, however, recent drought conditions could have exacerbated any poor veld conditions;
- No source of water within project area. The man-made dam was dry at the time of the assessment. Subsequently, any fauna which cannot traverse the border fence to migrate from the area will most likely die of dehydration; and
- Through an interview with the land owner, he indicated that all predators (i.e. Bat-eared Fox, Cape Fox, Brown Hyena and Black-backed Jackal) on the property are shot due to the possible threat they pose to his sheep.

Project related impacts

Table 8 and Table 9 provides an impact assessment of the perceived impacts on the fauna within the project area. In summary, the following impacts have been identified:

- Increased poaching risk due to increased personnel and movement of people in and out of the area.
- Increased fire hazards due to increased personnel and movement of people in and out of the area.
- Vehicles accessing the construction area through sensitive habitat (Construction phase)
- Collision of vehicles with faunal species.
- **Bird collisions with solar panels** (solar panels create a glair or mirror affect which can disorientate birds) and power lines - although no power lines forms part of the project design (assumed there will be a power line extending from the MV substation to the Eskom power line), the project does depend on an existing Eskom power line which needs to be taken into consideration (Operational Phase)

- Site clearance and removal of important vegetation (habitat) within drainage lines (Project design Option 1) (Construction phase).
- **Site clearance and removal of important vegetation (habitat) within drainage lines (Project design Option 2) (Construction phase).**
- Noise from construction (people in general) process disruptive / nuisance to fauna, causing fauna to migrate away from area (Construction phase).

 Dust being a nuisance (suffocating to an extent) to fauna, causing fauna to migrate out of the area (Construction phase).

 Loss of fauna diversity in the area due to an increase in human activity, loss of habitat and unsuitable / favourable conditions.

Table 8: Fauna impact assessment associated with the construction phase of the project

Brypaal Solar Fauna impact assessment		BEFORE												MITIGATION MEASURE	AFTER											
		Severity of impact			Spatial scope of impact			Duration of impact			Average impact				Severity of impact			Spatial scope of impact			Duration of impact			Sensitivity of receiving environment		
		Probability	Consequence	Ranking	Probability	Consequence	Ranking	Probability	Consequence	Ranking	Probability	Consequence	Ranking		Probability	Consequence	Ranking	Probability	Consequence	Ranking	Probability	Consequence	Ranking	Probability	Consequence	Ranking
Construction phase																										
1	Increased poaching risk due to increased personnel and movement of people in and out of the area.	5	3	20 (S)	5	3	20 (S)	5	3	20 (S)	5	3	20 (S)	► No trapping or hunting of any faunal species are to take place during the construction phase within the study area or within the surrounding area. ► In general, the contractor and staff must not cause any interferences with fauna species within the project area and on roads leading to the project area. ► Security at the entrance of the property must assess each vehicle and person entering and / or leaving the site for the position of carcasses / fauna species, traps, snares or weapons which could be used for poaching.	2	3	9 (M)	2	3	9 (M)	2	3	9 (M)	2	3	9 (M)
2	Increased fire hazards due to increased personnel and movement of people in and out of the area.	4	4	21 (H)	4	4	21 (H)	4	4	21 (H)	4	4	21 (H)	► Informal fires by construction personnel within the study area should be prohibited. ► If required, fires are only to be made within specific designated areas.	2	4	14 (S)	2	4	14 (S)	2	4	14 (S)	2	4	14 (S)
3	Vehicles accessing the construction area through sensitive habitat	5	3	20 (S)	5	2	16 (S)	5	3	20 (S)	5	3	20 (S)	► "Natural" or "conservation significant" areas should be demarcated on all project plans as "no-go" areas. ► Clear access routes should be mapped out and the necessary signage placed to guide onsite vehicles.	2	3	9 (M)	2	2	5 (L)	2	3	9 (M)	2	3	9 (M)
4	Collision of vehicles with faunal species.	5	2	16 (S)	5	4	23 (H)	5	4	23 (H)	5	3	20 (S)	► Enforce a speed limit for construction vehicles (e.g. 80km/h on main road and 40km/h within project area) along route alternatives in order to reduce collision of construction vehicles with fauna. ► Only essential staff members (e.g. security and maintenance) may travel at night, and no construction vehicles may be active after sunset. This is to reduce night time collisions with birds and other nocturnal faunal species.	3	2	8 (M)	3	4	18 (S)	3	4	18 (S)	3	3	13 (S)
5	Site clearance and removal of important vegetation (habitat) within drainage lines (Project design Option 1).	5	4	23 (H)	5	3	20 (S)	5	5	25 (H)	5	4	23 (H)	► Where ever practical the new development should avoid drainage lines, which are a key driver to ecological diversity within the project area. ► Project design Option 2 is the preferred option. ► Proper storm water management structures and practices should be applied to ensure the flow regime and down stream habitat within the drainage lines are not to severely altered.	5	4	23 (H)	5	3	20 (S)	5	5	25 (H)	5	4	23 (H)
6	Site clearance and removal of important vegetation (habitat) within drainage lines (Project design Option 2).	4	3	17 (S)	4	3	17 (S)	4	5	24 (H)	4	4	21 (H)	► Rescue and relocate fauna encountered within the construction footprint with special mention of slower moving species such as tortoises. ► "Natural" or "conservation significant" areas should be demarcated on all project plans as "no-go" areas.	5	3	20 (S)	5	3	20 (S)	5	5	25 (H)	5	4	23 (H)
7	Noise from construction (people in general) process disruptive / nuisance to fauna, causing fauna to migrate away from area.	5	2	16 (S)	5	3	20 (S)	5	3	20 (S)	5	3	20 (S)	► Excessive noise should be managed on site at all times.	3	2	8 (M)	3	3	13 (S)	3	3	13 (S)	3	3	13 (S)
8	Dust being a nuisance (suffocating to an extent) to fauna, causing fauna to migrate out of the area.	4	2	12 (M)	4	4	21 (H)	4	3	17 (S)	4	3	17 (S)	► Upon completion of construction activities, it must be ensured that no bare areas remain and that indigenous flora species are reintroduced (where possible).	2	2	5 (L)	2	4	14 (S)	2	3	9 (M)	2	3	9 (M)
9	Loss of fauna diversity in the area due to an increase in human activity, loss of habitat and unsuitable / favourable conditions.	5	3	20 (S)	5	4	23 (H)	5	3	20 (S)	5	3	20 (S)	► "Natural" or "conservation significant" areas should be demarcated on all project plans as "no-go" areas. ► Employees and contractors must be made aware of the value of the natural environment. ► Upon finalisation of the project scale and infrastructure, it is recommended that the impact of the project on the local and regional fauna should be evaluated. After which, applicable mitigation measures should be established.	3	3	13 (S)	3	4	18 (S)	3	3	13 (S)	3	3	13 (S)

Table 9: Fauna impact assessment associated with the operational phase of the project

	Brypaal Solar Fauna impact assessment	BEFORE: Severity of impact			BEFORE: Spatial scope of impact			BEFORE: Duration of impact			BEFORE: Average impact			MITIGATION MEASURE	AFTER: Severity of impact			AFTER: Spatial scope of impact			AFTER: Duration of impact			AFTER: Sensitivity of receiving environment		
		Probability	Consequence	Ranking	Probability	Consequence	Ranking	Probability	Consequence	Ranking	Probability	Consequence	Ranking		Probability	Consequence	Ranking	Probability	Consequence	Ranking	Probability	Consequence	Ranking	Probability	Consequence	Ranking
	Operational phase																									
1	Increased poaching risk due to increased personnel and movement of people in and out of the area.	5	3	20 (S)	5	3	20 (S)	5	4	23 (H)	5	3	20 (S)	► No trapping or hunting of any faunal species are to take place during the operational phase within the study area or within the surrounding area. ► In general, the contractor and staff must not cause any interferences with fauna species within the project area and on roads leading to the project area. ► Security at the entrance of the property must assess each vehicle and person entering and / or leaving the site for the position of carcasses / fauna species, traps, snares or weapons which could be used for poaching.	2	3	9 (M)	2	3	9 (M)	2	4	14 (S)	2	3	9 (M)
2	Increased fire hazards due to increased personnel and movement of people in and out of the area.	4	4	21 (H)	4	4	21 (H)	4	4	21 (H)	4	4	21 (H)	► Informal fires by personnel within the study area should be prohibited. ► If required, fires are only to be made within specific designated areas.	2	4	14 (S)	2	4	14 (S)	2	4	14 (S)	2	4	14 (S)
3	Collision of vehicles with faunal species.	5	2	16 (S)	5	4	23 (H)	5	4	23 (H)	5	3	20 (S)	► Enforce a speed limit for construction vehicles (e.g. 80km/h on main road and 40km/h within project area) along route alternatives in order to reduce collision of construction vehicles with fauna. ► Only essential staff members (e.g. security and maintenance) may travel at night, to reduce night time collisions with birds and other nocturnal faunal species.	3	2	8 (M)	3	4	18 (S)	3	4	18 (S)	3	3	13 (S)
4	Bird collisions with solar panels (solar panels create a glair or mirror affect which can disorientate birds) and power lines - although no high power lines forms part of the project design (assumed there will be a power line extending from the MV substation to the Eskom power line), the project does depend on an existing Eskom power line which needs to be taken into consideration.	5	3	20 (S)	5	4	23 (H)	5	4	23 (H)	5	3	20 (S)	► Consultation with the Percy FitzPatrick Institute at the University of Cape Town, should be undertaken regarding the conservation and mitigation of potential threats to the Ludwig's Bustard (*Neotis ludwigii*). ► Continue to raise awareness to stop hunting, and to encourage the public to report mortality from power lines etc. ► All new infrastructure (e.g. if power lines are to be used) should be sited and mitigated appropriately, and dangerous sections of line should be retrofitted with appropriate mitigation.	2	3	9 (M)	2	4	14 (S)	2	4	14 (S)	2	3	9 (M)
5	Loss of fauna diversity in the area due to an increase in human activity, loss of habitat and unsuitable / favourable conditions.	3	3	13 (S)	3	4	18 (S)	3	4	18 (S)	3	4	18 (S)	► "Natural" or "conservation significant" areas should be demarcated on all project plans as "no-go" areas. ► Employees and contractors must be made aware of the value of the natural environment. ► Upon finalisation of the project scale and infrastructure, it is recommended that the impact of the project on the local and regional fauna should be evaluated. After which, applicable mitigation measures should be established.	2	3	9 (M)	2	4	14 (S)	2	4	14 (S)	2	4	14 (S)

RECOMMENDATIONS

Finding a balance between economic growth and the protection of the environment will always remain a challenge. However, although all attempts should be made to support the growth of South African's economy, we must be aware that the integrity of our natural environment and its systems are vital to the survival of us all. Therefore, the common goal should be to promote sustainable economic growth while ensuring the protection of our natural resources and it's processes. To achieve this, the mitigation measures listed …… should be incorporated into the project design and implemented:

In conclusion, due to the **Bushmanland arid grassland being regarded as "Least Threatened**", with very little of the area being transformed, if the required mitigation measures are implemented and the boundary of the project is controlled it is not foreseen that a significant change in the surrounding ecology would occur. However, this depends on the scale and associated impacts of the project.

Based on the information available during the compilation of this report, it is recommended that project design Option 2 be implemented, as this will have the least impact on the fauna of the project area.

ADDITIONALLY ACCORDING TO THE :- AVIFAUNA Specialist Impact Assessment- APPENDIX A (DOC. REF: 2017/BES/SR/13)

7 Assessment of the proposed Brypaal Solar Power Project

7.1 Displacement due to disturbance associated with the construction and decommissioning of the solar plant and associated infrastructure (construction and de-commissioning)

The construction (and de-commissioning) of the PV plant and associated infrastructure will result in a significant amount of movement and noise, which will lead to displacement of avifauna from the development footprint. It is highly likely that most priority species potentially occurring on the site will vacate the development footprint for the duration of these activities.

7.2 Displacement due to habitat transformation associated with the PV plant and associated infrastructure (operation)

The construction of the PV plant and associated infrastructure will result in the radical transformation of the existing natural habitat. The vegetation will be cleared prior to construction commencing. Once operational, less sunlight will reach the vegetation below the solar panels, which is likely to result in stunted vegetation growth and possibly complete eradication of some plant species. The natural vegetation is likely to persist in the rows between the solar panels, but it will be different to what was available before the construction of the plant, in that it will be short grassland with few (if any) shrubs.

Small to medium-sized birds are often capable of surviving in small pockets of suitable habitat and are therefore generally less affected by habitat fragmentation than larger species. It is, therefore, possible that the smaller and medium-sized species (e.g. passerines) recorded at the site will continue to use the habitat available within the solar facility, albeit at reduced densities for some, especially as far as shrubland specialists are concerned e.g. Rufous-eared Warbler *Malcorus pectoralis*. Larger priority species which require contiguous, un-fragmented tracts of suitable habitat (e.g. large raptors, korhaans and bustards) are likely to occur at vastly reduced densities in the proposed plant or may even be totally displaced. The only larger priority species which was regularly encountered during surveys at the site, was the Karoo Korhaan. The species is described by Hockey *et al.* (2005) as "common and wide-spread in the Nama Karoo" and the impact of displacement on the regional population, should it occur, should therefore be minimal.

In the case of some priority raptors (e.g. Southern Pale Chanting Goshawk, Lanner Falcon and Pygmy Falcon) the potential availability of carcasses or injured birds due to collisions with the solar panels, and enhanced prey visibility (e.g. insects, reptiles and rodents) in the short grassland between the solar panels may attract them to the area. Jeal (2017) recorded large numbers of Barn Owls at the Bokpoort parabolic trough CSP facility near Groblershoop in the Northern Cape, roosting in the 'torque tubes' that support the parabolic mirrors – while this influx of owls may have been because of a lack of suitable roosting substrate in the surrounding range land, the enhanced prey visibility due to the sparse vegetation cover in the plant itself may also have played a role in attracting the owls. Greater Kestrel and Rock Kestrel could also be attracted to the solar panels as perches from where to hunt for rodent and insect prey. Cape Sparrows *Passer melanurus*, Laughing Doves *Spilopelia senegalensis* and other small birds will very likely attempt to nest underneath the solar panels to take advantage of the shade, but this should not adversely affect the operation of the equipment. The support frames and structures below the panels are probably to o low for Sociable Weavers to nest on them.Table 2 lists the priority species that could potentially be displaced due to habitat transformation2.

7.3 Collisions with the solar panels (operation)

The priority species that may possibly occur in the development area which could potentially be exposed to collision risk are listed in Table 2. In addition, the so-called "lake effect" could act as a potential attraction to waterbirds. It is not possible to tell whether this will happen until post-construction monitoring reveals actual mortality at the site, but the lack of major waterbodies with large waterbird populations in close vicinity to the proposed development area decreases the probability of the lake effect being a major source of mortality.

7.4 Entrapment in perimeter fences

Priority species such as Karoo Korhaan, Northern Black Korhaan, Kori Bustard and Ludwig's Bustard may be vulnerable to entrapment between double perimeter fences. The possibility of using a single perimeter fence should be investigated. Alternatively, the two fences should be placed far apart enough for birds to able to take off if they somehow end up between the two fences. In addition, staff should be sensitised to not panic birds when they discover them trapped between the fences bit to approach them with caution to give them time to escape by taking off in a lengthwise direction.

7.5 Impact on the solar infrastructure

An impact that could potentially materialise is the pollution of the solar panels by faecal deposits of large birds, particularly Pied Crows and raptors, if they regularly perch on the panels. It is expected that the regular cleaning and maintenance activities should prevent this from becoming a problem.

7.6 Assessment of the associated powerlines

7.6.1 Electrocutions

Given the clearance distances between the phases, the proposed 400kV power line should not pose an electrocution risk to avifauna regardless of the structure type which will be used. The approximate clearance distances (spacing) between phases typically ranges between 7m and 8.5m for the proposed tower types. Due to the large size of the clearances on most overhead lines of above 132kV, electrocutions are generally ruled out as even the largest birds cannot physically bridge the gap between dangerous components. It can therefore be concluded that electrocutions on the proposed 400kV grid connection should not be possible through conventional mechanisms, regardless of the tower type that will ultimately be used.

7.6.2 Collisions

See Table 2 for potential candidates for collision mortality in the Nama Karoo habitat on the proposed power line. The species most at risk will be Ludwig's Bustard, Kori Bustard and Karoo Korhaan.

7.7 Impact Rating Criteria

The impact criteria used to assess the potential impacts are set-out in detail below.

7.7.1 Method for Assessing the Significance of Potential Impacts

This section outlines the proposed method for assessing the significance of the potential environmental impacts. For each impact, the **EXTENT** (spatial scale), **MAGNITUDE** (severity of impact) and **DURATION** (time scale) are described.

These criteria are used to ascertain the **SIGNIFICANCE** of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The mitigation described represent the full range of plausible and pragmatic measures but does not necessarily imply that they would be implemented. The tables below indicate the scale used to assess these variables and defines each of the rating categories.

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	Regional	Beyond a 10km radius of the proposed site.
	Local	Within a 10km radius of the proposed site.
	Site specific	On site or within 100m of the proposed site.
Magnitude of impact (at the indicated spatial scale)	High	Natural and/ or social functions and/ or processes are *severely* altered
	Medium	Natural and/ or social functions and/ or processes are *notably* altered
	Low	Natural and/ or social functions and/ or processes are *slightly* altered
	Very Low	Natural and/ or social functions and/ or processes are *negligibly* altered
	Zero	Natural and/ or social functions and/ or processes remain *unaltered*
Duration of impact	Construction period	Up to 1 year
	Short Term	Up to 3 years after construction
	Medium Term	3-10 years after construction
	Long Term	More than 10 years after construction

The **SIGNIFICANCE** of an impact is derived by taking into account the temporal and spatial scales and magnitude. The means of arriving at the different significance ratings is explained in Table 6.

Table 5 Definition of significance ratings

SIGNIFICANCE RATINGS	LEVEL OF CRITERIA REQUIRED
High	▪ High magnitude with a regional extent and long-term duration ▪ High magnitude with either a regional extent and medium-term duration or a local extent and long-term duration ▪ Medium magnitude with a regional extent and long-term duration
Medium	▪ High magnitude with a local extent and medium-term duration ▪ High magnitude with a regional extent and construction period or a site-specific extent and long-term duration ▪ High magnitude with either a local extent and construction period duration or a site-specific extent and medium-term duration ▪ Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term ▪ Low magnitude with a regional extent and long-term duration

Low	▪ High magnitude with a site-specific extent and construction period duration ▪ Medium magnitude with a site-specific extent and construction period duration ▪ Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term ▪ Very low magnitude with a regional extent and long-term duration
Very low	▪ Low magnitude with a site-specific extent and construction period duration ▪ Very low magnitude with any combination of extent and duration except regional and long term
Neutral	▪ Zero magnitude with any combination of extent and duration

Once the significance of an impact has been determined, the **PROBABILITY** of this impact occurring as well as the **CONFIDENCE** in the assessment of the impact would be determined using the rating systems outlined in Table 7 and Table 8, respectively.

It is important to note that the significance of an impact should always be considered in conjunction with the probability of that impact occurring. Lastly, the **REVERSIBILITY** of the impact is estimated using the rating system outlined in Table 9.

Table 6: Definition of probability ratings

PROBABILITY RATINGS	CRITERIA
Definite	Estimated greater than 95 % chance of the impact occurring.
Probable	Estimated 5 to 95 % chance of the impact occurring.
Unlikely	Estimated less than 5 % chance of the impact occurring.

Table 7 Definition of confidence ratings

CONFIDENCE RATINGS	CRITERIA
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

Table 8:Definition of reversibility ratings

REVERSIBILITY RATINGS	CRITERIA
Irreversible	The activity will lead to an impact that is in all practical terms permanent.
Reversible	The impact is reversible within 2 years after the cause or stress is removed.

Table 9: Definition of irreplaceability ratings

IRREPLACEABILITY RATINGS	CRITERIA
Low	The affected resource is not unique and or does not serve an critical function or is degraded
Medium	The affected resource is moderately important in terms of uniqueness and function

	or in pristine condition
High	The affected resource is important in terms of uniqueness and function and or in pristine condition and warrants conservation / protection

7.8 Impact Tables

7.8.1 PV site

Displacement due to disturbance: PV site			
Construction phase			
	Preferred Alternative		No Go Alternative
Short description	Displacement of priority avifauna due to disturbance associated with the construction of the solar plant and associated infrastructure		The no-go option will result in no additional impacts on avifauna and will result in the ecological status quo being maintained
Assessment			
	Pre-Mitigation	Post Mitigation	
Nature	Negative	Negative	
Duration	Short term	Short term	
Extent	Site specific	Site specific	
Magnitude	High	Medium	
Probability	Probable	Probable	
Confidence	Sure	Sure	
Reversibility	Reversible	Reversible	
Resource irreplaceability	Low	Low	
Mitigatability	Low	Low	
Significance	Medium	Medium	
Mitigation	• Construction activity should be restricted to the immediate footprint of the infrastructure. • Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical. • The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.		
Cumulative Impact assessment	There are no planned or existing renewable energy facilities within a 30km radius around the proposed BSPP. The cumulative impact of displacement due to disturbance on priority species as a result of the project should therefore be very low.		

<table>
<tr><th colspan="4">Displacement due to habitat destruction: PV site</th></tr>
<tr><th colspan="4">Operational phase</th></tr>
<tr><th></th><th colspan="2">Preferred Alternative</th><th>No Go Alternative</th></tr>
<tr><td>Short description</td><td colspan="2">Displacement of priority avifauna due to habitat transformation associated with the PV plant and associated infrastructure</td><td>The no-go option will result in no additional impacts on avifauna and will result in the ecological status quo being maintained.</td></tr>
<tr><th colspan="4">Assessment</th></tr>
<tr><td></td><td>Pre-Mitigation</td><td>Post Mitigation</td><td></td></tr>
<tr><td>Nature</td><td>Negative</td><td>Negative</td><td></td></tr>
<tr><td>Duration</td><td>Long term</td><td>Long term</td><td></td></tr>
<tr><td>Extent</td><td>Site specific</td><td>Site specific</td><td></td></tr>
<tr><td>Magnitude</td><td>Medium</td><td>Low</td><td></td></tr>
<tr><td>Probability</td><td>Probable</td><td>Probable</td><td></td></tr>
<tr><td>Confidence</td><td>Unsure</td><td>Unsure</td><td></td></tr>
<tr><td>Reversibility</td><td>Partially reversible</td><td>Partially reversible</td><td></td></tr>
<tr><td>Resource irreplaceability</td><td>Medium</td><td>Medium</td><td></td></tr>
<tr><td>Mitigatability</td><td>Low</td><td>Low</td><td></td></tr>
<tr><td>Significance</td><td>High</td><td>Medium</td><td></td></tr>
<tr><td>Mitigation</td><td colspan="3">• The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of transformed areas is concerned.</td></tr>
<tr><td>Cumulative Impact assessment</td><td colspan="3">There are no planned or existing renewable energy facilities within a 30km radius around the proposed Brypaal Solar Project. The cumulative impact of displacement due to habitat transformation on priority species as a result of the project should therefore be very low as the footprint is small and there is abundant habitat available in the surrounding area.</td></tr>
</table>

Collisions with the solar panels: PV site		
Operational phase		
	Preferred Alternative	No Go Alternative
Short description	Collisions of priority avifauna with the solar panels resulting in the mortality of priority species.	The no-go option will result in no additional impacts on avifauna and will result in the ecological status quo being maintained.

Assessment		
	Pre-Mitigation	**Post Mitigation**
Nature	Negative	Negative
Duration	Long term	Long term
Extent	Site specific	Site specific
Magnitude	Low	Very low
Probability	Probable	Probable
Confidence	Unsure	Unsure
Reversibility	Reversible	Reversible
Resource irreplaceability	Low	Low
Mitigatability	Medium?	Medium?
Significance	Low	Very low
Mitigation	• No mitigation is required due to the very low expected magnitude	
Cumulative Impact assessment	There are no planned or existing renewable energy facilities within a 30km radius around the proposed BSPP. The cumulative impact of collision mortality on priority species as a result of the project should therefore be very low.	

Entrapment in perimeter fences: PV site			
Operational phase			
	Preferred Alternative		No Go Alternative
Short description	Entrapment in perimeter fences resulting in the mortality of priority species.		The no-go option will result in no additional impacts on avifauna and will result in the ecological status quo being maintained.
Assessment			
	Pre-Mitigation	**Post Mitigation**	
Nature	Negative	Negative	
Duration	Long term	Long term	
Extent	Local	Local	
Magnitude	Very low	Very low	
Probability	Probable	Unlikely	
Confidence	Unsure	Unsure	
Reversibility	High	High	
Resource irreplaceability	Low	Low	
Mitigatability	High	High	
Significance	Low	Very low	
Mitigation	A single perimeter fence should be used. Alternatively, the two fences should be at least 4 metres apart to allow medium to large birds enough space to take off.		
Cumulative Impact assessment	There are no planned or existing renewable energy facilities within a 30km radius around the proposed BSPP. The cumulative impact of mortality on priority species due to entrapment in fences as a result of the project should therefore be very low.		

Displacement due to disturbance: PV site			
Decommissioning phase			
	Preferred Alternative		No Go Alternative
Short description	The de-commissioning of the PV plant and associated infrastructure will result in a significant amount of movement and noise, which will lead to displacement of priority avifauna from the site due to disturbance. It is highly likely that most priority species will temporarily vacate the site footprint.		The no-go option will result in no additional impacts on avifauna and will result in the ecological status quo being maintained.
Assessment			
	Pre-Mitigation	Post Mitigation	
Nature	Negative	Negative	
Duration	Short term	Short term	
Extent	Site specific	Site specific	
Magnitude	High	Medium	
Probability	Probable	Probable	
Confidence	Sure	Sure	
Reversibility	Reversible	Reversible	
Resource irreplaceability	Low	Low	
Mitigatability	Low	Low	
Significance	Low	Low	
Mitigation	• Activity should be restricted to the immediate footprint of the infrastructure. • Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical. • The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the footprint and rehabilitation of disturbed areas is concerned.		
Cumulative Impact assessment	There are no planned or existing renewable energy facilities within a 30km radius around the proposed Brypaal Solar Project. The cumulative impact of displacement due to disturbance on priority species as a result of the project decommissioning should therefore be very low.		

7.8.2 Powerlines

Collisions: Grid connection			
Operational phase			
			No Go Alternative
Short description	Collisions of priority species with the earthwire of the proposed 400kV grid connection.		The no-go option will result in no additional impacts on avifauna and will result in the ecological status quo being maintained
Assessment			
	Pre-Mitigation	**Post Mitigation**	
Nature	Negative	Negative	
Duration	Long term	Long term	
Extent	Local	Local	
Magnitude	High	Medium	
Probability	Probable	Probable	
Confidence	Sure	Sure	
Reversibility	Low	Low	
Resource irreplaceability	High	High	
Mitigatability	Medium	Medium	
Significance	Low	Very Low	
Mitigation	The 400kV grid connection should be marked with Bird Flappers, on the earthwire for the entire length of the line.		
Cumulative Impact assessment	There are other HV lines present within the 30km radius around the proposed Brypaal Solar Power Project, either running to or from the Aries Substation which is situated approximately 50km south-east of the proposed solar development. The level of collision mortality on these lines is unknown, but it can be assumed that it is a regular occurrence. However, the short length of the proposed 400kV line should limit the potential for collision mortality, especially if properly mitigated with Bird Flight Diverters. The cumulative impact of the powerline in terms of potential collision mortality of priority species is therefore rated to be Low.		

7.9 Cumulative impacts

Cumulative effects are commonly understood to be impacts from different projects that combine to result in significant change, which could be larger than the sum of all the individual impacts. The assessment of cumulative effects therefore need to consider all renewable energy developments (wind and solar) within at least a 30-km radius of the proposed site. **In this instance, there are no renewable energy projects within a 30km radius around the proposed BSPP (DEA 2018). The cumulative impact of the proposed project is therefore considered to be Very Low, due to the small development footprint, which comprises only 0.1% of the available habitat in the 30km radius.**

7.10 No-Go Alternative

The no-go alternative will result in the current status quo being maintained as far as the avifauna is concerned. The low human population in the area is definitely advantageous to avifauna. The no-go option would therefore eliminate any additional impact on the ecological integrity of the proposed development area as far as avifauna is concerned.

8 CONCLUSIONS

The proposed BSPP will have some pre-mitigation impacts on avifauna at a site and local level which will range from High to Low.

The impact of displacement due to disturbance during the construction phase is rated as Medium and will remain at a Medium level after mitigation. The impact of displacement of priority species due to habitat transformation associated with the operation of the plant and associated infrastructure is rated as High. This impact can be partially reversed through mitigation, putting it at a Medium level, after mitigation.. The remaining envisaged impacts, i.e. mortalities in the operational phase due to collisions with the solar panels and entrapment in perimeter fences are both rated as Low and should be mitigatable to a Very Low level with appropriate mitigation. The impact of the **proposed 400kV grid connection** is assessed to be Low and can be further mitigated to a Very Low level, due to the **short length of the proposed overhead line.**

The **relatively small size of the footprint** leads one to the conclusion that the cumulative impact of the facility on priority avifauna should in all likelihood be Very Low, taking into account **the lack of other renewable projects within a 30km radius around the development area.**

From an avifaunal impact perspective, the proposed development could go ahead, provided the proposed mitigation measures are strictly implemented.

ASPECT	IMPACTS						
7. WILDLIFE							
Nature of the impact	Restoration of habitat. As rehabilitation progresses the habitat of certain species will be restored/created (Closure objective) Animals will probably only move back when human movement is limited.						
Extent	Site				Listed activity causing the impact:		
Duration	Short				GN325	GN327	GN324
Probability	Definite				1,9,15	12,13 14, 19	4
Significance	Low						
Phase responsible for the impact	Construction	Operational	Decommissioning	Closure			
	X	X					

ASPECT	IMPACTS						
8. SURFACE WATER							
Nature of the impact	Increased silt load. Clearing topsoil for footprint areas can increase infiltration rates of water to the groundwater system and decrease buffering capacity of soils to absorb contaminants from spills on surface. This can increase the risk of contamination of the groundwater system (increases aquifer vulnerability). The clearance of vegetation and the traffic on access roads will all contribute to an increase in the silt load on the project area.						
Extent	Local				Listed activity causing the impact:		
Duration	Short				GN325	GN327	GN324
Probability	Definite				1,9,15	12,13 14, 19	4
Significance	Low						
Phase responsible for the impact	Construction	Operational	Decommissioning	Closure			
	X	X					

<table>
<tr><td>ASPECT</td><td colspan="7">IMPACTS</td></tr>
<tr><td>8. SURFACE WATER</td><td colspan="7"></td></tr>
<tr><td>Nature of the impact</td><td colspan="7">Change in surface water quality.
Spillages from vehicles, diesel tanks lacking adequate bund walls, surface run-off (water, erosion, silt) that is not adequately diverted away from the PVSP project site.

Change in water quantity:
As this area is very small only (less than 1032 hectares) (10,3 km²) the impact of surface water will be very low in relation to the total drainage catchment surface area of 147 km² .

“Dirty / Clean” water systems at project site may impact on the quality of the surface water. The water should be contained in the surface runoff control measures provided therefore.</td></tr>
<tr><td>Extent</td><td colspan="4">Local</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Short</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">Low</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td></td><td></td></tr>
</table>

ADDITIONALLY ACCORDING TO THE :- Surface Water Assessment
APPENDIX A
(DOC REF: 2017/BES/SR/07)

Topographical features that need to be avoided **are “dry stream water courses**” that are draining towards the Salt River.

Executive Summary:

The topography on the site is rather uniform but does vary to some degree over the site. The site slopes from east to west and toward the Sout River. The site can be regarded as a plain with watercourses causing channels in the landscape. Small rocky outcrops are present but are not prominent land forms. Altitude varies from 880 m in the east to 845 m in the west and illustrates the gradual slope toward the river. Due to the increase in slope toward the river this area contains a high amount of seasonal and ephemeral streams and drainage lines.

Obligate wetland vegetation was utilised to determine the presence and border of wetlands. **The Sout River, streams and drainage lines are clearly defined and easily identifiable utilising the riparian vegetation.**

The study area contains a high amount of drainage lines and a few significant streams which drain into the Sout River. These drain from the plains south east of the river. The central significant stream has its origin within the site while the two significant streams adjacent to the northern and southern border only have their origins within the site. None of the streams or drainage lines contain any berms or artificial dams within their main channels. All watercourses within the site boundary as well as the Sout River are subjected to few impacts and are consequently considered to be largely natural. Due to the arid environment the riparian vegetation along the ephemeral stream and drainage lines are not the conventionally identified riparian species found in wetter eastern regions of the country but in this region can be reliably be considered obligate riparian species and utilised to identify watercourses. **As indicated by the vegetation no wetland conditions occur along the streams and drainage**

lines occurring on the site. **However, wetland conditions do occur in areas along the Sout River and although the river is not located on the site it may still be affected by the solar facility**. Riparian vegetation and topography allow easy identification of watercourses on the site. These watercourses also contain a distinct main channel which further simplifies identification.

No pans occur on the site. A small earth dam occurs in the northern corner of the site but is artificial and cannot be considered a pan system.

The tributaries of the Sout River and the river itself is subjected to very few impacts and is therefore considered as Largely Natural. **Those impacts that affect these watercourses include domestic stock farming with sheep, dirt track crossings and weirs upstream of the site**. Two small weirs upstream of the site has a limited impact on the Sout River. They will impact on the flow regime and sediment load of the river to some extent. A small dirt track also crosses the river. Due to the seasonal nature of the river it is unlikely to have a significant impact and will only affect the river during flooding events. The most significant impact would be associated with small livestock farming. This causes trampling of the catchment and riparian areas. The extent of this is also not large and the impact is not considered to alter the watercourses significantly. **Trampling by stock will contribute sediment to the system**.

The Sout River is considered a fourth order watercourse and the ephemeral tributaries third order whilst the drainage lines flowing into these are then second order watercourses (see Figure 1). The quaternary catchment of this area is D53H. No significant impacts affect the river systems in the area. An Index of Habitat Integrity (IHI) was conducted for the South River and the significant streams in the study area (Appendix C). The results of the IHI indicated the Sout River and its tributaries has an Instream and Riparian IHI of Category B: Largely Natural. This is due to few impacts altering the watercourses in this area.

The EI&S of the floodplains associated with the Sout River has been rated as being High: Floodplains that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers. This is largely due to the **Sout River being listed as a National Freshwater Ecosystems Priority Area (NFEPA) Upstream system** which is considered important to the functioning of the Orange River. The Soutriver flows in to the Hartbees River, also an Upstream NFEPA system, approximately 20 km upstream of the confluence with the Orange River. The river also has a high IHI which contributes to the EI&S.

The proposed solar facility will undoubtedly cause several significant impacts on the Sout River and its tributaries. As a result strict mitigation measures will have to be implemented to ensure that these impacts are kept to a minimum. Predicted impacts include increased sedimentation due to increased erosion, increased establishment of exotic invaders and some alteration to flood and flow regimes.

Discussion and conclusions

The **vegetation type occurring in the study area is Bushmanland Arid Grassland (NKb 3).** According to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) this vegetation type is considered to be of **Least Concern (LC)** (Map 3). It is not currently subjected to any pronounced transformation or development pressures. However, recently this area has been subjected to a high amount of solar project application and this may cause significant transformation pressures.

During the site survey several protected species were also noted to occur within the study area. These include Avonia albissima, Lithops julii subsp. fulleri, Aloe variegata, Hoodia gordonii and Euphorbia spinea.

The topography on the site is rather uniform but does vary to some degree over the site. The site slopes from east to west and toward the Sout River. The site can be regarded as a plain with watercourses causing channels in the landscape. Small rocky outcrops are present but are not prominent land forms. Altitude varies from 880 m in the east to 845 m in the west and illustrates the gradual slope toward the river. Due to the increase in slope toward the river this area contains a high amount of seasonal and ephemeral streams and drainage lines (Map 2 & 3).

Obligate wetland vegetation was utilised to determine the presence and border of wetlands. The Sout River, streams and drainage lines are clearly defined and easily identifiable utilising the riparian vegetation.

The study area contains a high amount of drainage lines and a few significant streams which drain into the Sout River (Map 2 & 3). These drain from the plains south east of the river. The central significant stream has its origin within the site while the two significant streams adjacent to the northern and southern border only have their origins within the site. None of the streams or drainage lines contain any berms or artificial dams within their main channels. All watercourses within the site boundary as well as the Sout River are subjected to few impacts and are consequently considered to be largely natural. Due to the arid environment the riparian vegetation along the ephemeral stream and drainage lines are not the conventionally identified riparian species found in wetter eastern regions of the country but in this region can be reliably be considered obligate riparian species and utilised to identify watercourses. **As indicated by the vegetation no wetland conditions occur along the streams and drainage lines occurring on the site**. However, wetland conditions do occur in areas along the Sout River and although the river is not located on the site it may still be affected by the solar facility. Riparian vegetation and topography allow easy identification of watercourses on the site. These watercourses also contain a distinct main channel which further simplifies identification.

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The proposed solar facility will undoubtedly cause several significant impacts on the Sout River and its tributaries. As a result strict mitigation measures will have to be implemented to ensure that these impacts are kept to a minimum. **Predicted impacts include increased sedimentation due to increased erosion, increased establishment of exotic invaders and some alteration to flood and flow regimes.**

The solar facility will likely require levelling of the layout area. This will require some drainage lines being levelled or disturbed through construction (Map 2). The construction phase will disturbed the soil surface and will allow sediments to be mobilised by runoff which will then increase the sediment load within the ephemeral streams and ultimately the Sout River. **The disturbance of the drainage lines will also increase the sediment load**. It is therefore important to limit the sediment input to the ephemeral streams and Sout River. Measures which can be utilised should include **contouring the site so that runoff velocity is decreased and contours can also be bermed to capture sediment.** Furthermore it is recommended that attenuation structures be implemented where affected drainage lines enter the ephemeral streams. The c**entral significant stream will be excluded from the site** as per layout plans. However, the upstream section of the stream will be included in the layout and here attenuation structures should also be implemented.

Due to the disturbance caused by construction coupled with the sandy soils of the area **erosion monitoring** will have to form a critical part of the construction and operational phases. Adequate erosion measures will have to be implemented where this is necessary.

Within the study area survey it was determined that the exotic invader, Mesquite Tree (Prosopis glandulosa), occurs sporadically within the study area . Disturbance during construction is likely to cause susceptible condition for increased establishment of this exotic. The ability of the species to invade watercourses in this arid region is well known, i.e. Ongers River, and this should be prevented. It is therefore recommended that **all specimens on the site be removed prior to construction and that monitoring of establishment of the species on the site be done throughout the operational phase**. Any seedlings or established trees should be removed throughout the operational phase. Although the Sout River does not form part of the site it should also be monitored as there is a high risk that specimens from the site may invade this watercourse.

Due to the clearing of vegetation, levelling of the site, contouring and attenuation structures the runoff will be altered and in so doing the input volumes into the ephemeral streams and Sout River. This will therefore alter the flow regime within these watercourses.

During previous studies (Burch et al 2014), it has been shown that **through construction soil compaction occurs which decreases infiltration and increases runoff**. Furthermore, the rain shadow caused by the panels cause an are not utilised for infiltration thus increasing runoff. This will also affect the inflow into the ephemeral streams and thus alter the flow regime.

As per the layout plans it is also recommended that **the central, significant ephemeral stream be excluded from the facility.**

<table>
<tr><td>ASPECT
9. GROUND WATER</td><td colspan="7">IMPACTS</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">Reduction of groundwater quality

The proposed PVSP project activities are not likely to impact on local ground-water quality.
All project components forms part of a closed system.

Storage of diesel/lubricants/oil, etc. will be done within bunded facilities. Therefore other than accidental spillages form vehicles/earthmoving equipment/storage facilities, PVSP facility breakages no further impact that could infiltrate and contaminate of the groundwater system is foreseen.</td></tr>
<tr><td>Extent</td><td colspan="4">Site</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Long</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">Low to Moderate</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td></td><td></td></tr>
</table>

<table>
<tr><td>10. GROUND WATER</td><td colspan="7">IMPACTS</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">Process water for PVSP facility:

Water from a desalination plant (to be constructed) (river water) and water abstracted from newly drilled boreholes on the farm and stored in a reservoir/tank facility.

Water will be used for abstracted from a borehole for dust suppression on the roads and potable water will be brought in with a tanker.</td></tr>
<tr><td>Extent</td><td colspan="4">Site</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Long</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">High</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td></td><td></td></tr>
</table>

ADDITIONALLY ACCORDING TO THE :- Geohydrological Assessment
APPENDIX A
(DOC REF: 2017/BES/SR/08)

CONCLUSION:

• The study area is located within the Lower Orange Management Area, Quaternary Drainage Area D53H. The non-perennial Sout river lays to the north-eastern boundary and run-off is in a north –eastern direction towards the Sout river.

• Groundwater occurs in zones of weathering and in fractures or in the contact zones between different lithology's, such as granodiorite, granite, pegmatite and gneiss of the Keimoes Suite (Me), **Yield is generally less than 0.5 l/s.** Groundwater can be exploited from joints and fractures in calcsilicates and sub ordinated quartzites of the Geelvloer Group (Mgv). The calc silicates have known karstic aquifer properties and are not likely to facilitate groundwater occurrence. …………

• The aquifer(s) of the area under investigation is classified as a poor aquifer according to the map of Aquifer Classification of South Africa, 2012 ………..

• The aquifer susceptibility index is classed as low vulnerability …….

• The aquifer vulnerability for the study area indicates the least tendency for contamination if pollutants are discharge or leeched over the long term ………….

• The water quality of sampled sites Breipaal I, Breipaal II and Breipaal III is classified as above the recommended standard and are not suitable for human consumption. These sites are classified above the recommended standard due to very high EC, TDS, Na, Ca,Cl, S04 and F concentrations.

ASPECT	IMPACTS						
11. AIR QUALITY							
Nature of the impact	Dust will be generated during the initial site preparation and construction phase (18 months) of the PVSP project (loading with an excavator on to a dump truck) and transportation on site/gravel/dirt/farm roads. Maintenance of the road would be a priority. Initial construction work with regard to infrastructure that involves the use of earth moving equipment. During the operational phase (20-25 years) dust could be generated by vehicles travelling on the public gavel road that will possible have an impact on the keeping the PVSP facility clean.						
Extent	Site				Listed activity causing the impact:		
Duration	Short-Long				GN325	GN327	GN324
Probability	Definite				1,9,15	12,13 14, 19	4
Significance	Low						
Phase responsible for the impact	Construction	Operational	Decommissioning	Closure			
	X	X					

ADDITIONALLY ACCORDING TO THE :- Surface Water Assessment APPENDIX A (DOC REF: 2017/BES/SR/07)

Impact 3: Dust generation **Impact Nature:** This activity entails the operation of vehicles on site and their associated dust generation.		
Without Mitigation		**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Short (2)	Short (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	MEDIUM (40)	LOW (18)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation	***Ensure that road surfaces are moist during maximum vehicle movement periods. Use existing roads as far as possible and minimise impact on undisturbed ground.***	
Cumulative Impacts	The cumulative impact of this activity will be small if managed but can have widespread impacts if ignored.	
Residual Impacts	Minor residual risks: with adequate mitigation dust generation will be low and relatively localised.	

ASPECT	IMPACTS						
12. NOISE POLLUTION							
Nature of the impact	Generators, vehicles, trucks, earth-moving equipment construction equipment, etc. will generate noise , especially during the construction phase. Reverse warning alarms on earthmoving machines is a main source of nuisance and noise pollution. The operational phase the noise will be restricted to the immediate worker environment at the PV solar facility and vehicles traveling the existing provincial road. The PVSP project site will be constructed within a rural landscape with dwellings located further than 280m south , 482m and 391m west from site. The impact would also be of importance regarding the direct worker environment that should adhere to the requirements in terms of the Occupational Health and Safety Act.						
Extent	Local				Listed activity causing the impact:		
Duration	short				GN325	GN327	GN324
Probability	Definite				1,9,15	12,13 14, 19	4
Significance	Low						
Phase responsible for the impact	Construction	Operational	Decommissioning	Closure			
	X	X					

<table>
<tr><td>ASPECT</td><td colspan="7">IMPACTS</td></tr>
<tr><td>13. ARCHAEOLOGICAL AND CULTURAL SITES</td><td colspan="7">There are no known sites graves on the proposed PVSP project site (preferred alternative 1). The majority of surface area is already disturbed by agricultural activities.</td></tr>
<tr><td>Nature of the impact</td><td colspan="7"></td></tr>
<tr><td>Extent</td><td colspan="4">N/A</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">N/A</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">N/A</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">None</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

ADDITIONALLY ACCORDING TO THE :- Heritage Impact Assessment
APPENDIX A
DOC REF:(2017/BES/SR/09)

Potential Impact

The development footprint is sited approximately 500 meters away from feature 1 resulting in no direct impact on the site (Figure 22). Furthermore, two find spots (Field number 707 & 708) is also located outside of the development footprint. Therefore, the impact on heritage sites by the proposed development is considered low. Any direct impacts that may occur would be during the construction phase only and would be of very low significance. Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. This and other projects in the area could have an indirect impact on the heritage landscape.

1 Pre-Construction phase: It is assumed that the pre-construction phase involves the removal of topsoil and vegetation as well as the establishment of infrastructure needed for the construction phase. These activities can have a negative and irreversible impact on heritage sites. Impacts include destruction or partial destruction of non-renewable heritage resources.

2 Construction Phase

During this phase, the impacts and effects are similar in nature but more extensive than the pre-construction phase. These activities can have a negative and irreversible impact on heritage sites. Impacts include destruction or partial destruction of non-renewable heritage resources.

3 Operation Phase: No impact is envisaged for the recorded heritage resources during this phase.

Table 6. Impact table – Archaeological heritage resources. ***Nature:*** During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological material or objects.		
Without mitigation		**With mitigation (Preservation/ excavation of site)**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (2)
Probability	Not probable (2)	Not probable (2)
Significance	**16 (Low)**	**16 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	No resources were recorded	No resources were recorded.
Can impacts be mitigated?	Yes, a chance find procedure should be implemented.	Yes
Mitigation: A Chance Find Procedure should be implemented for the project should any sites be identified during the construction process.		
Residual Impacts: If sites are destroyed this results in the depletion of archaeological record of the area. However, if sites are recorded and preserved or mitigated this adds to the record of the area.		

Figure 22. Development footprint in relation to the recorded sites.

Recommendations and conclusion

In terms of the archaeology component of Section 35 of the NHRA several Middle Stone Age flakes were found scattered over the area in low densities. According to Beaumont et al (1995) "thousands of square kilometres of Bushmanland are covered by a low density lithic scatter". These artefacts are referred to as background scatter or occurrences and of low heritage significance. **In addition to these low density scatters a distinct archaeological site (Feature 1) of significance was identified at 29° 12' 21.6829" S, 20° 21' 49.8601" E.** The site consists of several small stone packed circles with a high density of lithic scatters, ostrich eggshell (some are burned) and bone fragments. The site is tentatively classified as belonging to the informally named ceramic final Later Stone Age dating to ≤ 2000 years. **The site is located approximately 500 meters to the south of the development footprint and will not be impacted on.** The paleontological component was addressed by Van Deventer (2017), he concluded: "The main time frames for fossils in South Africa are the Carboniferous (Karoo), Cretaceous and Cainozoic (Tertiary and Quaternary periods) .

There are no Carboniferous or Cretaceous sediments present on the Brypaal site under discussion.

The Tertiary and Quarternary period sediments are typical calcretes and aelolian sands and to a lesser extent some fluvial sediments on the Brypaal site.

During deep excavations of >46 profile pits to a maximum depth of 3.5 m and surface geological mapping, **no micro-organism, fauna or flora fossils were observed in neither the calcretes or the aeolian or fluvial sediment."**

In terms of the built environment of the area (Section 34), **no standing structures older than 60 years occur within the study area.** In terms of Section 36 of the Act no burial sites were recorded. If any graves are located in future they should ideally be preserved in-situ or alternatively relocated according to existing legislation. **No public monuments** are located within or close to the study area. The study area is surrounded by residential developments and road infrastructure developments and the proposed development will not impact negatively on significant cultural landscapes or viewscapes. During the public participation process conducted for the project no heritage concerns was raised.

The impact of the proposed project on heritage resources is considered low and it is recommended that the proposed project can commence on the condition that the following recommendations are implemented as part of the EMPr and based on approval from SAHRA.

• Implementation of a chance find procedure.

• Although the Later Stone Age site (Feature 1) will not be impacted on directly the site should be preserved with a 50-m buffer zone.

Reasoned Opinion

The impact of the proposed project on heritage resources is considered low and no further pre-construction mitigation in terms of archaeological resources is required based on approval from SAHRA. Furthermore, the socio-economic benefits also outweigh the possible impacts of the development if the correct mitigation measures (i.e. chance find procedure and avoidance of sites) are implemented for the project.

<table>
<tr><td>ASPECT
14. SENSITIVE LANDSCAPE</td><td colspan="7">IMPACTS</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">No sensitive landscapes identified on the site.</td></tr>
<tr><td>Extent</td><td colspan="4">Not applicable</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Not applicable</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Not applicable</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">Not applicable</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

<table>
<tr><td>ASPECT
15.VISUAL ASPECTS</td><td colspan="7">IMPACTS</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">For more info see next page.</td></tr>
<tr><td>Extent</td><td colspan="4">Site</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Short</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">Moderate</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td></td><td></td></tr>
</table>

ADDITIONALLY ACCORDING TO THE :- Visual Impact Assessment
APPENDIX A
DOC REF:(2017/BES/SR/14)

Visual Impact Assessment Methodology

The Environmental Impacts Assessment methodology that will be used in the evaluation of the overall effect of a proposed activity on the environment includes an assessment of the significance of direct, indirect, and cumulative impacts in terms of the following criteria:

- The **nature** of the impact, cause of impact, what will be affected and how it will be affected.
- The **extent** of the impact (local, regional, national, or international). A value between 1 and 5 must be assigned as appropriate, with 1 being low and 5 being high.
- Impact **duration**
  - Very short-term (0-1 years) with a score of 1;
  - Short-term (2-5 years) with a score of 2;
  - Medium-term (5-15 years) with a score of 3;
  - Long-term (>15 years) with a score of 4;

- Permanent, with a score of 5.

- **Probability**
  - Very improbable (probably will not happen = 1);
  - Improbable (some possibility, but low likelihood = 2);
  - Probable (distinct possibility = 3);
  - Highly probable (most likely = 4);
  - Definite (impact will occur regardless of any prevention measures = 5).

- **Magnitude** scale
  - Small magnitude with no effect on the environment = 0;
  - Minor magnitude and will not result in an impact on processes = 2;
  - Low magnitude and will cause a slight impact on processes = 4;
  - Moderate magnitude and will result in processes continuing but in a modified way = 6;
  - High magnitude and therefore processes are altered to the extent that they must be ceased temporary = 8;
  - Very high magnitude with complete destruction of patterns and permanent cessation of processes = 10.

- The **status** can be described as either positive, negative or neutral.
- The **significance** can be described as **LOW**, **MEDIUM,** or **HIGH**, and are calculated through:

$$S=(E+D+M)P$$

Where:

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

S = <30	LOW	The impact would not have a direct influence on the decision to develop in the area.
S = 30-60	MEDIUM	The impact could influence the decision to develop in the area unless it is effectively

S = >60	HIGH	mitigated. The impact must have an influence on the decision process to develop in the area.

According to the Department of Environmental Affairs and Development Planning, an impact can be defined as: “A description of the effect of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined space and time” (Oberholzer, 2005).

Identification of Potential Impacts and Associated Activities

The following impacts were identified as major impacts and will be assessed for the construction, operational and closure phases of development.

CONSTRUCTION PHASE

Potential Impact: Dust caused by materials haulage to and from the site.

Recommended mitigations:

- Access road should be kept clean and dust generation should be minimised during construction.
- Surface material should be conserved for the use of rehabilitation or site development, and the surplus should be disposed of in a manner that appears natural.
- The laydown area needs to be protected against dust generation and also screened with shade cloth (if required).
- Site offices and structures to be kept to single-storey constructions and colours of buildings should reflect the colours of the surrounding vegetation and/or soil. Roofs should be non-reflective and preferred grey, while door and window frames should reference the roof or wall colours.
- All footprint areas impacted during construction should be rehabilitated and restored to previous natural state.
- Fencing should be located as close as possible to the PV site and are preferred to be grey in colour. Natural waterways and drainage lines, identified as sensitive, should not be fenced, if possible.
- It is recommended that the Fixed Tilt structure option be used, in order to limit the reflecting of sunlight off the panels, which will create a glint and glare impact.

Construction Impact 1: Hauling and delivery of construction material

Impact Nature: Hauling and delivery of construction material.		
	Without Mitigation	**With Mitigation**
Extent	National (3)	Regional (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Highly probable (4)
Significance	MEDIUM (55)	MEDIUM (32)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No

Mitigation	With good traffic management and the use of local manufacturers, traffic can be limited to a minimum. It is also important to keep the local people informed at all times.

Construction Impact 2: Locating access road off existing road

Impact Nature: Locating access road off existing road.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	MEDIUM (48)	LOW (27)
Status	Negative	Neutral
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Mitigation	Upgrade road junctions as required and rehabilitate and restore as part of closure and EMPr.	

Construction Impact 3: Visual disturbance of proposed development area

Impact Nature: Visual disturbance of proposed development area.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	MEDIUM (48)	LOW (27)
Status	Negative	Neutral
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Mitigation	Screen site, operate within the Construction Industry Management Guidelines and ensure dust control.	

Construction Impact 4: Construction of associated infrastructure

Impact Nature: Construction of associated infrastructure.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	Highly-probable (4)
Significance	HIGH (70)	MEDIUM (44)
Status	Negative	Neutral
Reversibility	Low	Moderate
Irreplaceable loss of resources	No	No
Mitigation	Use of local materials for building purposes. Ensure that buildings blend in with surrounding environment. Ensure dust control during construction of associated infrastructure.	

Construction Impact 5: Movement of construction vehicles with lights

Impact Nature: Movement of construction vehicles with lights		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Highly probable (4)
Significance	MEDIUM (45)	LOW (28)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Mitigation	No working after sundown.	

OPERATIONAL PHASE

Potential Impacts: Lights at night and movement of maintenance vehicles.

Recommended mitigations:

- Within the requirements of safety and efficiency, all lighting should be kept to a minimum.
- If should lighting is required, low-level lighting should be used. Low-level lighting is shielded for the purpose of reducing light spillage and pollution.
- No naked light sources should be directly visible from a distance. Only reflected light should be visible from outside the site.
- As per the relevant authority requirements, aircraft warning lights are to be installed.
- Light spillage and pollution are to be kept as a minimum by making use of shielded down-lighters for external lighting.
- Security and perimeter lighting must also be shielded for no light to fall outside the area needed to be lit.

Operational Impact 1: Site buildings and perimeter fence

Impact Nature: Site buildings and perimeter fence		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Highly probable (4)
Significance	MEDIUM (60)	MEDIUM (36)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Mitigation	Manage lighting. Good management practices.	

Operational Impact 2: Maintain visitors using access road

Impact Nature: Maintain visitors using access road.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	MEDIUM (32)	LOW (21)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Mitigation	Good management practices. In order to keep visiting umbers at a minimum, repairs must be carried out promptly and the premises and accommodating infrastructure must be kept tidy.	

Operational Impact 3: Impact of the development on the affected receptors

Impact Nature: Impact of the development on the affected receptors.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	Highly probable (4)
Significance	High (65)	Medium (44)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Mitigation	Keep noise and light pollution at a minimum through the implementation of protocols and guidelines. Optimise planning and management to keep the number of permanent workers at a minimum. Ensure optimised locality selection to ensure minimal visibility.	

CLOSURE PHASE

Potential Impact: All PV structures and associated structures and fencing need to be removed. Rehabilitation to natural state.

Recommended mitigations:

- All PV structures and associated structures and fencing must be removed and recycled.
- Ripping and rehabilitation of all internal roads.
- Rehabilitation of all impacted footprint areas. It is important that the area is restored to its original, natural state.

Closure Impact 1: Removal of PV structures and associated infrastructure.

Impact Nature: Removal of PV structures and associated infrastructure.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Short-term (2)
Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	Highly probable (4)
Significance	MEDIUM (60)	Medium (36)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Mitigation	All PV structures and associated infrastructure must be removed and all materials be recycled. After the removal of all structures rehabilitation and restoration of the entire area is required.	

Closure Impact 2: Removal of existing access road

Impact Nature: Removal of existing access road.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Highly probable (4)
Significance	MEDIUM (50)	LOW (28)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Mitigation	As part of the closure plan, access roads must be ripped, rehabilitated and restored.	

CUMULATIVE VISUAL IMPACTS

Cumulative Impact 1: The proposed project setting a precedent in the area resulting in possible landuse conflicts related to rapid and large-scale landscape changes

Impact Nature: *The proposed project setting a precedent in the area resulting in possible landuse conflicts related to rapid and large-scale landscape changes*		
	Without Mitigation	**With Mitigation**
Extent	Regional (2)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	MEDIUM (52)	LOW (27)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No

Cumulative impacts would be generated by new transmission lines, substations and access roads which will be associated with the new development. The construction period could have an increased impact due to longer timeframes, road access junctions will be more prone to impacts and lay-down areas may be more visible. Once operational, these facilities would not promote noticeable additional traffic movement. Mitigations would include encouraging the municipality to set up a planning committee which includes renewable developers, I&AP's and Local Authority which is tasked with addressing the issue of possible landuse conflicts related to rapid and large-scale landscape change around Kakamas.

Conclusion

The construction and operation of the proposed PV Solar Facility and its associated infrastructure will have a visual impact on the natural scenic resources and rural of the immediate context, only within the limited view corridors within 0.5 km range of the proposed facility and from viewpoint 2. **The moderating factors of the visual impact of the facility on the close range are the following:**

- **The entire site cannot be viewed at once due to the topography.**
- **The orientation of the panels. North-facing PV viewed from the south from viewpoint 2.**

In light of the above-mentioned factors that reduce the impact of the facility, the visual impact is assessed as medium visual impact.

The author is of the opinion that the facility has an advantage over the more conventional power generation plants (for instance coal-fired power stations) as it utilizes a renewable source of energy which is considered as an international and national priority to generate power and is therefore generally perceived in a more favourable light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers.

The project is deemed to be feasible from a visual impact assessment perspective and the following recommendations are made for the proposed PV Solar Power Facility:

- **The exterior of the invertor housing should be dark grey in order to reduce the visual impact of the structures.**
- **Mast of less than 15 m high is situated adjacent to the pylons and specified as a lattice structure if possible.**
- **The Betafence: Nylofor medium is the preferred option finished in a dark grey colour to a maximum height of 2030 mm.**

<table>
<tr><th>ASPECT</th><th colspan="7">IMPACTS</th></tr>
<tr><td>15. SOCIO-ECONOMICS</td><td colspan="7"></td></tr>
<tr><td>Nature of the impact</td><td colspan="7">Increase in Socio – economic activity at local level.

The project in itself would ensure that approximately 300 workers would be assured of a job during the construction phase of the project. The operational phase will require probable 20 - 30 workers in total. The majority will be responsible for regular maintenance work.

Job creation plays a major role in increasing the economic wellbeing of employees and their dependants in the Kakamas area (District: ZF Mgcawu district).

The increase in socio-economic activity will add to the current growth and development in Kakamas already created by similar solar projects.</td></tr>
<tr><td>Extent</td><td colspan="4">Local</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Long (20 -25year project)</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">High</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td></tr>
</table>

ADDITIONALLY ACCORDING TO THE : SOCIAL IMPACT ASSESSMENT APPENDIX A (DOC.REF:2017/BES/SR/11)

SUMMARY OF KEY FINDINGS

The assessment section is divided into:

- Assessment of compatibility with relevant policy and planning context (“planning fit”);
- Assessment of social issues associated with the construction phase;
- Assessment of social issues associated with the operational phase;
- Assessment of social issues associated with the decommissioning phase;
- Assessment of power line alignments;
- Assessment of the “no development” alternative;
- Assessment of cumulative impacts.

POLICY AND PLANNING ISSUES

The findings of the review indicate that renewable, including solar energy, is strongly supported at a national, provincial and local level. At a national level the While Paper on Energy Policy (1998) notes:

- Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future;
- The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly ***solar*** and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

The development of and investment in renewable energy is also supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all make reference to renewable energy.

The proposed SEF also supports a number of objectives contained in the NCP Provincial Growth and Development Strategy and the ZFMDM and KGLM IDP, specifically promotion of socio-economic development, SMME's, job creation and private sector investment. The findings of the SIA also indicate that unemployment and poverty levels in the study area are high. In this regard the proposed SEF has the potential to support local economic development and create employment opportunities. The proposed development therefore supports a number of key objectives contained in the KGLM IDP. The KGLM also identifies solar energy as a growth opportunity within the local economy.

The findings of the review of the relevant policies and documents pertaining to the energy sector therefore indicate that solar energy and the establishment of suitably sited solar energy facilities is supported at a national, provincial, and local level. It is therefore the opinion of the authors that the establishment of a SEF in the area is supported by national, provincial and local policies and planning documents.

CONSTRUCTION PHASE

The key social issues associated with the construction phase include:

Potential positive impacts

- **Creation of employment and business opportunities, and the opportunity for skills development and on-site training.**

Based on information from other SEF projects, the construction phase for a 100 MW CSPF is expected to extend over a period of 14-18 months and create approximately 300 employment opportunities, depending on the final design. Of this total ~ 60% (180) will be available to low-skilled workers (construction labourers, security staff etc.), 25% (75) to semi-skilled workers (drivers, equipment operators etc.) and 15% (45) to skilled personnel (engineers, land surveyors, project managers etc.). The total wage bill for the construction phase is estimated to be in the region of R 50 million (2017 rand value). The majority of the employment opportunities, specifically the low and semi-skilled opportunities, are likely to be available to local residents in the area, specifically residents from Keimoes and Kakamas. The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. This would represent a significant positive social benefit in an area with limited employment opportunities. However, in the absence of specific commitments from the developer to employ local contractors the potential for meaningful skills to local employment targets the benefits for members from the local communities may be limited. In addition, the low education and skills levels in the area may also hamper potential opportunities for local communities.

The potential benefits for local communities is confirmed by the findings of the Overview of the Independent Power Producers Procurement Programme (IPPPP) undertaken by the Department of Energy, National Treasury and DBSA (30 September 2016). The study found that employment opportunities created during the construction phase of the projects implemented to date had created 61% more jobs than anticipated. The study also found that significantly more people from local communities were employed during construction than was initially planned. In this regard the expectation for local community participation was 6 771 job years. To date 15 215 job years have been realised (i.e. 125% greater than initially planned). Black South African citizens, youths and rural or local communities have been the major beneficiaries during the construction phases, as they respectively represent 80%, 41% and 52% of total job opportunities created by IPPs to date.

The capital expenditure associated with the construction phase will be in the region of R 2.5 billion (2017 rand value). A percentage of the wage bill will also be spent in the local economy which will create opportunities for local businesses in Kakamas, Keimoes and Upington. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site.

Potential negative impacts

- Impacts associated with the presence of construction workers on local communities;
- Impacts related to the potential influx of job-seekers;
- Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site;
- Increased risk of grass fires associated with construction related activities;
- Noise, dust and safety impacts of construction related activities and vehicles;
- Impact on productive farmland.

The significance of the potential negative impacts with mitigation was assessed to be of Low significance. All of the potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. In addition, if the majority of the low and semi-skilled construction workers are sourced from the local area the potential risk to local family structures and social networks is regarded as low. However, the impact on individuals who are directly impacted on by construction workers (i.e. contract HIV/ AIDS) was assessed to be of Medium-High negative significance.

Table 1 summarises the significance of the impacts associated with the construction phase.

Table 1: Summary of social impacts during construction phase Impact	**Significance No Mitigation**	**Significance With Mitigation**
Creation of employment and business opportunities	Medium (Positive impact)	Medium (Positive impact)
Presence of construction workers and potential impacts on family structures and social networks	Medium (Negative impact for community as a whole)	Low (Negative impact for community as a whole)
Influx of job seekers	Low (Negative impact for community as a whole)	Low (Negative impact for community as a whole)
Safety risk, stock theft and damage to farm infrastructure associated with presence of construction workers	Medium (Negative impact)	Low (Negative impact)
Increased risk of veld fires	Medium (Negative impact)	Low (Negative impact)
Impact of heavy vehicles and construction activities	Medium (Negative impact)	Low (Negative impact)
Loss of farmland	Medium (Negative impact)	Low (Negative impact)

OPERATIONAL PHASE

Potential positive impacts

- **The establishment of infrastructure to generate renewable energy;**
- **Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;**
- **Benefits associated with the establishment of a Community Trust;**
- **Generation of income for affected landowner/s.**

Development of renewable energy infrastructure

The establishment of renewable energy infrastructure, such as the proposed Brypaal CSPF, should be viewed, firstly within the context of the South Africa's current reliance on coal powered energy to meet the majority of its energy needs, and secondly, within the context of the success of the REIPPPP.

The Green Jobs study (2011) notes that South Africa has one of the most carbon-intensive economies in the world, thus making the greening of the electricity mix a national imperative. The Greenpeace Report (Powering the future: Renewable Energy Roll-out in South Africa, 2013), notes that within a broader context of climate change, coal energy does not only have environmental impacts, it also has socio-economic impacts. Acid mine drainage from abandoned mines in South Africa impacts on water quality and poses the biggest threat to the country's limited water resources. Huge volumes of water are also required to wash coal and cool operating power stations.

The Green Jobs study (2011) identifies a number of advantages associated with wind power as a source of renewable energy, including zero carbon dioxide (CO2) emissions during generation and low lifecycle emissions. Greenhouse gases (GHG) associated with the construction phase are offset within a very short period of time compared with the project's lifespan. Wind power therefore provides an ideal means for reaching emission reduction targets in a relatively easy manner. In addition, and of specific relevance to South Africa, wind as energy source is not dependent on water (as compared to the massive water requirements of conventional power stations), has a limited footprint and therefore does not impact on large tracts of land, poses limited pollution and health risks, specifically when compared to coal and nuclear energy plants.

In terms of investment, the REIPPPP has attracted R53.4 billion in foreign investment and financing in the six bid windows (BW1 – BW4 and 1S2). This is more than double the inward FDI attracted into South Africa during 2015 (R22.6 billion). In terms of local equity shareholding, 47% (R31.5 billion) of the total equity shareholding (R66.7 billion) was held by South African's across BW1 to BW4 and BW1S2. As far as Broad Based Black Economic Empowerment is concerned, Black South Africans own, on average, 31% of projects that have reached financial close. The combined (construction and operations) procurement value for BW1 to BW4 and 1S2 is projected as R142.9 billion, of which R44.3 billion has been spent to date. In terms of employment, a total of 28 4842 job years2 have been created for South African citizens, of which 26 207 were in construction and 2 276 in operations.

The establishment of renewable energy facilities, such as the Brypaal CSP, therefore not only address the environmental issues associated with climate change and consumption of scarce water resources, but also creates significant socio-economic opportunities and benefits, specifically for historically disadvantaged, rural communities.

Creation of employment and business opportunities

The total number of permanent employment opportunities is estimated to be in the region of 20. Of this total ~ 12are low skilled workers, 6semi-skilled and 2skilled. The annual wage bill for the operational phase will be ~ R 3million (2017Rand value). The majority of the low and semi-skilled beneficiaries are likely to be historically disadvantaged (HD) members of the community. Given the location of the proposed facility the majority of permanent staff is likely to reside in the towns of Kakamas and Keimoes.

Procurement during the operational phase will also create opportunities for the local economy and businesses. In this regard the overview of the IPPPP (2016) notes that the procurement spend over the 20 year operational phase for BW1 to BW4 and 1S2 will be in the region of R 70 billion. The Green Jobs study (2011) also found that energy generation is expected to become an increasingly important contributor to green job creation over time, as projects are constructed or commissioned. The study notes that largest gains are likely to be associated with operations and maintenance (O&M) activities. In this regard, operations and maintenance employment linked to renewable energy generation plants will also be substantial in the longer term.

Community Trust

The establishment of a community benefit structure (typically, a Community Trust) also creates an opportunity to support local economic development in the area. The requirement for the project to allocate funds to socio-economic contributions (through structures such as Community Trusts) provides an opportunity to advance local community projects, which is guaranteed for a 20 year period (project lifespan). **The revenue from the proposed SEF can be used to support a number of social and economic initiatives in the area, including but not limited to:**

- **Creation of jobs;**
- **Education;**
- **Support for and provision of basic services;**
- **School feeding schemes;**
- **Training and skills development; and**
- **Support for SMME's.**

The 2016 IPPP Overview notes that to date (across 6 bid windows) a total contribution of R19.3 billion has been committed to Socio-economic Development (SED) initiatives linked to Community Trusts. Of this total commitment, R15.2 billion has been specifically allocated to local communities where the IPPs operate. The Green Jobs study (2011), found that the case for wind power is enhanced by the positive effect on rural or regional development. Wind farms located in rural areas create an opportunity to benefit the local and regional economy through the creation of jobs and tax revenues.
The long term duration of the contributions from the SEF also enables local municipalities and communities to undertake long term planning for the area. Experience has, however, shown that Community Trusts can be mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a Community Trust or other community benefit structure (entity). The REIPPP programme does however have stringent audit requirements in place to try and prevent the mismanagement of trusts.

Potential negative impacts

- Influx of job seekers to the area;
- Loss of productive agricultural land;
- The visual impacts and associated impact on sense of place;
- Potential impact on tourism.

The significance of the potential negative impacts with mitigation was assessed to be of Low significance. All of the potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented.

The visual impacts on landscape character associated with large renewable energy facilities, such as SEFs, are highlighted in the research undertaken by Warren and Birnie (2009). In the South African context, the majority of South Africans have a strong connection with and affinity for the large, undisturbed open spaces that are characteristic of the South African landscape. The impact of large, solar energy plants on the landscape is therefore likely to be a key issue in South Africa, specifically given South African's strong attachment to the land and the growing number of solar energy applications. However, in the case of the proposed CSPF the impact on the areas sense of place with mitigation is likely to be low. The significance of the impacts associated with the operational phase are summarised in Table 2.

Table 2: Summary of social impacts during operational phase Impact	Significance No Mitigation	Significance With Mitigation
Promotion of renewable energy projects	High (Positive impact)	High (Positive impact)
Creation of employment and business opportunities	Low (Positive impact)	Medium (Positive impact)
Establishment of Community Trust	Medium (Positive impact)	High (Positive impact)
Generate income for affected landowner/s	Low (Positive impact)	Medium (Positive impact)
Impact on agricultural land	Low (Negative impact)	Low (Negative impact)
Visual impact and impact on sense of place	Medium (Negative impact)	Low (Negative impact)
Impact on tourism	Low (Positive and Negative)	Low (Positive and Negative)

CUMULATIVE IMPACTS

Cumulative impact on sense of place

In addition to the proposed CSPF,one other SEF is proposed in the immediate vicinity of the site. In addition, a number of other SEFs are proposed to the vicinity of Kenhardt. The potential for cumulative impacts associated with combined visibility (whether two or more solar facilities will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more solar facilities along a single journey, e.g. road or walking trail) does therefore exist. However, with careful planning, the visual impacts associated with SEFs tend to be low. The visibility of the proposed SEFs will also be mitigated by the low-scale nature of SEFs. The potential cumulative impacts associated with combined visibility (whether two or more wind farms (solar facilities) will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more wind farms (solar facilities) along a single journey, e.g. road or walking trail) are therefore likely to be low. However, the potential impact of solar facilities on the landscape is an issue that does need to be considered, specifically given South African's strong attachment to the land and the growing number of solar plant applications. With regard to the area, a number of SEFs have been proposed in the NCP. The Northern Cape Environmental Authorities should therefore be aware of the potential cumulative impacts when evaluating applications.

Cumulative impact on services

The establishment of the proposed SEF and the other renewable energy facilities in the KGLM will place pressure on local services in the towns of Kakamas and Keimoes, specifically medical, education and accommodation. This pressure will be associated with the influx of workers to the area associated with the construction and operational phases of the renewable energy projects proposed in the area, including the proposed SEF. The potential impact on local services can be mitigated by employing local community members. The presence of non-local workers during both the construction and operation phase will also place pressure on property prices and rentals. As a result, local residents, such as government officials, such as municipal workers, school teachers and the police, may no longer be able to buy or afford to rent accommodation in Kakamas and Keimoes. With effective mitigation the impact is rated as **Low Negative.**

However, as indicated below, this impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of a renewable energy hub in the KGLM. These benefits will create opportunities for investment in Kakamas and Keimoes, **including the opportunity to up-grade and expand existing services and the construction of new houses. In this regard the establishment of a renewable energy hub will create a unique opportunity for the KGLM to develop**. In should also be noted that it is the function of national, provincial and local government to address the needs created by development and provide the required services. The **additional demand for services and accommodation** created by the establishment of development renewable energy projects in the KGLM should therefore be addressed in the Integrated Development Planning process undertaken by the KGLM and ZFMDM.

Cumulative impact on local economies

In addition to the potential negative impacts, **the establishment of the proposed CSPF and other renewable energy projects in the area also has the potential to create a number of socio-economic opportunities for the KGLM and ZFMDM, which, in turn, will result in a positive social benefit**. The positive cumulative impacts include creation of employment, skills development and training opportunities, creation of downstream business opportunities. This benefit is rated as **High Positive** with enhancement.

DECOMMISSIONING

Typically, the major social impacts associated with the decommissioning phase are linked to the **loss of jobs and associated income**. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of the SEFs decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in the 20-25 years post commissioning. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning.

Given the relatively small number of people employed during the operational phase (~ 20), the potential negative social impact on the local economy associated with decommissioning will be limited. In addition, the potential impacts associated with the decommissioning phase can also be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be Low (negative).

In terms of closure costs, the revenue from the sale of scrap metal from the PV plant should be allocated to cover the costs associated with closure and the rehabilitation of disturbed areas.

NO-DEVELOPMENT OPTION

The No-Development option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a High negative social cost. The no-development option also represents a lost opportunity in terms of the employment and business opportunities (construction and operational phase) associated with the proposed SEF, and the benefits associated with the establishment of a Community Trust. This also represents a negative social cost.

However, at a provincial and national level, it should be noted that the SEF development proposal is not unique. In that regard, a significant number of renewable energy development, including SEFs, are currently proposed in the Northern Cape and South Africa. Foregoing the proposed SEF development would therefore not necessarily compromise the development of renewable energy facilities in the NCP or South Africa. However, the socio-economic benefits the local communities in KGLM would be forfeited.

CONCLUSIONS AND RECOMMENDATIONS

The findings of the SIA indicate that the development of the proposed Brypaal CSPF will create employment and business opportunities for locals during both the construction and operational phase of the project.

The establishment of a Community Trust will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximse the potential benefits. The significance of this impact is rated as **High Positive**. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives. The establishment of the proposed Brypaal CSPF is therefore supported by the findings of the SIA.

Due the number of other renewable energy projects proposed in the KGLM, it is recommended that **the KGLM liaise with the proponents to investigate how best the Community Trusts can be established and managed so as to promote and support local, socio-economic development in the region as a whole.**

However, the potential impacts associated with large, solar energy facilities on an areas sense of place and landscape cannot be ignored. These impacts are an issue that will need to be addressed by the relevant environmental authorities, specifically given the large number of applications for solar facilities in the area.

<table>
<tr><td><u>ASPECT</u>
16. INTERESTED & AFFECTEDPARTIES</td><td colspan="7">IMPACTS</td></tr>
<tr><td>Nature of the impact</td><td colspan="7">The main impact on the landowner is visual impact and the PVSP project area of smaller than 1032ha that will not be available for agricultural activities (grazing for sheep) at any given time for the next 20-25 years.

<u>According to the I & AP's job creation is one of the main issues that need to be addressed by the project. Other issues that are of concern is safety (due to the influx of workers) on farms; maintenance of the main access road (gravel road), water sources for the project, socio-economic support for schools, training opportunities/skills development for workers at the solar facility.</u>

<u>See Issues and Response report (Appendix D).</u>

<u>Communication with local Business Chamber: - The Chamber will be used for communication in order to get the message out and to educate the rest of the community.</u></td></tr>
<tr><td>Extent</td><td colspan="4">Regional</td><td colspan="3">Listed activity causing the impact:</td></tr>
<tr><td>Duration</td><td colspan="4">Long</td><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>Probability</td><td colspan="4">Definite</td><td rowspan="4">1,9,15</td><td rowspan="4">12,13
14, 19</td><td rowspan="4">4</td></tr>
<tr><td>Significance</td><td colspan="4">High</td></tr>
<tr><td rowspan="2">Phase responsible for the impact</td><td>Construction</td><td>Operational</td><td>Decommissioning</td><td>Closure</td></tr>
<tr><td>X</td><td>X</td><td></td><td></td></tr>
</table>

ASSESSMENT OF THE IMPACTS POTENTIALLY CREATED BY THE ALTERNATIVE LAND USE:

No alternative land use is possible on the active fenced-off project site while the PVSP project is operational. The land would become available for alternative use again (after 20-25 years).

j) Assessment of each identified potentially significant impact and risk

SEE PREVIOUS SECTION (I) FOR DETAIL IN THIS REGARD.

k) Summary of specialist reports.
NOTE: SEE APPENDIX A FOR FULL REPORTS.

	LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS
1.1	**Geological Report** **DOC REF:(2017/BES/SR/12)**	During the field survey it was established that the north-western part of the study area consists of granitoids with the following order of abundancy: Gneiss > metaquartzite > pegmatite > surficial calcrete deposits. Surficial calcrete deposits with occasional gneiss outcrops dominate the south-eastern part of the study area. The drainage systems consist of alluvial and aeolian sandy material, while gypsic deposits coexist with a calcareous mixture. **The proposed development will have a low to moderate impact on the geological environment and these impacts can be largely mitigated with a resultant low overall significance due to the limited extent of the proposed earthworks as well as the layout of the proposed site being on an area dominated by gneisses with surficial calcrete deposits. The geology is favourable in terms of erodibility potential**. The proposed layout has been selected to avoid areas with unfavourable topography and various variations in geology. The proposed layout is deemed acceptable in terms of this impact study.
1.2	**Geotechnical Survey Report (BES)** **DOC REF:(2017/BES/SR/01)**	**Geotechnical Interpretation and Summary:** An evaluation of the impact of the geotechnical characteristics on the development, is discussed below and summarised in Section 5. **Ground Conditions:** The ground conditions encountered within the trial pits comprise a thin cover of gravelly sand (topsoil) from mixed origin, overlying a variety of calcrete e.g. soft powdery, nodular, hard pan and tabular. The calcrete is not very deep and are limited to a depth of approximately 1.2 meters and some places intergrowth with the weathered gneiss. **Laboratory Testing:** Laboratory tests were done on selected samples from the profile pits. Tests were undertaken by Simlab (Pty) Ltd in Kimberley. The various tests and pertinent information from these tests are highlighted below and the detailed test results are included as Appendix E1. Tests undertaken include: • Indicator tests (including full grading and moisture content) • pH and conductivity tests • Chemical tests

		Further Investigation: Site specific investigations should be done at the sub-station for foundation purpose as well as at each pylon site with special attention to the required depth of the pylons and related to the bedrock strength and type and weathering potential. **Geotechnical Recommendations :** **<u>Founding conditions are favourable for the proposed development and conventional construction methods can be implemented.</u>** Depending on the design and loads to be applied, the following recommendations are made; It is assumed that the calcrete and gneiss encountered on the site are suitable for construction of access roads and tracks, based on the existing main road. **Final Recommendations** : ➢ It is imperative that a **Competent Person** inspects all anomalous sites and attend the site investigations and excavations prior to the construction phase to ensure that conditions are suitable for the specific foundation system to be implemented. The **Competent Person** has to undertake a site-specific investigation and interpretation for each pylon screw. ➢ ***<u>Stormwater management</u>*****:** Stormwater management is critical to prevent erosion and to prevent any damage to the environment. ➢ ***<u>Drainage systems</u>*****:** Avoid as far as possible any development on drainage systems and if deemed necessary, please adhere to precautionary measures. ➢ ***<u>Seepage water</u>*****:** During the investigation, seepage water was present **close to the Salt river**. ➢ ***<u>Stability of Trenches:</u>*** *<u>Trench instability are present where seepage water is encountered.</u>* ➢ ***<u>Sulphur odour</u>*****:** A Sulphur odour was present during the investigations and it could have negative effects on the development. ➢ ***<u>Linear shrinkage</u>*****:** Medium linear shrinkage of the soils was only encountered at the low-lying areas close to the Salt river as well as in the alluvial clay below surface in the other main drainage system (Profile G2). ➢ ***<u>Electrical resistivity</u>*****:** Three layers of resistivity exist on the majority of the surface: A shallow layer < 7 m; very resistive second layer

		at depth >7.63 and conductive third layer at depth > 27.54 m. Design principles should take this in consideration. ➢ ***<u>Soil sensitivity and soil erosion:</u>*** Potential soil erosion upon disturbance is possible at certain areas, precautionary measures and rehabilitation specifications should be noticed. ➢ ***<u>Soil alkalinity:</u>*** *<u>High pH conditions are present and could have corrosive properties.</u>* ➢ ***<u>Salinity:</u>*** *<u>Saline soils could have corrosive potential and should be avoided as far as possible</u>* ➢ ***<u>Redox potential:</u>*** *<u>Low redox potential was encountered at a few sites and are indicative of sensitive soils which are prone to soil erosion upon disturbance.</u>*
2	**DESCRIPTION OF THE TOPOGRAPHY OF THE BRYPAAL PV SOLAR PROJECT FOCUS AREA** **DOC REF:(2017/BES/SR/02)**	The surface area required for the PV project and associated infrastructure should be selected and demarcated by a surveyor with definite beacons and which is correlated with a project plan. No surface should be disturbed unnecessarily. Disturbed surface areas should be rehabilitated. No silt from such areas should be allowed to end-up in dry stream courses. Berm walls need to be put in place. Daily inspections required during the construction phase. **There is no reason from a topographical point of view that the PV Solar project should not be authorised. The topography makes it ideal for the construction and operation of such a facility on the Brypaal project focus area.** The surface area required for the PV project and associated infrastructure should be selected and demarcated by a surveyor with definite beacons and which is correlated with a project plan. No surface should be disturbed unnecessarily. Disturbed surface areas should be rehabilitated. No silt (soil), as the result of erosion of newly disturbed surface areas, should be allowed to end-up in dry stream courses. Berm walls need to be put in place.
3	**BRYPAAL SOLAR POWER (PV) PROJECT** **JUNE 2017** **Soil Specialist Impact Assessment** **DOC REF: (2017/BES/SR/03)**	From the Soil Impact Assessment, the following conclusions can be drawn: • The arid climate of the study area coupled with the shallow soils limits the agricultural potential to low intensity grazing. Therefore, the impact of the proposed development on agricultural resources is considered to be small. • The long-term challenges regarding the management of salts in the dust are problematic and can be managed through the application of dust suppressant polymers on the dirt roads. • Erosion must be controlled through appropriate mitigation and control structures. • Impacts from vehicles such as spillages, should be prevented and mitigated. • Dust generation should be mitigated and minimised. In perspective, the impacts of the proposed facility can be motivated as necessary in decreasing the impacts in areas where agriculture potential plays a more significant role. The importance of generating cleaner energy in and for South Africa cannot be overemphasised. Consequently, **there will be no impacts that cannot be mitigated or that should prevent the development from being approved.**

4	**LAND USE & LAND CAPABILITY** **DOC REF: (2017/BES/SR/04)**	There is no reason from a land use and land capability point of view that the PV Solar project should not be authorised. The topography makes it ideal for the construction and operation of such a facility on the Brypaal project focus area. The surface area required for the PV project and associated infrastructure should be selected and demarcated by a surveyor with definite beacons and which is correlated with a project plan. No surface (vegetation cover) should be disturbed unnecessarily, only what is really required for the construction of the PV Solar facility and associated infrastructure. Disturbed surface areas should be rehabilitated. Only a portion of the 1032 ha available from the project will be disturbed. Probable less than 40-50 % will be disturbed by construction of the PV Solar facility. A certain surface area (vegetation cover) will be disturbed during site preparation in the construction phase. Rehabilitation of bare disturbed surface areas will be difficult, as this project is located in a dry desert climate region that only receives between 100-200mm rainfall per year. Irrigation is not possible. Therefore the unnecessary disturbance of surface areas will be limited to what is really required for the construction of PV Solar facility and associated infrastructure.
5	**Flora Specialist Ecological Impact Assessment** **DOC REF:(2017/BES/SR/05)**	During the survey only one protected species was confirmed within the proposed development area, namely Hoodia gordonii. These plants if noted within the development area can be removed and replanted as part of the rehabilitation and revegetation plan. Removal and/or relocation of protected species are subject to permit requirements from the provincial authorities. From this Vegetation Survey the following conclusions can be drawn: - With the necessary mitigation measures in place and with diligent implementation and execution of these measurements, all the impacts can either be maintained to an absolute minimum or be avoided. Subsequently the development will have very little effect on the greater ecosystem functioning and its ability to fulfil essential processes. - With the implementation of mitigation measures this development will most likely not contribute to the potential cumulative impacts within the greater area. Consequently, there will be no botanical fatal flaws or impacts that cannot be mitigated or that should prevent the development from being approved.
6.1	**Baseline fauna assessment of Brypaal Farm 134** **DOC REF: (2017/BES/SR/06)**	RECOMMENDATIONS Finding a balance between economic growth and the protection of the environment will always remain a challenge. However, although all attempts should be made to support the growth of South African's economy, we must be aware that the integrity of our natural environment and its systems are vital to the survival of us all. Therefore, the common goal should be to promote sustainable economic growth while ensuring the protection of our natural resources and it's processes. To achieve this, the mitigation measures listed in §5.4 should be incorporated into the project design and implemented: In conclusion, due to the Bushmanland arid grassland being regarded as "Least Threatened", with very little of the area being transformed, if the required mitigation measures are implemented and the boundary of the project is controlled it is not foreseen that a significant change in the surrounding ecology would occur. However, this depends on the scale and associated impacts of the project. **Based on the information available during the compilation of this report, it is recommended that project design Option 2 be implemented, as this will have the least impact on the fauna of the project area.**

6.2	**AVIFAUNAL IMPACT ASSESSMENT** **DOC REF: (2017/BES/SR/13)**	CONCLUSIONS The proposed BSPP will have some pre-mitigation impacts on avifauna at a site and local level which will range from High to Low. The impact of displacement due to disturbance during the construction phase is rated as Medium and will remain at a Medium level after mitigation. The impact of displacement of priority species due to habitat transformation associated with the operation of the plant and associated infrastructure is rated as High. This impact can be partially reversed through mitigation, putting it at a Medium level, after mitigation.. The remaining envisaged impacts, i.e. mortalities in the operational phase due to collisions with the solar panels and entrapment in perimeter fences are both rated as Low and should be mitigatable to a Very Low level with appropriate mitigation. The impact of the proposed 400kV grid connection is assessed to be Low and can be further mitigated to a Very Low level, due to the short length of the proposed overhead line. **The relatively small size of the footprint leads one to the conclusion that the cumulative impact of the facility on priority avifauna should in all likelihood be Very Low, taking into account the lack of other renewable projects within a 30km radius around the development area.** **From an avifaunal impact perspective, the proposed development could go ahead, provided the proposed mitigation measures are strictly implemented. No further monitoring will be required during the operational phase**

7	**Surface Water Assessment for the proposed solar farm on Portion 4 of the farm Breipaal 134 near the town of Kakamas, Northern Cape Province.** **September 2016** **DOC REF: (2017/BES/SR/07)**	Discussion and conclusions The vegetation type occurring in the study area is Bushmanland Arid Grassland (NKb 3). According to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) this vegetation type is considered to be of Least Concern (LC) (Map 3). It is not currently subjected to any pronounced transformation or development pressures. However, recently this area has been subjected to a high amount of solar project application and this may cause significant transformation pressures. During the site survey several protected species were also noted to occur within the study area. These include Avonia albissima, Lithops julii subsp. fulleri, Aloe variegata, Hoodia gordonii and Euphorbia spinea. The topography on the site is rather uniform but does vary to some degree over the site. The site slopes from east to west and toward the Sout River. The site can be regarded as a plain with watercourses causing channels in the landscape. Small rocky outcrops are present but are not prominent land forms. Altitude varies from 880 m in the east to 845 m in the west and illustrates the gradual slope toward the river. Due to the increase in slope toward the river this area contains a high amount of seasonal and ephemeral streams and drainage lines (Map 2 & 3). Obligate wetland vegetation was utilised to determine the presence and border of wetlands. The Sout River, streams and drainage lines are clearly defined and easily identifiable utilising the riparian vegetation. The study area contains a high amount of drainage lines and a few significant streams which drain into the Sout River (Map 2 & 3). These drain from the plains south east of the river. The central significant stream has its origin within the site while the two significant streams adjacent to the northern and southern border only have their origins within the site. None of the streams or drainage lines contain any berms or artificial dams within their main channels. All watercourses within the site boundary as well as the Sout River are subjected to few impacts and are consequently considered to be largely natural. Due to the arid environment the riparian vegetation along the ephemeral stream and drainage lines are not the conventionally identified riparian species found in wetter eastern regions of the country but in this region can be reliably be considered obligate riparian species and utilised to identify

		watercourses. As indicated by the vegetation no wetland conditions occur along the streams and drainage lines occurring on the site. However, wetland conditions do occur in areas along the Sout River and although the river is not located on the site it may still be affected by the solar facility. Riparian vegetation and topography allow easy identification of watercourses on the site. These watercourses also contain a distinct main channel which further simplifies identification. No pans occur on the site. A small earth dam occurs in the northern corner of the site but is artificial and cannot be considered a pan system. The tributaries of the Sout River and the river itself is subjected to very few impacts and is therefore considered as Largely Natural. Those impacts that affect these watercourses include domestic stock farming with sheep, dirt track crossings and weirs upstream of the site. Two small weirs upstream of the site has a limited impact on the Sout River. They will impact on the flow regime and sediment load of the river to some extent. A small dirt track also crosses the river. Due to the seasonal nature of the river it is unlikely to have a significant impact and will only affect the river during flooding events. The most significant impact would be associated with small livestock farming. This causes trampling of the catchment and riparian areas. The extent of this is also not large and the impact is not considered to alter the watercourses significantly. Trampling by stock will contribute sediment to the system. The Sout River is considered a fourth order watercourse and the ephemeral tributaries third order whilst the drainage lines flowing into these are then second order watercourses (see Figure 1). The quaternary catchment of this area is D53H. No significant impacts affect the river systems in the area. An Index of Habitat Integrity (IHI) was conducted for the South River and the significant streams in the study area (Appendix C). The results of the IHI indicated the Sout River and its tributaries has an Instream and Riparian IHI of Category B: Largely Natural. This is due to few impacts altering the watercourses in this area. The EI&S of the floodplains associated with the Sout River has been rated as being High: Floodplains that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers. This is largely due to the Sout River being listed as a National Freshwater Ecosystems Priority Area (NFEPA) Upstream system which is considered important to the functioning of the Orange River. The Soutriver flows in to the Hartbees River, also an Upstream NFEPA system, approximately 20 km upstream of the confluence with the Orange River. The river also has a high IHI which contributes to the EI&S. **The proposed solar facility will undoubtedly cause several significant impacts on the Sout River and its tributaries. As a result strict mitigation measures will have to be implemented to ensure that these impacts are kept to a minimum. Predicted impacts include increased sedimentation due to increased erosion, increased establishment of exotic invaders and some alteration to flood and flow regimes.** The solar facility will likely require levelling of the layout area. This will require some drainage lines being levelled or disturbed through construction (Map 2). The construction phase will disturbed the soil surface and will allow sediments to be mobilised by runoff which will then increase the sediment load within the ephemeral streams and ultimately the Sout River. The disturbance of the drainage lines will also increase the sediment load. It is therefore important to limit the sediment input to the ephemeral streams and Sout River. Measures which can be utilised should include contouring the site so that runoff velocity is decreased and contours can also be bermed to capture sediment. Furthermore it is recommended that attenuation structures be implemented where affected drainage lines enter the ephemeral streams. The central significant stream will be excluded from the site as per layout plans. However, the upstream section of the stream will be included in the layout and here attenuation structures should also be implemented. Due to the disturbance caused by construction coupled with the sandy soils of the area erosion monitoring will have to form a critical part of the construction and operational phases. Adequate erosion measures will have to be implemented where this is necessary.

		Within the study area survey it was determined that the exotic invader, Mesquite Tree (Prosopis glandulosa), occurs sporadically within the study area (Appendix B). Disturbance during construction is likely to cause susceptible condition for increased establishment of this exotic. The ability of the species to invade watercourses in this arid region is well known, i.e. Ongers River, and this should be prevented. It is therefore recommended that all specimens on the site be removed prior to construction and that monitoring of establishment of the species on the site be done throughout the operational phase. Any seedlings or established trees should be removed throughout the operational phase. Although the Sout River does not form part of the site it should also be monitored as there is a high risk that specimens from the site may invade this watercourse. Due to the clearing of vegetation, levelling of the site, contouring and attenuation structures the runoff will be altered and in so doing the input volumes into the ephemeral streams and Sout River. This will therefore alter the flow regime within these watercourses. During previous studies (Burch et al 2014), it has been shown that through construction soil compaction occurs which decreases infiltration and increases runoff. Furthermore, the rain shadow caused by the panels cause an are not utilised for infiltration thus increasing runoff. This will also affect the inflow into the ephemeral streams and thus alter the flow regime. As per the layout plans it is also recommended that the central, significant ephemeral stream be excluded from the facility.

8	**Desktop geohydrological study for the proposed solar farm on Portion 4 of the farm Breipaal near the town of Kakamas, Northern Cape Province.** **DOC REF: (2017/BES/SR/08)**	CONCLUSION • The study area is located within the Lower Orange Management Area, Quaternary Drainage Area D53H. The non-perennial Sout river lays to the north-eastern boundary and run-off is in a north –eastern direction towards the Sout river. • Groundwater occurs in zones of weathering and in fractures or in the contact zones between different lithology's, such as granodiorite, granite, pegmatite and gneiss of the Keimoes Suite (Me), Yield is generally less than 0.5 l/s. Groundwater can be exploited from joints and fractures in calcsilicates and sub ordinated quartzites of the Geelvloer Group (Mgv). The calc silicates have known karstic aquifer properties and are not likely to facilitate groundwater occurrence. Refer to Figure 10 • The aquifer(s) of the area under investigation is classified as a poor aquifer according to the map of Aquifer Classification of South Africa, 2012 and is depicted in Figure 11. • The aquifer susceptibility index is classed as low vulnerability and depicted on the map in Figure 12. • The aquifer vulnerability for the study area indicates the least tendency for contamination if pollutants are discharge or leeched over the long term and is depicted on map in Figure 13. • The water quality of sampled sites Breipaal I, Breipaal II and Breipaal III is classified as above the recommended standard and are not suitable for human consumption. These sites are classified above the recommended standard due to very high EC, TDS, Na, Ca,Cl, S04 and F concentrations.

8.1	**HERITAGE IMPACT ASSESSMENT** **DOC REF: (2017/BES/SR/09)**	Recommendations and conclusion In terms of the archaeology component of Section 35 of the NHRA several Middle Stone Age flakes were found scattered over the area in low densities. According to Beaumont et al (1995) "thousands of square kilometres of Bushmanland are covered by a low density lithic scatter". These artefacts are referred to as background scatter or occurrences and of low heritage significance. In addition to these low density scatters a distinct archaeological site (Feature 1) of significance was identified at 29° 12' 21.6829" S, 20° 21' 49.8601" E. The site consists of several small stone packed circles with a high density of lithic scatters, ostrich eggshell (some are burned) and bone fragments. The site is tentatively classified as belonging to the informally named ceramic final Later Stone Age dating to ≤ 2000 years. The site is located approximately 500 meters to the south of the development footprint and will not be impacted on. The paleontological component was addressed by Van Deventer (2017), he concluded: "The main time frames for fossils in South Africa are the Carboniferous (Karoo), Cretaceous and Cainozoic (Tertiary and Quaternary periods) . There are no Carboniferous or Cretaceous sediments present on the Brypaal site under discussion. The Tertiary and Quarternary period sediments are typical calcretes and aelolian sands and to a lesser extent some fluvial sediments on the Brypaal site. During deep excavations of >46 profile pits to a maximum depth of 3.5 m and surface geological mapping, no micro-organism, fauna or flora fossils were observed in neither the calcretes or the aeolian or fluvial sediment." In terms of the built environment of the area (Section 34), no standing structures older than 60 years occur within the study area. In terms of Section 36 of the Act no burial sites were recorded. If any graves are located in future they should ideally be preserved in-situ or alternatively relocated according to existing legislation. No public monuments are located within or close to the study area. The study area is surrounded by residential developments and road infrastructure developments and the proposed development will not impact negatively on significant cultural landscapes or viewscapes. During the public participation process conducted for the project no heritage concerns was raised. **The impact of the proposed project on heritage resources is considered low and it is recommended that the proposed project can commence on the condition that the following recommendations are implemented as part of the EMPr and based on approval from SAHRA.** **• Implementation of a chance find procedure.** **• Although the Later Stone Age site (Feature 1) will not be impacted on directly the site should be preserved with a 50-m buffer zone.**
8.2	**Paleontological Report** **DOC REF: (2017/BES/SR/10)**	**Palaeontological sites of interest** No fossils or any geological formation of any interest were found on the study area. **Conclusion** **Several walk-through routes were completed for geology, soils and vegetation surveys. On each route careful observations were made with respect to potential and probable palaeontological occurrence. For the area under discussion no evidence was found of any palaeontological occurrences.**

9	**VISUAL IMPACT ASSESSMENT** **DOC REF: (2017/BES/SR/14)**	**Conclusion:** The construction and operation of the proposed PV Solar Facility and its associated infrastructure will have a visual impact on the natural scenic resources and rural of the immediate context, only within the limited view corridors within 0.5 km range of the proposed facility and from viewpoint 2. The moderating factors of the visual impact of the facility on the close range are the following: • The entire site cannot be viewed at once due to the topography. • The orientation of the panels. North-facing PV viewed from the south from viewpoint 2. In light of the above-mentioned factors that reduce the impact of the facility, the visual impact is assessed as medium visual impact. The author is of the opinion that the facility has an advantage over the more conventional power generation plants (for instance coal-fired power stations) as it utilizes a renewable source of energy which is considered as an international and national priority to generate power and is therefore generally perceived in a more favourable light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers. The project is deemed to be feasible from a visual impact assessment perspective and the following recommendations are made for the proposed PV Solar Power Facility: • The exterior of the invertor housing should be dark grey in order to reduce the visual impact of the structures. • Mast of less than 15 m high is situated adjacent to the pylons and specified as a lattice structure if possible. • The Betafence: Nylofor medium is the preferred option finished in a dark grey colour to a maximum height of 2030 mm.

10	**SOCIAL IMPACT ASSESSMENT** **BRYPAAL 100 MW** **CONCENTRATED SOLAR POWER FACILITY** **NORTHERN CAPE PROVINCE** **MAY 2017** **Prepared** **By Tony Barbour** **ENVIRONMENTAL CONSULTING** **DOC REF:(2017/BES/SR/11)**	**CONCLUSIONS AND RECOMMENDATIONS** **The findings of the SIA indicate that the development of the proposed Brypaal CSPF will create employment and business opportunities for locals during both the construction and operational phase of the project.** The establishment of a Community Trust will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximse the potential benefits. The significance of this impact is rated as High Positive. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives. The establishment of the proposed Brypaal CSPF is therefore supported by the findings of the SIA. Due the number of other renewable energy projects proposed in the KGLM, it is recommended that the KGLM liaise with the proponents to investigate how best the Community Trusts can be established and managed so as to promote and support local, socio-economic development in the region as a whole. However, the potential impacts associated with large, solar energy facilities on an areas sense of place and landscape cannot be ignored. These impacts are an issue that will need to be addressed by the relevant environmental authorities, specifically given the large number of applications for solar facilities in the area.
11	**TRAFFIC IMPACT STUDY** **DOC REF: (2017/BES/SR/16)**	**3.6 Conclusion** **It can be concluded that:** **• Due to limited detail quantities and infrastructure plans, this report presents only concepts and preliminary plans. The final detail lay outs and quantities will be addressed during the Detail Design Phase** **• There will be an increase in traffic volume during Construction phase on Road 2972 due to trucks and other small vehicles** **• A small fraction of the road material consists of TSP and PM10 emissions** **• Road 2972 has the potential to emanate dust due to the current geotechnical characteristics** **• There is a high-risk area where Road 2971 crosses the Salt river** **• During rain events there might be some more road deterioration and decrease of road stability** **• Material selection for upgrading Road 2972 and the access road must be done by a competent person** **• Some maintenance practices to minimise dust, should be implemented** **3.7 Recommendations** **• The final detail lay outs and quantities will be addressed during the Detail Design Phase.**

		3.7 Recommendations • The final detail lay outs and quantities will be addressed during the Detail Design Phase. • A Traffic / transportation officer should do a detail planning and develop a transport program for heavy trucks during the construction phase to ensure optimum use of each of the major access roads to Brypaal (Kakamas to Brypaal; Pofadder to Bypaal or Kenhardt to Brypaal). • Dust suppression will be necessary: Typical dust mitigation measures include: o regular watering of service roads. o spaying of products such as Dust-a-side or others which are adaptable to the material and climate of the site and which are environmental friendly and harmless to the environment. o speed reduction. o minimising material handling operations. o early or concurrent rehabilitation of disturbed surfaces. • Safety precautions such as Safety control officer at critical points or nodes or intervals at peak hours. • A Traffic and Transportation Management plan should be implemented during all phases of the project (See Appendix C).
12	WATER USE LICENCE (WULA)	Water Use Licence Application (WULA): An environmental consultancy is currently busy with the study. The Water Resource Assessment will also be used. **The original consultant (Gys Hoon) recently past away and could not finalize the job.**

NOTE: SEE APPENDIX A FOR FULL REPORTS.

l) Environmental impact statement

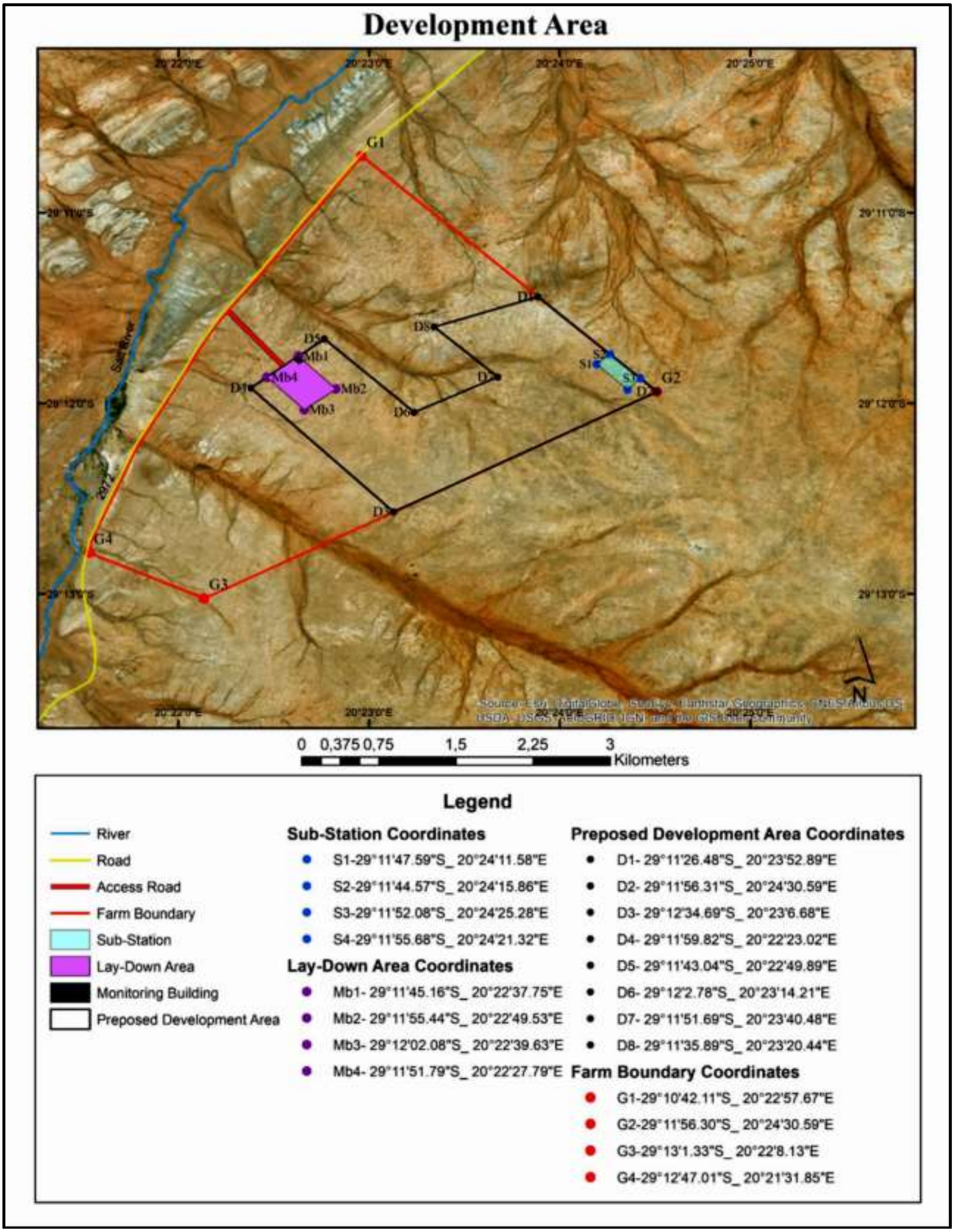
(i) a summary of the **key findings** of the environmental impact assessment:

See section (k) Summary of specialist reports for information in this regard..

(ii) **a map/plan 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

SEE ALSO SECTION 1C OF THE EMPR FOR MORE INFORMATION.

MAP/ PLAN =NEXT PAGE


Development Area
G1
G2
G3
G4
D1
D2
D3
D4
D5
D6
D7
D8
S1
S2
S3
Mb1
Mb2
Mb3
Mb4
0 0,375 0,75 1,5 2,25 3
Kilometers
Legend
River
Road
Access Road
Farm Boundary
Sub-Station
Lay-Down Area
Monitoring Building
Preposed Development Area
Sub-Station Coordinates
S1-29°11'47.59"S_ 20°24'11.58"E
S2-29°11'44.57"S_ 20°24'15.86"E
S3-29°11'52.08"S_ 20°24'25.28"E
S4-29°11'55.68"S_ 20°24'21.32"E
Lay-Down Area Coordinates
Mb1- 29°11'45.16"S_ 20°22'37.75"E
Mb2- 29°11'55.44"S_ 20°22'49.53"E
Mb3- 29°12'02.08"S_ 20°22'39.63"E
Mb4- 29°11'51.79"S_ 20°22'27.79"E
Preposed Development Area Coordinates
D1- 29°11'26.48"S_ 20°23'52.89"E
D2- 29°11'56.31"S_ 20°24'30.59"E
D3- 29°12'34.69"S_ 20°23'6.68"E
D4- 29°11'59.82"S_ 20°22'23.02"E
D5- 29°11'43.04"S_ 20°22'49.89"E
D6- 29°12'2.78"S_ 20°23'14.21"E
D7- 29°11'51.69"S_ 20°23'40.48"E
D8- 29°11'35.89"S_ 20°23'20.44"E
Farm Boundary Coordinates
G1-29°10'42.11"S_ 20°22'57.67"E
G2-29°11'56.30"S_ 20°24'30.59"E
G3-29°13'1.33"S_ 20°22'8.13"E
G4-29°12'47.01"S_ 20°21'31.85"E

(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives

Summary of impacts:

<table>
<tr><th>ACTIVITY
(whether listed or not listed)

(E.g. Excavations, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc.).</th><th>POTENTIAL IMPACT

(e.g. dust, noise, drainage surface disturbance,, surface water contamination, groundwater contamination, air pollution etc.)</th><th>ASPECT</th></tr>
<tr><td>1.1

Listed Activity causing the impact:
<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td><td>Geology (underlying rock material) is going to be destroyed to a certain extent during the construction phase of the PVSP project. Construction material will be obtained from newly established quarries on site that is going to be used as filling material during initial ground works on the proposed PVSP project site. It is expected that some cut and fill will take place in the construction of certain project components.

The location of the quarries will be determined as part of the Geo-Technical survey done by BES.

Geotechnical Recommendations: Founding conditions are favourable for the proposed development and conventional construction methods can be implemented. Depending on the design and loads to be applied, the following recommendations are made;
It is assumed that the calcrete and gneiss encountered on the site are suitable for construction of access roads and tracks, based on the existing main road.

Once the construction of the PVSP facility has been completed the quarries will be rehabilitated with replacing the initial stockpiled topsoil (restricted resource on site) on top of sloped quarries.</td><td>GEOLOGY</td></tr>
</table>

<table>
<tr>
<td>2.1

Listed Activity causing the impact:
<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td>
<td>Change in landform :
The existing topography is described as flat with some rock outcrops (rock plates) and the majority of infrastructure required for the PVSP project would have an permanent impact on topography. Some infrastructure (contractor lay–down area) will be temporary on site. Construction rock material and topsoil will be stored in temporary stockpiles for construction purposes.

An terraced landscape will be created (where required) to serve as the footprint of the different components of the PVSP project.

* Disturbance of the surface drainage:
Construction material will be obtained from newly established quarries on site that is going to be used as filling material during initial ground works on the proposed PVSP project site. It is expected that some cut and fill workings will take place in the construction of certain project components (trenches, canals, evaporation dams, access roads, etc. Quarries , trenches, canals , will act as that act as depressions in the environment that captures run-off (standing water).

Normal surface drainage will be disturbed at a given point. Run-off if will be diverted away from the site (surface run-off control structures).

The majority of infrastructure will remain for an estimated project life of 20-25 years. During closure the site will be rehabilitated and all infrastructure demolished. At closure certain infrastructure components could possible identified to be used in the future by the land owner .</td>
<td>TOPOGRAPHY:</td>
</tr>
<tr>
<td>3.1 Listed Activity causing the impact:
<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td>
<td>This is a proposed new PVSP project site. The soils in the whole study area were found to be of the hard rock outcrops and shallow Coega soil form. Deeper soil (Hutton) is associated with dry stream tributaries(natural depression areas) that have been filled-up with aeolian deposits with time.

Any future construction of infrastructure should be preceded by the removal of all available topsoil/overburden material (although limited). Topsoil removal during site preparation earmarked for the proposed PVSP project.

In the process of removing topsoil the soil layers are mixed and the structure may be disturbed. Proceeding with quarrying without proper removal of topsoil and stockpiling.</td>
<td>Soil (topsoil & access roads)</td>
</tr>
<tr>
<td>3.2</td>
<td>Soil Compaction: The initial site preparation for and establishment of infrastructure components such as access roads, PV solar field, contractor laydown area, etc. cause compaction of soil, the loss of a growth medium resource and the alienation of a particular surface area.

The majority of the proposed PVSP project site is already disturbed by agricultural activity (grazing by sheep). The establishment, construction, operation and eventually rehabilitation (demolition) of listed structures would cause compaction of soil. All activities will be concentrated on the application area.</td>
<td></td>
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<tr>
<td>3.3</td>
<td>Soil erosion: Due to the fact that certain surface areas would become compacted and this would lead to lesser infiltration of rainwater and more run-off that could cause erosion on bare disturbed surfaces. Erosion would always be possible until such time a vegetation cover is provided during rehabilitation phase.

When removing topsoil during site preparation, little storm water control structures are in place. If a severe storm hits the area, it may lead to erosion on site. Topsoil stockpiles may be prone to erosion due to lack of vegetation cover. Water control structures may fail or severe rainstorms may cause excessive run-off. Surface compaction due to activities taking place.</td>
<td></td>
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</table>

<table>
<tr><td>3.4</td><td><u>Potential of soil contamination.</u>
Vehicles/trucks/cranes/ earth moving equipment breakages and oil/lubricant /diesel spills may contaminate soil.

The temporary workshop/ diesel tank facility (mobile) may contaminate soil due to spillages and bad management. Bad surface water management may divert contaminated run-off water on soil and thereby contaminating it.</td><td></td></tr>
<tr><td>3.5</td><td><u>Loss of soil structure</u>
In the process of removing topsoil the soil layers are mixed and the structure may be disturbed.</td><td></td></tr>
<tr><td>3.6</td><td><u>Loss of soil fertility</u>
The mixing of soil during site preparation, compaction and potential pollution (spillages form oil etc.) all may cause this situation.</td><td></td></tr>
<tr><td>4. Listed Activity causing the impact:
<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td><td><u>Temporary loss of land capability to support grazing:</u>
Temporary loss of land capability to support grazing (20-25 years). The area where the infrastructure will be constructed will thus be alienated, until the area is rehabilitated.

Some structures could probable remain if an alternative use is being found.</td><td>LAND CAPABILITY</td></tr>
<tr><td>5. Listed Activity causing the impact:
<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td><td><u>Temporary loss of land capability to support grazing (20-25 years).</u> The area where the infrastructure will be constructed will thus be alienated, until the area is rehabilitated. Some structures could probable remain if an alternative use is found.

Without mitigation the loss of agricultural land might be permanent. Mitigation will include rehabilitation of construction site and re-establishment of natural vegetation. Ensuring that as little surface disturbance as possible occurs, is crucial.

It is also important to avoid al drainage systems in the site, as these areas are more prone to erosion.</td><td>LAND USE</td></tr>
<tr><td>6.1 Listed Activity causing the impact:
<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td><td><u>Habitat change, loss of species, spread of alien and invasive species.</u>

During the initial site preparation and construction of the PVSP project vegetation clearance, disturbance of the ecosystem, habitat and trampling will happen.

Destruction of habitats for vegetation. Due to a disturbed ecosystem, bare ground and invasion of exotics and further spreading of exotics can follow.

Construction may lead to potential indirect loss of or damage to drainage lines. This may potentially lead to localised loss of habitat and biodiversity.

The vegetation needs to be cleared to remove the topsoil. Loss of protected species if not relocated.

Soil erosion and associated degradation of ecosystems. Increased erosion risk as a result of soil disturbance and loss of vegetation cover, as well as increased runoff generated by the PV area and access roads.</td><td>VEGETATION (FLORA)</td></tr>
</table>

<table>
<tr>
<td>6.2</td>
<td><u>Habitat change, loss of species, spread of alien and invasive species</u>.

The change in the current habitat will be mitigated during replacement of topsoil and eventually final rehabilitation of the site.</td>
<td></td>
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</table>

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<tr>
<td>7.1 Listed Activity causing the impact:

<table>
<tr><td>GN325</td><td>GN327</td><td>GN324</td></tr>
<tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr>
</table>

See section 1(b) for more detail.</td>
<td>Wildlife or wildlife habitat destruction /change / disturbance.
The flora which normally serves as habitat for animals would be destroyed during site preparation. The increase in activity will temporarily scare other animals. The area will serve as a new habitat after rehabilitation.

Existing impacts
The following existing environmental impacts were identified during the site assessment: have exacerbated any poor veld conditions; -made dam was dry at the time of the assessment. Subsequently, any fauna which cannot traverse the border fence to migrate from the area will most likely die of dehydration; and -eared Fox, Cape Fox, Brown Hyena and Black-backed Jackal) on the property are shot due to the possible threat they pose to his sheep.

Project related impacts
The following impacts have been identified:

Increased poaching risk due to increased personnel and movement of people in and out of the area.
Increased fire hazards due to increased personnel and movement of people in and out of the area.
Vehicles accessing the construction area through sensitive habitat (Construction phase)
Collision of vehicles with faunal species.
Bird collisions with solar panels (solar panels create a glair or mirror affect which can disorientate birds) and power lines - although no power lines forms part of the project design (assumed there will be a power line extending from the MV substation to the Eskom power line), the project does depend on an existing Eskom power line which needs to be taken into consideration (Operational Phase)
Site clearance and removal of important vegetation (habitat) within drainage lines (Project design Option 1) (Construction phase).
Site clearance and removal of important vegetation (habitat) within drainage lines (Project design Option 2) (Construction phase).
Noise from construction (people in general) process disruptive / nuisance to fauna, causing fauna to migrate away from area (Construction phase).
Dust being a nuisance (suffocating to an extent) to fauna, causing fauna to migrate out of the area (Construction).
Loss of fauna diversity in the area due to an increase in human activity, loss of habitat and unsuitable/favourable conditions.
</td>
<td>WILD LIFE
(FAUNA)
Wildlife (Injury and death)</td>
</tr>
<tr>
<td></td>
<td>The proposed BSPP will have some pre-mitigation impacts on avifauna at a site and local level which will range from High to Low.

The impact of displacement due to disturbance during the construction phase is rated as Medium and will remain at a Medium level after mitigation. The impact of displacement of priority species due to habitat transformation associated with the operation of the plant and associated infrastructure is rated as High. This impact can be partially reversed through mitigation, putting it at a Medium level, after mitigation.. The remaining envisaged impacts, i.e. mortalities in the operational phase due to collisions with the solar panels and entrapment in perimeter fences are both rated as Low and should be mitigatable to a Very Low level with appropriate mitigation. The impact of the proposed 400kV grid connection is assessed to be Low and can be further mitigated to a Very Low level, due to the short length of the proposed overhead line.

The relatively small size of the footprint leads one to the conclusion that the cumulative impact of the facility on priority avifauna should in all likelihood be Very Low, taking into account the lack of other renewable projects within a 30km radius around the development area.

From an avifaunal impact perspective, the proposed development could go ahead, provided the proposed mitigation measures are strictly implemented.</td>
<td>Avifauna</td>
</tr>
</table>

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<tr>
<td>8.1 Listed Activity causing the impact:

<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td>
<td><u>Increased silt load.</u>
Clearing topsoil for footprint areas can increase infiltration rates of water to the groundwater system and decrease buffering capacity of soils to absorb contaminants from spills on surface. This can increase the risk of contamination of the groundwater system (increases aquifer vulnerability).

The clearance of vegetation and the traffic on access roads will all contribute to an increase in the silt load on the project area.</td>
<td rowspan="3">SURFACE WATER</td>
</tr>
<tr>
<td rowspan="2">8.2</td>
<td><u>Change in surface water quality.</u>
Spillages from vehicles, diesel tanks lacking adequate bund walls, surface run-off (water, erosion, silt) that is not adequately diverted away from the PVSP project site.

<u>Change in water quantity:</u>
As this area is very small only (less than 1032 hectares) (10,3 km²) the impact of surface water will be very low in relation to the total drainage catchment surface area of 147 km² .

<u>"Dirty / Clean" water systems at project site</u> may impact on the quality of the surface water. The water should be contained in the surface runoff control measures provided therefore.</td>
</tr>
<tr>
<td>The study area contains a high amount of drainage lines and a few significant streams which drain into the Sout River.
As indicated by the vegetation no wetland conditions occur along the streams and drainage lines occurring on the site. However, wetland conditions do occur in areas along the Sout River and although the river is not located on the site it may still be affected by the solar facility.

Those impacts that affect these watercourses include domestic stock farming with sheep, dirt track crossings and weirs upstream of the site.

Predicted impacts include increased sedimentation due to increased erosion, increased establishment of exotic invaders and some alteration to flood and flow regimes.

Disturbance during construction is likely to cause susceptible condition for increased establishment of this exotic. The ability of the species to invade watercourses in this arid region is well known,

During previous studies (Burch et al 2014), it has been shown that through construction soil compaction occurs which decreases infiltration and increases runoff. Furthermore, the rain shadow caused by the panels cause an are not utilised for infiltration thus increasing runoff. This will also affect the inflow into the ephemeral streams and thus alter the flow regime.</td>
</tr>
</table>

<table>
<tr><td>9.1 Listed Activity causing the impact:
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See section 1(b) for more detail.</td><td><u>Reduction of groundwater quality</u>
The proposed PVSP project activities are not likely to impact on local ground-water quality.

All project components forms part of a closed system.

Storage of diesel/lubricants/oil, etc. will be done within bunded facilities. Therefore other than accidental spillages form vehicles/earthmoving equipment/storage facilities, PVSP facility breakages no further impact that could infiltrate and contaminate of the groundwater system is foreseen.</td><td rowspan="2">GROUND WATER</td></tr>
<tr><td>9.2</td><td><u>Process water for PVSP facility:</u>
Water from a desalination plant (to be constructed) and water abstracted from newly drilled boreholes on the farm and stored in a reservoir/tank facility.

Water will be used for abstracted from a borehole for dust suppression on the roads and potable water will be brought in with a tanker.</td></tr>
</table>

<table>
<tr><td>10. Listed Activity causing the impact:
<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td><td>Dust will be generated during the initial site preparation and construction phase (18 months) of the PVSP project (loading with an excavator on to a dump truck) and transportation on site/gravel/dirt/farm roads. Maintenance of the road would be a priority.

Initial construction work with regard to infrastructure that involves the use of earth moving equipment.

During the operational phase (20-25 years) dust could be generated by vehicles travelling on the public gavel road that will possible have an impact on the keeping the PVSP facility clean.</td><td>AIR QUALITY</td></tr>
<tr><td>11. Listed Activity causing the impact:
<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td><td><u>Generators, vehicles, trucks, earth-moving equipment construction equipment, etc. will generate noise ,</u> especially during the construction phase. Reverse warning alarms on earthmoving machines is a main source of nuisance and noise pollution.

The operational phase the noise will be restricted to the immediate worker environment at the PV solar facility and vehicles traveling the existing provincial road.

The PVSP project site will be constructed within a rural landscape with dwellings located further than 280m south , 482m and 391m west from site.

The impact would also be of importance regarding the direct worker environment that should adhere to the requirements in terms of the Occupational Health and Safety Act.</td><td>NOISE</td></tr>
<tr><td>12.1 Listed Activity causing the impact:
<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td><td>There are no known graves on the proposed PVSP project site (preferred alternative 1). The majority of surface area is already disturbed by agricultural activities.

The development footprint is sited approximately 500 meters away from feature 1 resulting in no direct impact on the site (Figure 22). Furthermore, two find spots (Field number 707 & 708) is also located outside of the development footprint. <u>Therefore, the impact on heritage sites by the proposed development is considered low.</u>

Any direct impacts that may occur would be during the construction phase only and would be of very low significance. Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. This and other projects in the area could have an indirect impact on the heritage landscape.

During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological material or objects.</td><td>ARCHAEOLOGICAL AND CULTURAL SITES</td></tr>
</table>

<table>
<tr>
<td></td>
<td>Palaeontological sites of interest
<u>No fossils or any geological formation of any interest were found on the study area.</u>

Conclusion
Several walk-through routes were completed for geology, soils and vegetation surveys. On each route careful observations were made with respect to potential and probable palaeontological occurrence. For the area under discussion no evidence was found of any palaeontological occurrences.</td>
<td>Palaeontological sites of interest</td>
</tr>
<tr>
<td>13. Listed Activity causing the impact:

<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td>
<td>The construction and operation of the proposed PV Solar Facility and its associated infrastructure will have a visual impact on the natural scenic resources and rural of the immediate context, only within the limited view corridors within 0.5 km range of the proposed facility and from viewpoint 2. The moderating factors of the visual impact of the facility on the close range are the following:
• The entire site cannot be viewed at once due to the topography.
• The orientation of the panels. North-facing PV viewed from the south from viewpoint 2.
In light of the above-mentioned factors that reduce the impact of the facility, the visual impact is assessed as medium visual impact.
The author is of the opinion that the facility has an advantage over the more conventional power generation plants (for instance coal-fired power stations) as it utilizes a renewable source of energy which is considered as an international and national priority to generate power and is therefore generally perceived in a more favourable light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers.
The project is deemed to be feasible from a visual impact assessment perspective and the following recommendations are made for the proposed PV Solar Power Facility:
• The exterior of the invertor housing should be dark grey in order to reduce the visual impact of the structures.
• Mast of less than 15 m high is situated adjacent to the pylons and specified as a lattice structure if possible.
• The Betafence: Nylofor medium is the preferred option finished in a dark grey colour to a maximum height of 2030 mm.</td>
<td>VISUAL IMPACT</td>
</tr>
<tr>
<td>13.1 Listed Activity causing the impact:

<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td>
<td>Increase in Socio – economic activity at local level.

The project in itself would ensure that approximately 300 workers would be assured of a job during the construction phase of the project. The operational phase will require probable 20 -30 workers in total. The majority will be responsible for regular maintenance work.

Job creation plays a major role in increasing the economic wellbeing of employees and their dependants in the Kakamas area (District: ZF Mgcawu district).

The increase in socio-economic activity will add to the current growth and development in Kakamas already created by similar solar projects.

Creation of employment and business opportunities, and the opportunity for skills development and on-site training.

Summary of social impacts during construction phase Impact :
• Creation of employment and business opportunities
• Presence of construction workers and potential impacts on family structures and social networks
• Influx of job seekers
• Safety risk, stock theft and damage to farm infrastructure associated with presence of construction workers
• Increased risk of veld fires
• Impact of heavy vehicles and construction activities
• Loss of farmland</td>
<td>SOCIO- ECONOMICS</td>
</tr>
</table>

<table>
<tr>
<td></td>
<td>OPERATIONAL PHASE
Potential positive impacts
• The establishment of infrastructure to generate renewable energy;
• Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
• Benefits associated with the establishment of a Community Trust;
• Generation of income for affected landowner/s.

Potential negative impacts
• Influx of job seekers to the area;
• Loss of productive agricultural land;
• The visual impacts and associated impact on sense of place;
• Potential impact on tourism.</td>
<td></td>
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<tr>
<td>14. Listed Activity causing the impact:
<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td>
<td>The main impact on the landowner is visual impact and the PVSP project area of smaller than 1032ha that will not be available for agricultural activities (grazing for sheep) at any given time for the next 25 years.

According to the I & AP's job creation is one of the main issues that need to be addressed by the project. Other issues that are of concern is safety (due to the influx of workers) on farms; maintenance of the main access road (gravel road), water sources for the project, socio-economic support for schools, training opportunities/skills development for workers at the solar facility.

Communication with local Business Chamber: - The Chamber will be used for communication in order to get the message out and to educate the rest of the community.</td>
<td>INTERESTED & AFFECTEDPARTIES</td>
</tr>
</table>

(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;

The main closure objective of Vintage Energy (Pty) Ltd. is to rehabilitate the entire PROJECT site in such a way to ensure that the new man-made topographical landscape would blend in with the surrounding landscape, not pose a safety hazard to humans and animals, while at the same time allow for alternative land uses. Establish a self-sustaining and stable vegetation cover in order to mitigate the visual impact, to control erosion and to create some habitat for animals. The rehabilitated environment also needs to be aesthetically acceptable according to the principle of BPEO. The applicant will ensure that the Operation/Sites are:

- Neither a danger to public health and safety nor to animal health and safety;
- Not a source of any pollution;
- Stable (ecological and geophysical);
- Rehabilitated to the state that is suitable for the predetermined and agreed land use (grazing);
- Compatible with the surrounding biophysical environment;
- A sustainable environment;
- Aesthetically acceptable;
- Not an economic, social or environmental liability to the local community or the state now or in the future.

(m) 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:

	LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS
1.1	**Geological Report** **DOC REF:(2017/BES/SR/12)**	During the field survey it was established that the north-western part of the study area consists of granitoids with the following order of abundancy: Gneiss > metaquartzite > pegmatite > surficial calcrete deposits. Surficial calcrete deposits with occasional gneiss outcrops dominate the south-eastern part of the study area. The drainage systems consist of alluvial and aeolian sandy material, while gypsic deposits coexist with a calcareous mixture. **The proposed development will have a low to moderate impact on the geological environment and these impacts can be largely mitigated with a resultant low overall significance due to the limited extent of the proposed earthworks as well as the layout of the proposed site being on an area dominated by gneisses with surficial calcrete deposits. The geology is favourable in terms of erodibility potential**. The proposed layout has been selected to avoid areas with unfavourable topography and various variations in geology. The proposed layout is deemed acceptable in terms of this impact study.
1.2	**Geotechnical Survey Report (BES)** **DOC REF:(2017/BES/SR/01)**	**Geotechnical Interpretation and Summary:** An evaluation of the impact of the geotechnical characteristics on the development, is discussed below and summarised in Section 5. **Ground Conditions:** The ground conditions encountered within the trial pits comprise a thin cover of gravelly sand (topsoil) from mixed origin, overlying a variety of calcrete e.g. soft powdery, nodular, hard pan and tabular. The calcrete is not very deep and are limited to a depth of approximately 1.2 meters and some places intergrowth with the weathered gneiss. **Laboratory Testing:** Laboratory tests were done on selected samples from the profile pits. Tests were undertaken by Simlab (Pty) Ltd in Kimberley. The various tests and pertinent information from these tests are highlighted below and the detailed test results are included as Appendix E1. Tests undertaken include:

		• Indicator tests (including full grading and moisture content) • pH and conductivity tests • Chemical tests **Further Investigation:** Site specific investigations should be done at the sub-station for foundation purpose as well as at each pylon site with special attention to the required depth of the pylons and related to the bedrock strength and type and weathering potential. **Geotechnical Recommendations :** **Founding conditions are favourable for the proposed development and conventional construction methods can be implemented.** Depending on the design and loads to be applied, the following recommendations are made; It is assumed that the calcrete and gneiss encountered on the site are suitable for construction of access roads and tracks, based on the existing main road. **Final Recommendations** : ➢ It is imperative that a **Competent Person** inspects all anomalous sites and attend the site investigations and excavations prior to the construction phase to ensure that conditions are suitable for the specific foundation system to be implemented. The **Competent Person** has to undertake a site-specific investigation and interpretation for each pylon screw. ➢ ***Stormwater management*****:** Stormwater management is critical to prevent erosion and to prevent any damage to the environment. ➢ ***Drainage systems*****:** Avoid as far as possible any development on drainage systems and if deemed necessary, please adhere to precautionary measures. ➢ ***Seepage water*****:** During the investigation, seepage water was present **close to the Salt river**. ➢ ***Stability of Trenches:*** *Trench instability are present where seepage water is encountered.*

		➢ ***Sulphur odour***: A Sulphur odour was present during the investigations and it could have negative effects on the development. ➢ ***Linear shrinkage***: Medium linear shrinkage of the soils was only encountered at the low-lying areas close to the Salt river as well as in the alluvial clay below surface in the other main drainage system (Profile G2). ➢ ***Electrical resistivity***: Three layers of resistivity exist on the majority of the surface: A shallow layer < 7 m; very resistive second layer at depth >7.63 and conductive third layer at depth > 27.54 m. Design principles should take this in consideration. ➢ ***Soil sensitivity and soil erosion:*** Potential soil erosion upon disturbance is possible at certain areas, precautionary measures and rehabilitation specifications should be noticed. ➢ ***Soil alkalinity:*** *High pH conditions are present and could have corrosive properties.* ➢ ***Salinity:*** *Saline soils could have corrosive potential and should be avoided as far as possible* ➢ ***Redox potential:*** *Low redox potential was encountered at a few sites and are indicative of sensitive soils which are prone to soil erosion upon disturbance.*
2	**DESCRIPTION OF THE TOPOGRAPHY OF THE BRYPAAL PV SOLAR PROJECT FOCUS AREA** **DOC REF:(2017/BES/SR/02)**	The surface area required for the PV project and associated infrastructure should be selected and demarcated by a surveyor with definite beacons and which is correlated with a project plan. No surface should be disturbed unnecessarily. Disturbed surface areas should be rehabilitated. No silt from such areas should be allowed to end-up in dry stream courses. Berm walls need to be put in place. Daily inspections required during the construction phase. **There is no reason from a topographical point of view that the PV Solar project should not be authorised. The topography makes it ideal for the construction and operation of such a facility on the Brypaal project focus area.** The surface area required for the PV project and associated infrastructure should be selected and demarcated by a surveyor with definite beacons and which is correlated with a project plan. No surface should be disturbed unnecessarily. Disturbed surface areas should be rehabilitated. No silt (soil), as the result of erosion of newly disturbed surface areas, should be allowed to end-up in dry stream courses. Berm walls need to be put in place.

3	**BRYPAAL SOLAR POWER (PV) PROJECT** **JUNE 2017** **Soil Specialist Impact Assessment** **DOC REF: (2017/BES/SR/03)**	From the Soil Impact Assessment, the following conclusions can be drawn: • The arid climate of the study area coupled with the shallow soils limits the agricultural potential to low intensity grazing. Therefore, the impact of the proposed development on agricultural resources is considered to be small. • The long-term challenges regarding the management of salts in the dust are problematic and can be managed through the application of dust suppressant polymers on the dirt roads. • Erosion must be controlled through appropriate mitigation and control structures. • Impacts from vehicles such as spillages, should be prevented and mitigated. • Dust generation should be mitigated and minimised. In perspective, the impacts of the proposed facility can be motivated as necessary in decreasing the impacts in areas where agriculture potential plays a more significant role. The importance of generating cleaner energy in and for South Africa cannot be overemphasised. Consequently, **there will be no impacts that cannot be mitigated or that should prevent the development from being approved.**
4	**LAND USE & LAND CAPABILITY** **DOC REF: (2017/BES/SR/04)**	**There is no reason from a land use and land capability point of view that the PV Solar project should not be authorised. The topography makes it ideal for the construction and operation of such a facility on the Brypaal project focus area.** The surface area required for the PV project and associated infrastructure should be selected and demarcated by a surveyor with definite beacons and which is correlated with a project plan. No surface (vegetation cover) should be disturbed unnecessarily, only what is really required for the construction of the PV Solar facility and associated infrastructure. Disturbed surface areas should be rehabilitated. Only a portion of the 1032 ha available from the project will be disturbed. Probable less than 40-50 % will be disturbed by construction of the PV Solar facility. A certain surface area (vegetation cover) will be disturbed during site preparation in the construction phase. Rehabilitation of bare disturbed surface areas will be difficult, as this project is located in a dry desert climate region that only receives between 100-200mm rainfall per year. Irrigation is not possible. Therefore the unnecessary disturbance of surface areas will be limited to what is really required for the construction of PV Solar facility and associated infrastructure.
5	**Flora Specialist Ecological Impact Assessment** **DOC REF:(2017/BES/SR/05)**	During the survey only one protected species was confirmed within the proposed development area, namely Hoodia gordonii. These plants if noted within the development area can be removed and replanted as part of the rehabilitation and revegetation plan. Removal and/or relocation of protected species are subject to permit requirements from the provincial authorities. From this Vegetation Survey the following conclusions can be drawn: - With the necessary mitigation measures in place and with diligent implementation and execution of these measurements, all the impacts can either be maintained to an absolute minimum or be avoided. Subsequently the development will have very little effect on the greater ecosystem functioning and its ability to fulfil essential processes. - With the implementation of mitigation measures this development will most likely not contribute to the potential cumulative impacts within the greater area.

		Consequently, there will be no botanical fatal flaws or impacts that cannot be mitigated or that should prevent the development from being approved.
6.1	**Baseline fauna assessment of Brypaal Farm 134** **DOC REF: (2017/BES/SR/06)**	RECOMMENDATIONS Finding a balance between economic growth and the protection of the environment will always remain a challenge. However, although all attempts should be made to support the growth of South African's economy, we must be aware that the integrity of our natural environment and its systems are vital to the survival of us all. Therefore, the common goal should be to promote sustainable economic growth while ensuring the protection of our natural resources and it's processes. To achieve this, the mitigation measures listed in §5.4 should be incorporated into the project design and implemented: In conclusion, due to the Bushmanland arid grassland being regarded as "Least Threatened", with very little of the area being transformed, if the required mitigation measures are implemented and the boundary of the project is controlled it is not foreseen that a significant change in the surrounding ecology would occur. However, this depends on the scale and associated impacts of the project. **Based on the information available during the compilation of this report, it is recommended that project design Option 2 be implemented, as this will have the least impact on the fauna of the project area.**
6.2	**AVIFAUNAL IMPACT ASSESSMENT** **DOC REF: (2017/BES/SR/13)**	CONCLUSIONS The proposed BSPP will have some pre-mitigation impacts on avifauna at a site and local level which will range from High to Low. The impact of displacement due to disturbance during the construction phase is rated as Medium and will remain at a Medium level after mitigation. The impact of displacement of priority species due to habitat transformation associated with the operation of the plant and associated infrastructure is rated as High. This impact can be partially reversed through mitigation, putting it at a Medium level, after mitigation.. The remaining envisaged impacts, i.e. mortalities in the operational phase due to collisions with the solar panels and entrapment in perimeter fences are both rated as Low and should be mitigatable to a Very Low level with appropriate mitigation. The impact of the proposed 400kV grid connection is assessed to be Low and can be further mitigated to a Very Low level, due to the short length of the proposed overhead line. **The relatively small size of the footprint leads one to the conclusion that the cumulative impact of the facility on priority avifauna should in all likelihood be Very Low, taking into account the lack of other renewable projects within a 30km radius around the development area.** **From an avifaunal impact perspective, the proposed development could go ahead, provided the proposed mitigation measures are strictly implemented. No further monitoring will be required during the operational phase**

7	**Surface Water Assessment for the proposed solar farm on Portion 4 of the farm Breipaal 134 near the town of Kakamas, Northern Cape Province.** **September 2016** **DOC REF: (2017/BES/SR/07)**	Discussion and conclusions The vegetation type occurring in the study area is Bushmanland Arid Grassland (NKb 3). According to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) this vegetation type is considered to be of Least Concern (LC) (Map 3). It is not currently subjected to any pronounced transformation or development pressures. However, recently this area has been subjected to a high amount of solar project application and this may cause significant transformation pressures. During the site survey several protected species were also noted to occur within the study area. These include Avonia albissima, Lithops julii subsp. fulleri, Aloe variegata, Hoodia gordonii and Euphorbia spinea. The topography on the site is rather uniform but does vary to some degree over the site. The site slopes from east to west and toward the Sout River. The site can be regarded as a plain with watercourses causing channels in the landscape. Small rocky outcrops are present but are not prominent land forms. Altitude varies from 880 m in the east to 845 m in the west and illustrates the gradual slope toward the river. Due to the increase in slope toward the river this area contains a high amount of seasonal and ephemeral streams and drainage lines (Map 2 & 3). Obligate wetland vegetation was utilised to determine the presence and border of wetlands. The Sout River, streams and drainage lines are clearly defined and easily identifiable utilising the riparian vegetation. The study area contains a high amount of drainage lines and a few significant streams which drain into the Sout River (Map 2 & 3). These drain from the plains south east of the river. The central significant stream has its origin within the site while the two significant streams adjacent to the northern and southern border only have their origins within the site. None of the streams or drainage lines contain any berms or artificial dams within their main channels. All watercourses within the site boundary as well as the Sout River are subjected to few impacts and are consequently considered to be largely natural. Due to the arid environment the riparian vegetation along the ephemeral stream and drainage lines are not the conventionally identified riparian species found in wetter eastern regions of the country but in this region can be reliably be considered obligate riparian species and utilised to identify watercourses. As indicated by the vegetation no wetland conditions occur along the streams and drainage lines occurring on the site. However, wetland conditions do occur in areas along the Sout River and although the river is not located on the site it may still be affected by the solar facility. Riparian vegetation and topography allow easy identification of watercourses on the site. These watercourses also contain a distinct main channel which further simplifies identification. No pans occur on the site. A small earth dam occurs in the northern corner of the site but is artificial and cannot be considered a pan system. The tributaries of the Sout River and the river itself is subjected to very few impacts and is therefore considered as Largely Natural. Those impacts that affect these watercourses include domestic stock farming with sheep, dirt track crossings and weirs upstream of the site. Two small weirs upstream of the site has a limited impact on the Sout River. They will impact on the flow regime and sediment load of the river to some extent. A small dirt track also crosses the river. Due to the seasonal nature of the river it is unlikely to have a significant impact and will only affect the river during flooding events. The most significant impact would be associated with small livestock farming. This causes trampling of the catchment and riparian areas. The extent of this is

also not large and the impact is not considered to alter the watercourses significantly. Trampling by stock will contribute sediment to the system.

The Sout River is considered a fourth order watercourse and the ephemeral tributaries third order whilst the drainage lines flowing into these are then second order watercourses (see Figure 1). The quaternary catchment of this area is D53H. No significant impacts affect the river systems in the area. An Index of Habitat Integrity (IHI) was conducted for the South River and the significant streams in the study area (Appendix C). The results of the IHI indicated the Sout River and its tributaries has an Instream and Riparian IHI of Category B: Largely Natural. This is due to few impacts altering the watercourses in this area.

The EI&S of the floodplains associated with the Sout River has been rated as being High: Floodplains that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers. This is largely due to the Sout River being listed as a National Freshwater Ecosystems Priority Area (NFEPA) Upstream system which is considered important to the functioning of the Orange River. The Soutriver flows in to the Hartbees River, also an Upstream NFEPA system, approximately 20 km upstream of the confluence with the Orange River. The river also has a high IHI which contributes to the EI&S.

The proposed solar facility will undoubtedly cause several significant impacts on the Sout River and its tributaries. As a result strict mitigation measures will have to be implemented to ensure that these impacts are kept to a minimum. Predicted impacts include increased sedimentation due to increased erosion, increased establishment of exotic invaders and some alteration to flood and flow regimes.

The solar facility will likely require levelling of the layout area. This will require some drainage lines being levelled or disturbed through construction (Map 2). The construction phase will disturbed the soil surface and will allow sediments to be mobilised by runoff which will then increase the sediment load within the ephemeral streams and ultimately the Sout River. The disturbance of the drainage lines will also increase the sediment load. It is therefore important to limit the sediment input to the ephemeral streams and Sout River. Measures which can be utilised should include contouring the site so that runoff velocity is decreased and contours can also be bermed to capture sediment. Furthermore it is recommended that attenuation structures be implemented where affected drainage lines enter the ephemeral streams. The central significant stream will be excluded from the site as per layout plans. However, the upstream section of the stream will be included in the layout and here attenuation structures should also be implemented.

Due to the disturbance caused by construction coupled with the sandy soils of the area erosion monitoring will have to form a critical part of the construction and operational phases. Adequate erosion measures will have to be implemented where this is necessary.

Within the study area survey it was determined that the exotic invader, Mesquite Tree (Prosopis glandulosa), occurs sporadically within the study area (Appendix B). Disturbance during construction is likely to cause susceptible condition for increased establishment of this exotic. The ability of the species to invade watercourses in this arid region is well known, i.e. Ongers River, and this should be prevented. It is therefore recommended that all specimens on the site be removed prior to construction and that monitoring of establishment of the species on the site be done throughout the operational phase. Any seedlings or established trees should be removed throughout the operational phase. Although the Sout River does not form part of the site it should also be monitored as there is a high risk that specimens from the site may invade this watercourse.

Due to the clearing of vegetation, levelling of the site, contouring and attenuation structures the runoff will be altered and in so doing the input volumes

		into the ephemeral streams and Sout River. This will therefore alter the flow regime within these watercourses. During previous studies (Burch et al 2014), it has been shown that through construction soil compaction occurs which decreases infiltration and increases runoff. Furthermore, the rain shadow caused by the panels cause an are not utilised for infiltration thus increasing runoff. This will also affect the inflow into the ephemeral streams and thus alter the flow regime. **As per the layout plans it is also recommended that the central, significant ephemeral stream be excluded from the facility.**

8	**Desktop geohydrological study for the proposed solar farm on Portion 4 of the farm Breipaal near the town of Kakamas, Northern Cape Province.** **DOC REF: (2017/BES/SR/08)**	CONCLUSION • The study area is located within the Lower Orange Management Area, Quaternary Drainage Area D53H. The non-perennial Sout river lays to the north-eastern boundary and run-off is in a north –eastern direction towards the Sout river. • Groundwater occurs in zones of weathering and in fractures or in the contact zones between different lithology's, such as granodiorite, granite, pegmatite and gneiss of the Keimoes Suite (Me), Yield is generally less than 0.5 l/s. Groundwater can be exploited from joints and fractures in calcsilicates and sub ordinated quartzites of the Geelvloer Group (Mgv). The calc silicates have known karstic aquifer properties and are not likely to facilitate groundwater occurrence. Refer to Figure 10 • The aquifer(s) of the area under investigation is classified as a poor aquifer according to the map of Aquifer Classification of South Africa, 2012 and is depicted in Figure 11. • The aquifer susceptibility index is classed as low vulnerability and depicted on the map in Figure 12. • The aquifer vulnerability for the study area indicates the least tendency for contamination if pollutants are discharge or leeched over the long term and is depicted on map in Figure 13. • The water quality of sampled sites Breipaal I, Breipaal II and Breipaal III is classified as above the recommended standard and are not suitable for human consumption. These sites are classified above the recommended standard due to very high EC, TDS, Na, Ca,Cl, S04 and F concentrations.

8.1	**HERITAGE IMPACT ASSESSMENT** **DOC REF: (2017/BES/SR/09)**	Recommendations and conclusion In terms of the archaeology component of Section 35 of the NHRA several Middle Stone Age flakes were found scattered over the area in low densities. According to Beaumont et al (1995) “thousands of square kilometres of Bushmanland are covered by a low density lithic scatter”. These artefacts are referred to as background scatter or occurrences and of low heritage significance. In addition to these low density scatters a distinct archaeological site (Feature 1) of significance was identified at 29° 12' 21.6829" S, 20° 21' 49.8601" E. The site consists of several small stone packed circles with a high density of lithic scatters, ostrich eggshell (some are burned) and bone fragments. The site is tentatively classified as belonging to the informally named ceramic final Later Stone Age dating to ≤ 2000 years. The site is located approximately 500 meters to the south of the development footprint and will not be impacted on. The paleontological component was addressed by Van Deventer (2017), he concluded: “The main time frames for fossils in South Africa are the Carboniferous (Karoo), Cretaceous and Cainozoic (Tertiary and Quaternary periods) . There are no Carboniferous or Cretaceous sediments present on the Brypaal site under discussion. The Tertiary and Quarternary period sediments are typical calcretes and aelolian sands and to a lesser extent some fluvial sediments on the Brypaal site. During deep excavations of >46 profile pits to a maximum depth of 3.5 m and surface geological mapping, no micro-organism, fauna or flora fossils were observed in neither the calcretes or the aeolian or fluvial sediment.” In terms of the built environment of the area (Section 34), no standing structures older than 60 years occur within the study area. In terms of Section 36 of the Act no burial sites were recorded. If any graves are located in future they should ideally be preserved in-situ or alternatively relocated according to existing legislation. No public monuments are located within or close to the study area. The study area is surrounded by residential developments and road infrastructure developments and the proposed development will not impact negatively on significant cultural landscapes or viewscapes. During the public participation process conducted for the project no heritage concerns was raised. **The impact of the proposed project on heritage resources is considered low and it is recommended that the proposed project can commence on the condition that the following recommendations are implemented as part of the EMPr and based on approval from SAHRA.** **• Implementation of a chance find procedure.** **• Although the Later Stone Age site (Feature 1) will not be impacted on directly the site should be preserved with a 50-m buffer zone.**
8.2	**Paleontological Report** **DOC REF: (2017/BES/SR/10)**	**Palaeontological sites of interest** No fossils or any geological formation of any interest were found on the study area. **Conclusion** **Several walk-through routes were completed for geology, soils and vegetation surveys. On each route careful observations were made with respect to potential and probable palaeontological occurrence. For the area under discussion no evidence was found of any palaeontological occurrences.**

9	**VISUAL IMPACT ASSESSMENT** **DOC REF: (2017/BES/SR/14)**	**Conclusion:** The construction and operation of the proposed PV Solar Facility and its associated infrastructure will have a visual impact on the natural scenic resources and rural of the immediate context, only within the limited view corridors within 0.5 km range of the proposed facility and from viewpoint 2. The moderating factors of the visual impact of the facility on the close range are the following: • The entire site cannot be viewed at once due to the topography. • The orientation of the panels. North-facing PV viewed from the south from viewpoint 2. In light of the above-mentioned factors that reduce the impact of the facility, the visual impact is assessed as medium visual impact. The author is of the opinion that the facility has an advantage over the more conventional power generation plants (for instance coal-fired power stations) as it utilizes a renewable source of energy which is considered as an international and national priority to generate power and is therefore generally perceived in a more favourable light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers. The project is deemed to be feasible from a visual impact assessment perspective and the following recommendations are made for the proposed PV Solar Power Facility: • The exterior of the invertor housing should be dark grey in order to reduce the visual impact of the structures. • Mast of less than 15 m high is situated adjacent to the pylons and specified as a lattice structure if possible. • The Betafence: Nylofor medium is the preferred option finished in a dark grey colour to a maximum height of 2030 mm.

10	**SOCIAL IMPACT ASSESSMENT** **BRYPAAL 100 MW CONCENTRATED SOLAR POWER FACILITY** **NORTHERN CAPE PROVINCE** **MAY 2017** **Prepared** **By Tony Barbour** **ENVIRONMENTAL CONSULTING** **DOC REF:(2017/BES/SR/11)**	**CONCLUSIONS AND RECOMMENDATIONS** **The findings of the SIA indicate that the development of the proposed Brypaal CSPF will create employment and business opportunities for locals during both the construction and operational phase of the project.** The establishment of a Community Trust will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximse the potential benefits. The significance of this impact is rated as High Positive. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives. The establishment of the proposed Brypaal CSPF is therefore supported by the findings of the SIA. Due the number of other renewable energy projects proposed in the KGLM, it is recommended that the KGLM liaise with the proponents to investigate how best the Community Trusts can be established and managed so as to promote and support local, socio-economic development in the region as a whole. However, the potential impacts associated with large, solar energy facilities on an areas sense of place and landscape cannot be ignored. These impacts are an issue that will need to be addressed by the relevant environmental authorities, specifically given the large number of applications for solar facilities in the area.
11	**TRAFFIC IMPACT STUDY** **DOC REF: (2017/BES/SR/16)**	**3.6 Conclusion** It can be concluded that: • Due to limited detail quantities and infrastructure plans, this report presents only concepts and preliminary plans. The final detail lay outs and quantities will be addressed during the Detail Design Phase • There will be an increase in traffic volume during Construction phase on Road 2972 due to trucks and other small vehicles • A small fraction of the road material consists of TSP and PM10 emissions • Road 2972 has the potential to emanate dust due to the current geotechnical characteristics • There is a high-risk area where Road 2971 crosses the Salt river • During rain events there might be some more road deterioration and decrease of road stability • Material selection for upgrading Road 2972 and the access road must be done by a competent person • Some maintenance practices to minimise dust, should be implemented 3.7 Recommendations • The final detail lay outs and quantities will be addressed during the Detail Design Phase.

		3.7 Recommendations • The final detail lay outs and quantities will be addressed during the Detail Design Phase. • A Traffic / transportation officer should do a detail planning and develop a transport program for heavy trucks during the construction phase to ensure optimum use of each of the major access roads to Brypaal (Kakamas to Brypaal; Pofadder to Bypaal or Kenhardt to Brypaal). • Dust suppression will be necessary: Typical dust mitigation measures include: o regular watering of service roads. o spaying of products such as Dust-a-side or others which are adaptable to the material and climate of the site and which are environmental friendly and harmless to the environment. o speed reduction. o minimising material handling operations. o early or concurrent rehabilitation of disturbed surfaces. • Safety precautions such as Safety control officer at critical points or nodes or intervals at peak hours. • A Traffic and Transportation Management plan should be implemented during all phases of the project .
12	**WATER USE LICENCE (WULA)**	**Water Use Licence Application (WULA):** **An environmental consultancy is currently busy with the study. The Water Resource Assessment will also be used.** **The original consultant (Gys Hoon) recently past away and could not finalize the job.**

NOTE: SEE APPENDIX A FOR FULL REPORTS.

NOTE: SEE EMPR (SECTION f) FOR MORE INFORMATION ON IMPACT MANAGEMENT ACTIONS.

n) Final proposed alternatives.

(Provide an explanation for the final layout of the infrastructure and activities on the overall site as shown on the final site map together with the reasons why they are the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment)

See section *(h) a* ***full description*** *of the* ***process*** *followed to reach* ***the proposed preferred activity, site and location within the site****, including - (i) details of all the* ***alternatives*** *considered;*

o) Aspects for inclusion as conditions of Authorisation.

Any aspects which have not formed part of the EMPr that must be made conditions of the Environmental Authorisation

NONE.

p) Description of any assumptions, uncertainties and gaps in knowledge.

(Which relate to the assessment and mitigation measures proposed)

NONE.

(q) a Reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation:

There are no significant reasons why the activity should not be authorised. However, if the proposed management and mitigation measures are not properly applied or if the PV solar operation intentionally disregards any of these measures, it will negatively affect the environment and have more long-term consequences. Therefore, the competent authority should take all the necessary steps to ensure that the PV Solar operation complies with the conditions set out in the approval of the EMPR. It is also noted that the proposed development is not predicted to pose significant negative environmental or social impacts that cannot be mitigated to acceptable levels, and none of the specialists have noted any fatal flaws relating to the development. Significant positive socioeconomic impacts are also predicted to result from the proposed project, and the power generated from the proposed solar facility will contribute towards stabilising the Eskom power supply grid and provide a much needed additional source of power. With the above in mind, and in terms of meeting the objectives of sustainable development, the EAP is of the view that DEA should authorise the development of the proposed Brypaal Solar PV Facility, subject to effective implementation of the mitigation measures spelled out in the EMPR .

r) Period for which the Environmental Authorisation is required.

25 YEARS.

s) Undertaking

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Basic assessment report and the Environmental Management Programme report.

(i) the correctness of the information provided in the reports;

(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

(i) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;

SEE PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT FOR SIGNED UNDERTAKING

t) Financial Provision for Rehabilitation

(where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts);

All financial cost incurred from the beginning of the project for rehabilitation will be regarded as part of the **operating cost** from day one until closure.

u) Deviations from the approved scoping report and plan of study.

i. Deviations from the methodology used in determining the significance of potential environmental impacts and risks.

NONE.

ii. Motivation for the deviation.

NONE.

v) Other Information required by the competent Authority

NONE.

w) Other matters required in terms of sections 24(4)(a) and (b) of the Act.

There are no alternatives.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1) Draft environmental management programme.

a) **Details of the EAP,** (Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

b) **Description of the Aspects of the Activity** (Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1)(h) herein as required). YES , SEE PART A (EIAR) FOR MORE DETAIL.

		Activity, Product or Service
	Construction phase	**GN R325: Description of project activity that triggers listed activity:**
1		**Activity 1:** The construction of a **PHOTOVOLTAIC SOLAR POWER (PVSP) facility (with associated infrastructure**) for the generation of electricity from a renewable resource (solar radiation) where the electricity output is 100MW in total.
2		**Activty 9:** The construction of substation (transformers) and power lines (400 kV) up to the Eskom connection (main substation outside the project site,property).
3		**Activity 15**: The clearance of an footprint area of up to probable 500ha of a total of 1032 hectares of indigenous vegetation during site preparation for the establishment of the indicated activities under Activity (1) –
		GN R327: Description of project activity that triggers listed activity:
4		**Activty12 :** Possible the construction of the following: (i) canals exceeding …………. square metres in size; (ii) channels exceeding ……….. square metres in size; (iii) bridges exceeding ……………square metres in size; **(iv) dams, where the dam, including infrastructure and water surface area, ……….. square metres in size;** (v) weirs, where the weir, including infrastructure and water surface area, ……… square metres in size; (vi) bulk storm water outlet(s) structures exceeding …………square metres in size; (x) buildings exceeding ……………square metres in size; (xii) infrastructure or structures with a physical footprint of ………………. square metres or more; a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;

5	**Activty 13:** The PVSP project utilizes kl/ annum water from a **desalination plant**, as process water during steam generation (turbine house) and also drinking water, dust suppression, cleaning, etc. Reservoir (tanks) would be constructed with a capacity of …………… kl . Water will be recycled via **lined collection dam facilities**. Surface run-off that ends-up in the dirty environment would be captured via a collection of trenches/canals and channeled to a evaporation pond (capacity …………..kl) .
6	**Activty 14:** The construction **of temporary diesel tank storage facilities** (bunded) as part of the contractor lay down site. (Capacity…………L)
7	**Activity 19:** 1) During initial site preparation operation the **site will be surveyed and levelled** for particular project (infrastructure) components (listed activities). This will involve **vegetation clearance, topsoil/overburden removal & stockpiling at dedicated stockpile areas**. 2) Dedicated **quarries** will be mechanically excavated for obtaining construction infill/backfill material (weathered overburden material). Prior to removal of material the topsoil need to be stockpiled in a dedicated stockpile next to the quarry. The material will be loaded onto trucks and transport to construction site where required for infilling, backfilling, terraces, benches, etc. 3) Surface run-off control trenches/canals/evaporation dam sites//culverts/energy dissipating structures, etc. need to be excavated/constructed.
	Activty 28 = See activity 1 & 15 of GN 325
	GN R324: Description of project activity that triggers listed activity:
8	**Activty 1:** During the construction phase **information/ identification of the project/ safety information billboards/ safety warning signs** will be provided on site.
9	**Activity 4:** An **access road** will be constructed on site to give access to the contactors initially and eventually where required a permanent road on site for easy access during the operational phase of the PVSP project. An access road is also needed as along the border fence for security reasons and also act as a fire-break.

c) Composite Map

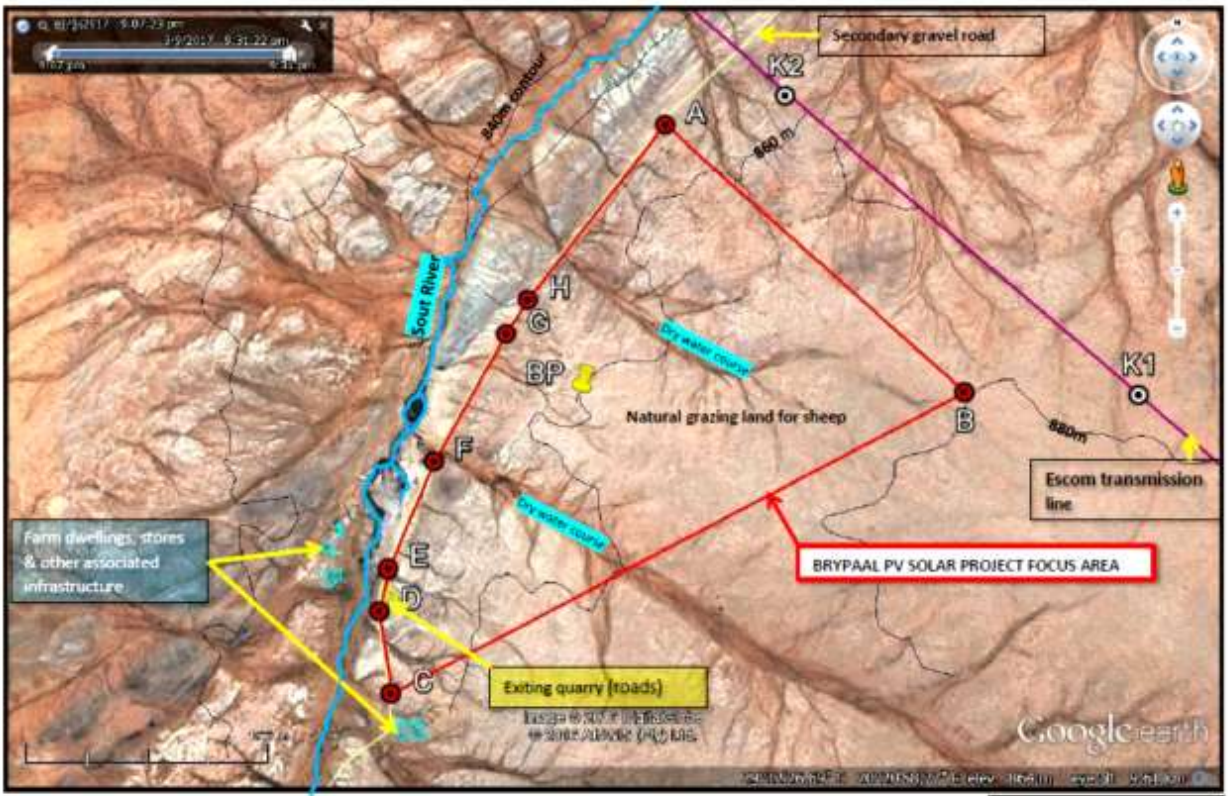
(Provide a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers)

Towards a Pre- Final surface layout map of the Project Focus Area:

No.	MAPS	
C1	**The Brypaal PV Solar Project Focus Area** - Satellite image used as base map superimposing Maps C2-C6 as overlays. - Indicate environmental finds/sensitivities and buffer zones.	
C2	**The Topography of the Project Focus Area**	
C3	**The Geology of the Project Focus Area**	
C4	**The Soil map**	
C5	**The Flora Sensitivity Map of the Project Focus Area**	
C6	**The Fauna Significant findings map of the Project Focus Area**	
C7	**The Heritage findings map of the Project Focus Area**	
C8	**The Initial surface layout (footprint) map of the Project Focus Area**	
C9	**The Pre- Final surface layout map/plan of the Project Focus Area**	

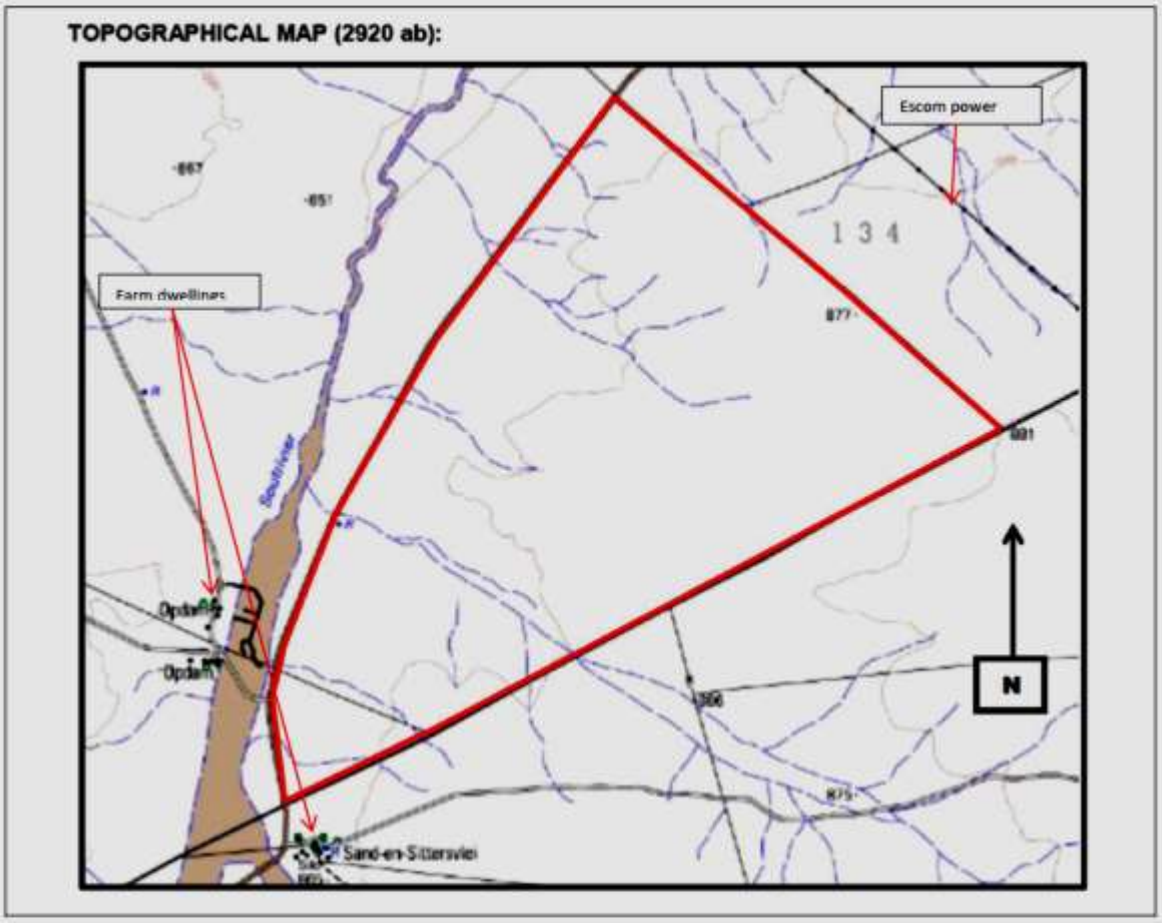
C1	**The Brypaal PV Solar Project Focus Area**	
	Initial focus area of environmental description and impact studies	

BRYPAAL PV SOLAR PROJECT FOCUS AREA



PROJECT MAP NO.1

C2	The Topography of the Project Focus Area	

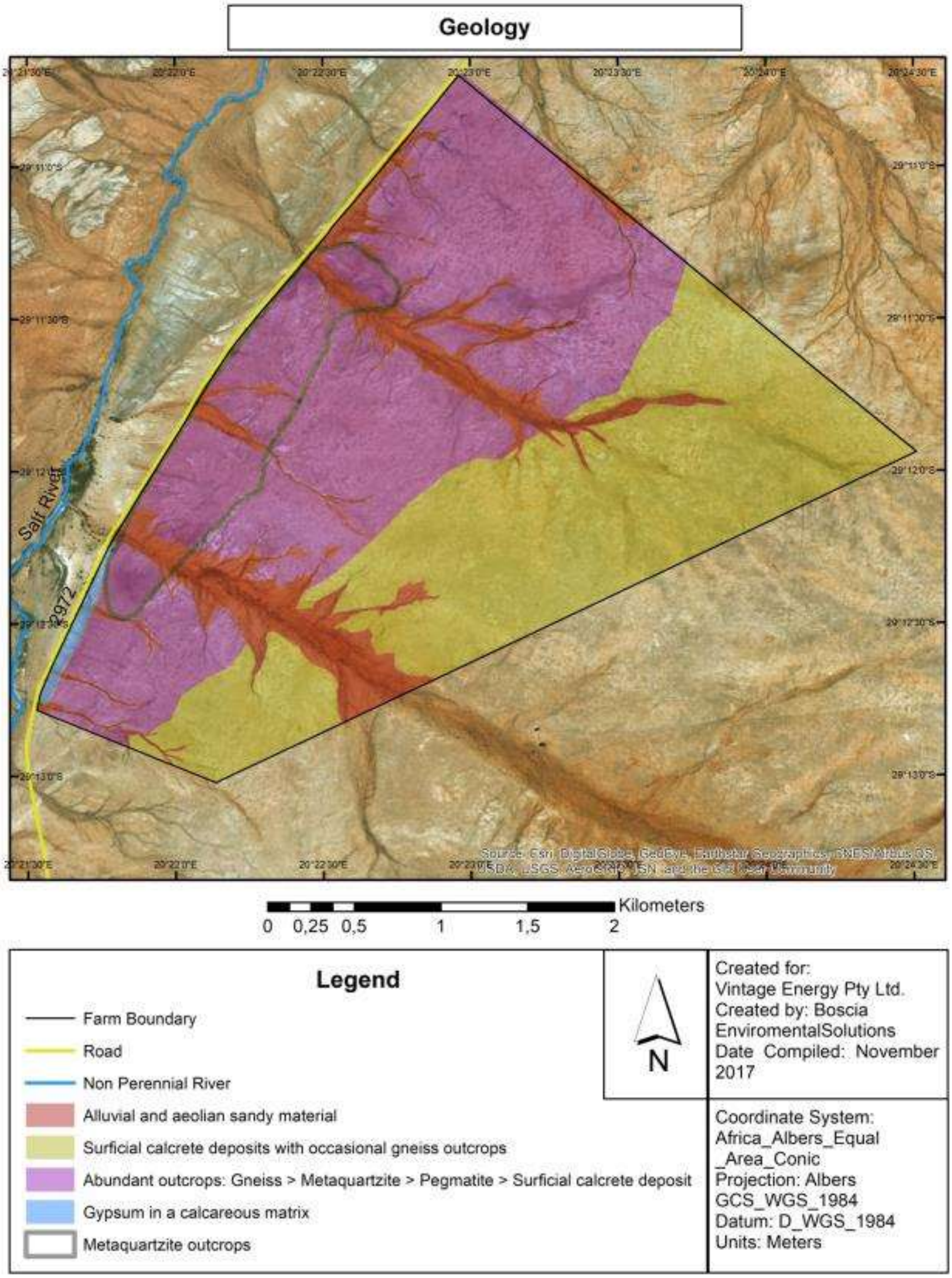


The majority of the surface area is described a flat (see GOOGLE EARTH SLOPE ANALYSES OF THE PROJECT AREA USING SATTELITE IMAGERY) with average slopes of 0,3%, 0,8% and 0,9 % etc.. This makes the project site an ideal focus area for the PV solar project.

Topographical features that need to be avoided are “dry stream water courses” that are draining towards the Salt River.

The majority of the proposed project area (study area) lies between 860-880m above sea level and sloping towards the western side with a height of 860m towards 840m above sea level. The project area on the western side is more dissected by dry water courses, draining the project surface area towards the Sout River.

C3	The Geology of the Project Focus Area	



Geology (DOC REF: 2017/BES/SR/12)

During the field survey it was established that the north-western part of the study area consists of granitoids with the following order of abundancy: Gneiss > metaquartzite > pegmatite > surficial calcrete deposits. Surficial calcrete deposits with occasional gneiss outcrops dominate the south-eastern part of the study area. The drainage systems consist of alluvial and aeolian sandy material, while gypsic deposits coexist with a calcareous mixture.

The proposed development will have a low to moderate impact on the geological environment and these impacts can be largely mitigated with a resultant low overall significance due to the limited extent of the proposed earthworks as well as the layout of the proposed site being on an area dominated by gneisses with surficial calcrete deposits. The geology is favourable in terms of erodibility potential. The proposed layout has been selected to avoid areas with unfavourable topography and various variations in geology. The proposed layout is deemed acceptable in terms of this impact study.

Geotechnical Recommendations (DOC REF: 2017/BES/SR/01)
Founding conditions are favourable for the proposed development and conventional construction methods can be implemented. Depending on the design and loads to be applied, the following recommendations are made;
It is assumed that the calcrete and gneiss encountered on the site are suitable for construction of access roads and tracks, based on the existing main road.

C4	**The Soil map (Sensitivity)**	

Interpretation of Soil Survey and Analytical Data

Agricultural Potential

The agricultural potential of the site is determined mainly by the climate in that the rainfall effectively excludes any form of crop production, therefore the site is suited only for grazing. Due to the water quality and restricted availability no crop production is possible. Even if water was available for irrigation, due to the finer texture of the subsoils within the level terrain area the long-term viability of irrigated agriculture will be limited through the limited potential of irrigation induced salt leaching.

Overall Soil and Land Impact

The impact on soil and agriculture is expected to be low, due to the low agricultural potential as well as the variable rainfall in this environment if:

- Erosion prevention and storm water management measures are implemented; and
- A large enough footprint area around the development area is left open.

Soil sensitivity can be established by determining the dispersivity and erosion potential of soil by means of calculating the sodium exchangeable percentage:

$$\frac{Na}{CEC}\ x\ 100$$

Sodium exchangeable percentage values are divided into classes based on the amount of exchangeable potential indicating the degree of soil dispersivity. Class 1 indicates the lowest sodium exchangeable percentage hence being the most favourable class, while class 4 indicates the highest sodium exchangeable percentage, thus being the least favourable.

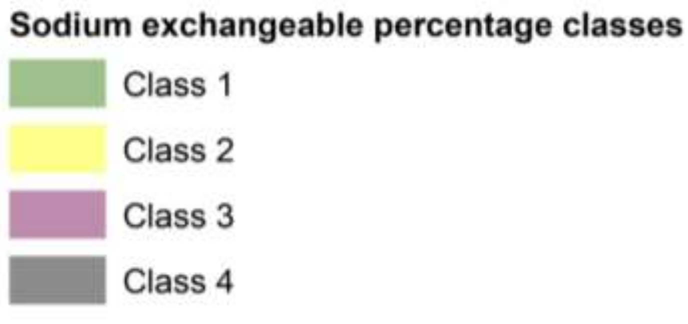


Figure 15 illustrates the soil sensitivity map based on soil dispersivity (sodium exchangeable percentage).

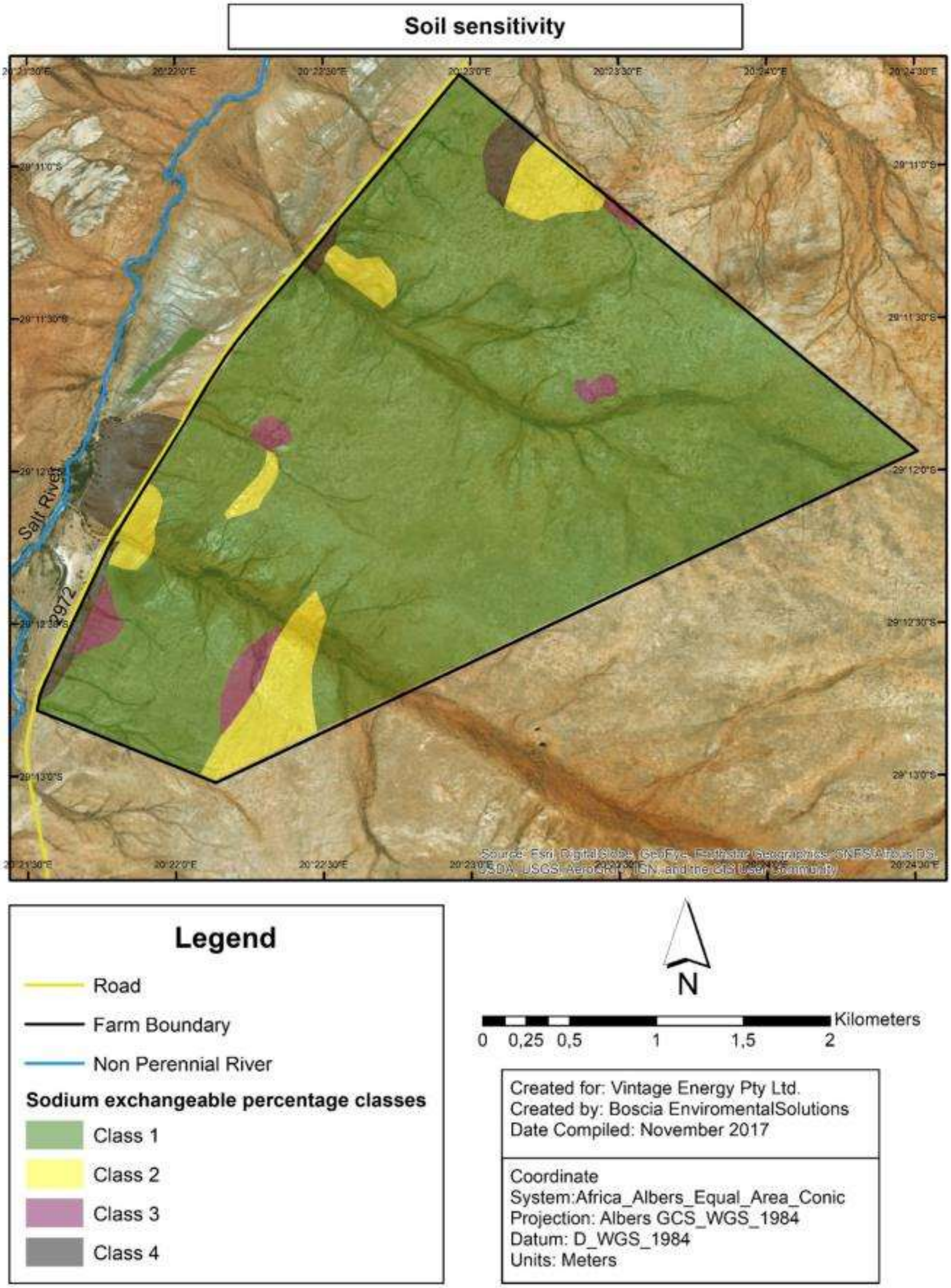


Figure: Soil sensitivity map of the study area (Google Earth, 2016).

Discussion and Conclusion

Based on the information obtained, an area of 320 ha with the most favourable soil characteristics was selected. Previous figure illustrates the proposed development area for the Brypaal Solar Power (PV) Project.

During this investigation it was confirmed that the most favourable soil conditions is within the south-eastern part of the study area, due to the overall low soil dispersivity.

A summary of the pre- and post-mitigation impact significance ratings for the different impacts and risk factors identified for the proposed development are provided below :

Summary of pre- and post-mitigation impact significance ratings.

Construction and Operational Phase			
Phase	**Impact**	**Significance Pre-mitigation**	**Significance Post-mitigation**
Construction and Operational	Loss of agricultural land.	MEDIUM (32)	LOW (21)
	Increased susceptibility to erosion.	MEDIUM (36)	LOW (21)
	Dust generation.	MEDIUM (40)	LOW (18)
	Vehicle operation on site.	LOW (28)	LOW (10)

Cumulative Impacts			
Phase	**Impact**	**The impact of the proposed project in isolation**	**The cumulative impact of the project together with the projects within the area**
Cumulative	Cumulative impact of the loss of agricultural land	MEDIUM (32)	LOW (28)

From this Soil Impact Assessment, the following conclusions can be drawn:

- The arid climate of the study area coupled with the shallow soils limits the agricultural potential to low intensity grazing. Therefore, the impact of the proposed development on agricultural resources is considered to be small.
- The long-term challenges regarding the management of salts in the dust are problematic and can be managed through the application of dust suppressant polymers on the dirt roads.
- Erosion must be controlled through appropriate mitigation and control structures.
- Impacts from vehicles such as spillages, should be prevented and mitigated.
- Dust generation should be mitigated and minimised.

In perspective, the impacts of the proposed facility can be motivated as necessary in decreasing the impacts in areas where agriculture potential plays a more significant role. The importance of generating cleaner energy in and for South Africa cannot be overemphasised. Consequently, there will be no impacts that cannot be mitigated or that should prevent the development from being approved.

C5	**The Flora Sensitivity Map of the Project Focus Area**	
	Ecological Sensitivity	

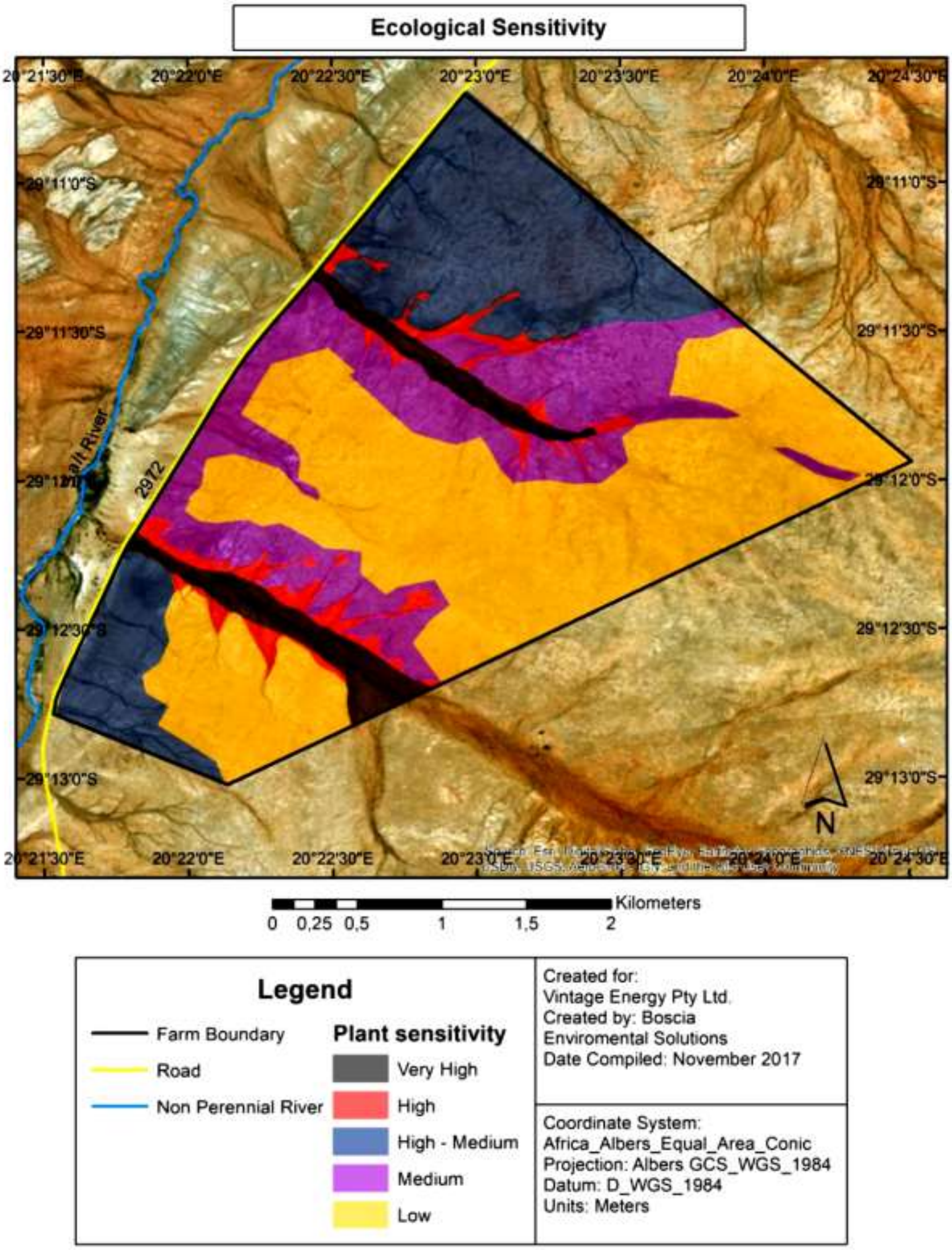


Figure : Vegetation sensitivity map of the Brypaal Proposed Solar Facility indicating the sensitivity status of the area.

Vegetation Sensitivity Assessment:

The following sensitivity map (previous page) has been compiled, based on the criteria as set out in this report, using existing information gathered from field surveys and existing literature and information available.

The grassland habitat and parts of the shrubby grassland habitat are of medium to low sensitivity however containing sporadic individuals of *Hoodia gordonii* which is considered as protected. The shrubby grassland habitat also contains small populations of other protected species like *Avonia albissima, Euphorbia spinea* and *Lithops julii subsp. fulleri var. fullerii.* However, the significance of impacts on vegetation in these areas is likely to be medium to low due to the proposed layout of the development area. The major drainage lines (stream order 3) in the area are considered ecologically significant and has been avoided (No-Go areas) and appropriately buffered. Based on information from existing sources such as NFEPA Wetlands, Desktop Delineated Wetlands and Threatened Ecosystem Status as well as vegetation field observations, it has been established that these drainage lines are not considered as wetlands. Therefore, as mentioned in the Stormwater Management Plan, all major drainage lines (stream order 3) needs to be avoided in order to assure natural water flow when needed, as well as to limit soil erosion.These major drainage lines are considered natural corridors.

Discussion and Conclusion

Based on the information obtained, an area of 320 ha with the most favourable botanical characteristics was selected. Figure 13 illustrates the proposed development area for the Brypaal Solar Power (PV) Project.

During the site visit it was confirmed that the vegetation of the study area is consistent with the Bushmanland Arid Grassland (NKb 3), Bushmanland Sandy Grassland (NKb 4) and Bushmanland Basin Shrubland (NKb 6). The overall vegetation character can be described as semi-natural due to the gradual historical transformation (grazing of sheep) the landscape has undergone over a long period of time.

Due to the relatively homogenous geomorphology and geology of the directly affected area, variation in species composition between different habitats is low. Habitats is rather characterised by species confined only to that specified habitat.

The habitat features observed on this area correspond to the geological distribution and soil characteristics. The different habitat features observed are described based on their biodiversity attributes and proximity to the proposed development area. The habitats that were identified during this survey includes the Grassland, Shrubby Grassland with sub-habitat Bare Patches and also

Drainage Systems with sub-habitats, Stream Order 3, Stream Order 2, Stream Order 1 and Paleo Drainage Systems.

During the survey only one protected species was confirmed within the proposed development area, namely *Hoodia gordonii*. A total of four plant species were identified within the study area (not within the proposed development area), being protected within the Northern Cape Nature Conservation Act (Act 9 of 2009):

- *Hoodia gordonii*
- *Avonia albissima*
- *Euphorbia spinea*
- *Lithops julii subsp. fulleri var. fulleri*

Following data collection and the processing and interpretation thereof, the habitat types and geomorphological features were classified in different levels of sensitivity, as illustrated in the table below:

Table 2: Summary of identified sensitivities.

Habitat and Geomorphological Feature	**Sensitivity**	**Reason**
Drainage Systems – Stream Order 3	Very High (No-go area)	Critical role within the ecosystems: Ecological functions such as surface flow reduction and flood attenuation, erosion control and stream flow augmentation. Vulnerabilities: Erosion risk
Drainage Systems – Stream Order 2 and Stream Order 1	High	Acts as buffers around No-go Areas. Vulnerabilities: Erosion risk
Shrubby Grassland	Medium & High-Medium	Contribution to the general habitat diversity of the area. Contains species identified as protected. Vulnerabilities: Loss of unique species.
Drainage Systems – Paleo Drainage Systems	Low - Medium	Semi-natural, historically transformed through long term sheep grazing. Vulnerabilities: Potential soil erosion
Grassland		

A summary of the pre- and post-mitigation impact significance ratings for the different impacts and risk factors identified for the proposed development are provided below (Table 6).

Table 3: Summary of pre- and post-mitigation impact significance ratings.

Construction and Operational Phase			
Phase	**Impact**	**Significance Pre-mitigation**	**Significance Post-mitigation**
Planning and Construction	The impacts on vegetation and protected plant species	MEDIUM (44)	LOW (27)
	Soil erosion and associated degradation	MEDIUM (32)	LOW (15)
	Impacts on Drainage Lines	MEDIUM (42)	LOW (4)
	Alien Plant Invasion	MEDIUM (52)	LOW (12)
Operational	The disturbance or loss of natural vegetation and protected plant species	MEDIUM (44)	LOW (18)
	High levels of erosion due to altered runoff patterns caused by rainfall interception by infrastructure and compacted area.	MEDIUM (56)	LOW (4)
	Impact on Drainage Lines	MEDIUM (42)	LOW (4)
	Increase in Alien Plant Invasion	MEDIUM (56)	LOW (12)

Cumulative Impacts			
Phase	**Impact**	**The impact of the proposed project in isolation**	**The cumulative impact of the project together with the projects within the area**
Cumulative	Decreased ability to meet conservation targets.	LOW (12)	MEDIUM (42)
	Compromising functioning of habitats.	LOW (12)	LOW (24)

During the survey only one protected species was confirmed within the proposed development area, namely *Hoodia gordonii*. These plants if noted within the development area can be removed and replanted as part of the rehabilitation and revegetation plan. Removal and/or relocation of protected species are subject to permit requirements from the provincial authorities.

From this Vegetation Survey the following conclusions can be drawn:

- With the necessary mitigation measures in place and with diligent implementation and execution of these measurements, all the impacts can either be maintained to an absolute minimum or be avoided. Subsequently the development will have very little effect on the greater ecosystem functioning and its ability to fulfil essential processes.
- With the implementation of mitigation measures this development will most likely not contribute to the potential cumulative impacts within the greater area.

Consequently, there will be no botanical fatal flaws or impacts that cannot be mitigated or that should prevent the development from being approved.

C6	The Fauna Significant findings map of the Project Focus Area	

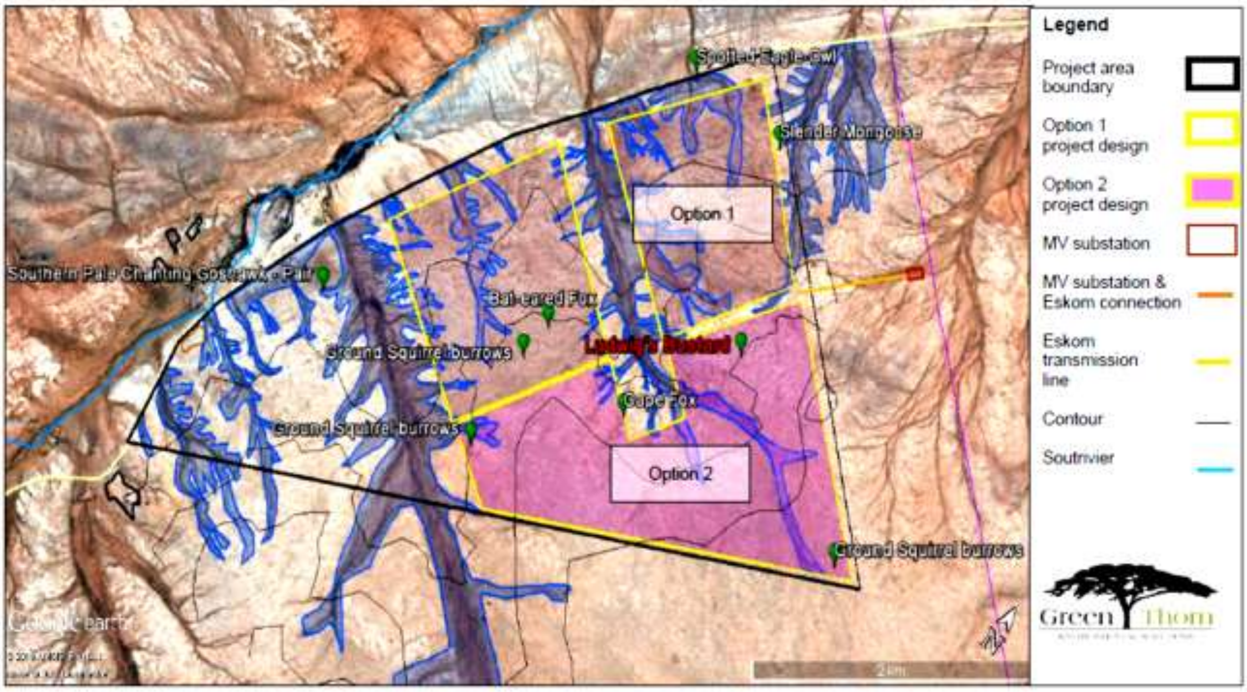


Figure 13: Locations of the most significant findings made during the fauna site assessment

RECOMMENDATIONS

Finding a balance between economic growth and the protection of the environment will always remain a challenge. However, although all attempts should be made to support the growth of South African's economy, we must be aware that the integrity of our natural environment and its systems are vital to the survival of us all. Therefore, the common goal should be to promote sustainable economic growth while ensuring the protection of our natural resources and it's processes. To achieve this, the mitigation measures …….should be incorporated into the project design and implemented:

In conclusion, due to the Bushmanland arid grassland being regarded as "Least Threatened", with very little of the area being transformed, if the required mitigation measures are implemented and the boundary of the project is controlled it is not foreseen that a significant change in the surrounding ecology would occur. However, this depends on the scale and associated impacts of the project.

Based on the information available during the compilation of this report, it is recommended that project design Option 2 be implemented, as this will have the least impact on the fauna of the project area.

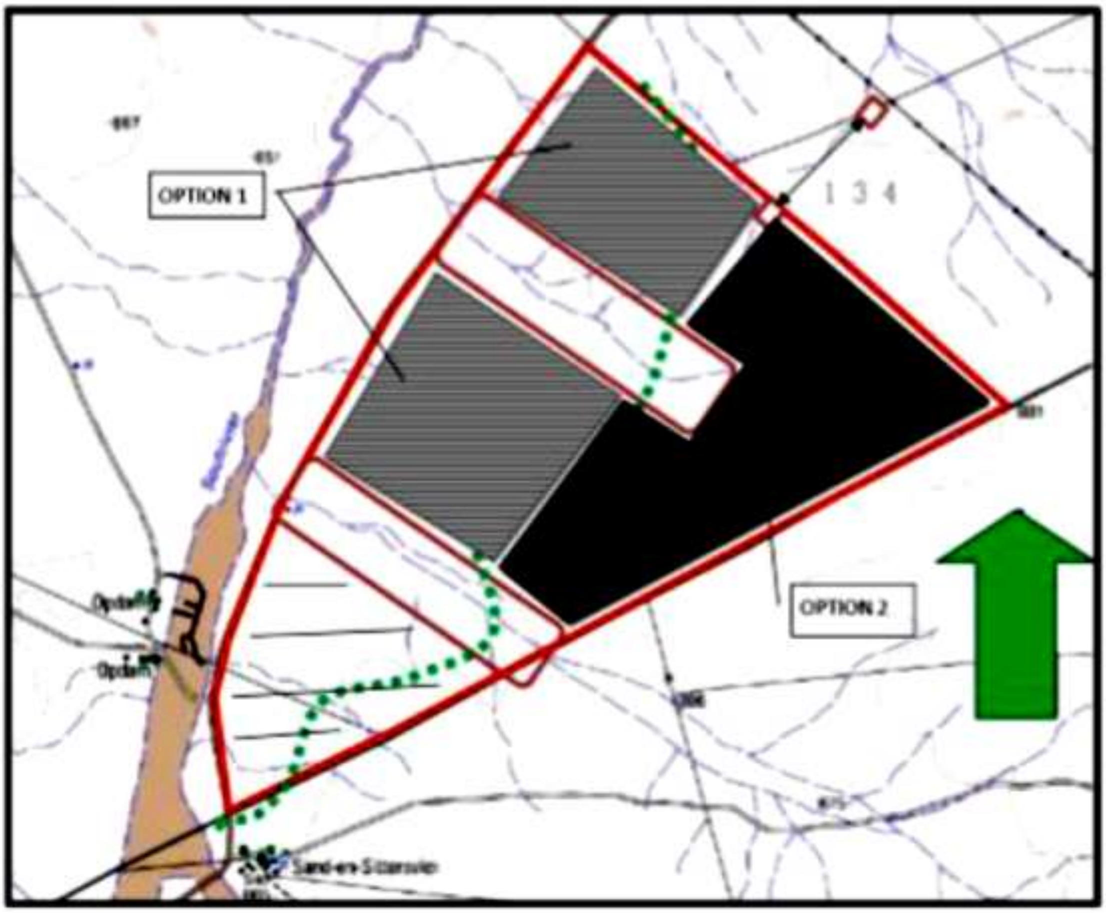
C7	The Heritage findings map of the Project Focus Area	

Figure 22. Development footprint in relation to the recorded sites.

Potential Impact

The development footprint is sited approximately 500 meters away from feature 1 resulting in no direct impact on the site (Figure 22). Furthermore, two find spots (Field number 707 & 708) is also located outside of the development footprint. **Therefore, the impact on heritage sites by the proposed development is considered low**. Any direct impacts that may occur would be during the construction phase only and would be of very low significance. Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. This and other projects in the area could have an indirect impact on the heritage landscape.

C8	The Initial surface (footprint) layout map of the Project Focus Area	



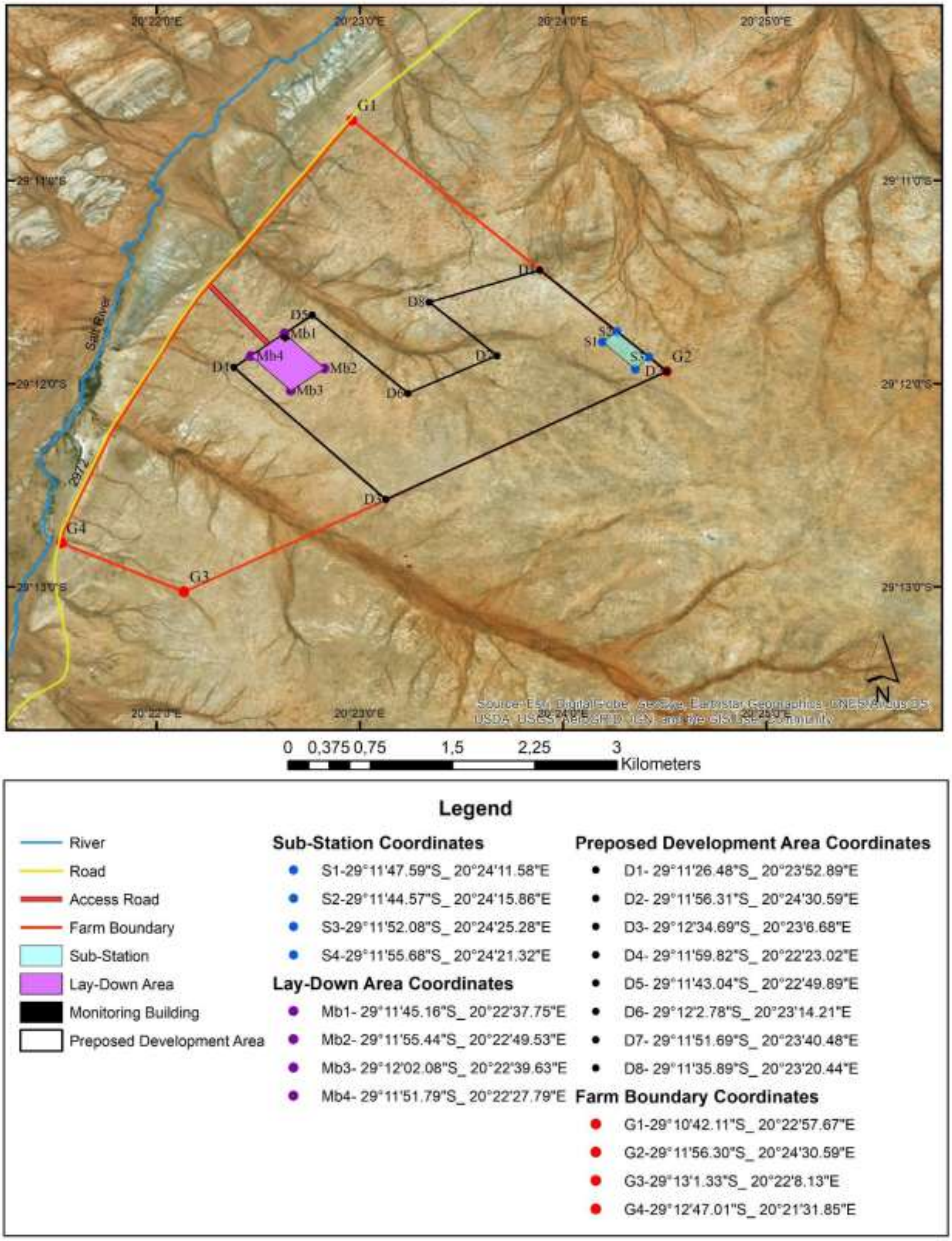
C9	**The Pre- Final surface layout map/plan of the Project Focus Area**	

Conclusion:

Based on the information obtained, environmental description and impact asessment an area of **321 ha** with the most favourable environmental component characteristics was selected. The next figure illustrates the ideal proposed development area for the Brypaal Solar Power (PV) Project.

SEE NEXT PAGE FOR IDEAL DEVELOPMENT AREA MAP/PLAN

Development Area



d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including–

(i) planning and design;

(ii) pre-construction activities;

(iii) construction activities;

(iv) rehabilitation of the environment after construction and where applicable post closure; and

(v) where relevant, operation activities;

AND

f) Impact Management Outcomes/Actions(Mitigation measures)

The EMPr stipulates the environmental standards to be adhered to by the parties involved in the various phases of the project life cycle of the project. As such the draft EMPr comprises a section for each of the following project life cycle phases:

- Pre-construction;
- Construction activities (including rehabilitation);
- Operational and
- Decommissioning.

Specific management measures applicable to each phase are provided which includes where appropriate a description of the environmental aspects associated with that phase, the roles & responsibilities for implementation of the EMPr, timeframes, and monitoring requirements. It is intended that this EMPr is used in conjunction with project-specific management plans.:

DEDICATED EM PLANS AS REQUESTED BY DEA IN THE LETTER OF 28 SEPTEMBER 2017		
No.	**EMPLANS**	**Section/ Doc. Reference/Where?**
1	**EROSION MANAGEMENT PLAN**	**2017/BES/MPR/01**
2	**STORM WATER MANAGEMENT PLAN**	**2017/BES/MPR/02**
3.1	**PLANT RESCUE AND PROTECTION PLAN**	**2017/BES/MPR/03**
3.2	**ALIEN INVASIVE VEGETATION MANAGEMENT PLAN**	**2017/BES/MPR/03**
4	**AVIFAUNA MONITORING AND PROTECTION PLAN:** **From an avifaunal impact perspective, the proposed development could go ahead, provided the proposed mitigation measures are strictly implemented. <u>No further monitoring will be required during the operational phase.</u>**	**2017/BES/SR/13**
5	**OPEN SPACE MANAGEMENT PLAN**	**EMP**
6	**TRAFFIC MANAGEMENT PLAN INCLUDING TRANSPORTATION PLAN**	**2017/BES/SR/16 & 2017/BES/MPR/04**
7	**HAZARDOUS SUBSTANCES LEAKAGE OR SPILLAGE MONITORING SYSTEM**	**EMP**
8	**FIRE MANAGEMENT PLAN**	**EMP**
9	**REHABILITATION PLAN**	**See section f(iv) B – Rehabilitation plan,** etc. See also **2017/BES/MPR/03**

d) **Description of Impact management objectives at including management statements**

i) **Determination of closure objectives.**

The main closure objective of **Vintage Energy (Pty) Ltd.** is to rehabilitate the entire project site in such a way to ensure that the new man-made topographical landscape would blend in with the surrounding landscape, not pose a safety hazard to humans and animals, while at the same time allow for alternative land uses. Establish a self-sustaining and stable vegetation cover in order to mitigate the visual impact, to control erosion and to create some habitat for animals. The rehabilitated environment also needs to be aesthetically acceptable according to the principle of BPEO. Another main objective is to manage the surface water and ground water in such way that an acceptable water standard is achieved at closure.

Vintage Energy (Pty) Ltd. will ensure that the Operation/Site are:

- Neither a danger to public health and safety nor to animal health and safety;
- Not a source of any pollution;
- Stable (ecological and geophysical);
- Rehabilitated to the state that is suitable for the predetermined and agreed land use (farming again with some sheep) ;
- Compatible with the surrounding biophysical environment;
- A sustainable environment;
- Aesthetically acceptable;
- Not an economic, social or environmental liability to the local community or the state now or in the future.

Vintage Energy (Pty) Ltd. will furthermore:

- ensure that the physical and chemical stability of the rehabilitated site will be such that risk to the environment is not increased by naturally occurring forces to the extent that such increased risk cannot be contended with by the installed measures;
- subscribe to the optimal exploitation and utilization of approved project site;
- ensure that the project site is closed efficiently and cost effectively after 25 years;
- ensure that the operation is not abandoned but closed in accordance with the relevant requirements;
- ensure that the interest of all interested and affected parties will be considered;
- ensure that the all-relevant legislation regarding closure will be adhered to, and all relevant application procedures followed.

ALTERNATIVELY: The project could be upgraded with new technology (after 25 years)

ii) **Has a water use licence has been applied for?** A new WULA application will be prepared and be submitted to the Department of Water and Sanitation. Proof of submission will be sent onto the competent authority should it be necessary.

		Objectives
1	**GEOLOGY**	Optimal excavation of the construction material resource in order to ensure to facilitate better rehabilitation planning. The overburden and topsoil (where available) must be replaced in a responsible and planned manner in order to achieve some conformity with the surrounding undisturbed area.
2	**TOPOGRAPHY**	Rehabilitation of the new topographical landscape in such a way that it would blend in with the surrounding landscape and allow normal surface drainage to continue. Rehabilitation in such a way that the new landscape features would be stable and would not pose any safety hazard to human and animal anymore.
3	**SOIL**	The topsoil removed in the site preparation process should be replaced during the rehabilitation exercise.
		No soil erosion must be visible and no potential for soil erosion must be present at closure.
		No soil contamination must be visible or known before closure can be given.
		No compaction of any roads or any other area must be present during closure. If the soil structure is disturbed mitigation measures e.g. the use of organic material, lime and fertilizers must be implemented to restore the soil structure.
		The soil must be fertile enough to sustain vegetation.
4	**LAND CAPABILITY**	Rehabilitated to the state that it is suitable for the predetermined and agreed land capability.
5 **6**	**LAND USE**	The replacement of topsoil would ensure that the land is able to support some grazing.
7	**VEGETATION (FLORA)**	During rehabilitation indigenous vegetation cover comprising of local plant species should be established in order to ensure a well-adapted sustainable plant cover that would be able to prevent erosion of the replaced topsoil on the disturbed mining site exposed surfaces, tailings dumps, etc.).
8		No invasive and alien species must be present after closure. A post-closure control program must also be implemented.
9		No excessive dust must be present during the normal growth season after closure.
10	**FAUNA**	The animal life habitat must be restored after decommissioning. Success will be measured against the extent to which the animals return to the area.
		The animal life habitat must be restored after decommissioning. Success will be measured against the extent to which the animals return to the area.
		The post-closure phase must be suitable for further restoration of the newly man-made animal habitat. The area must be stable and acceptable for the return of animal- and plant life.
11	**SURFACE WATER**	The post closure water run-off may in no circumstance impact negatively on the water quality.
		Ultimately rehabilitation of the disturbed project site and the construction of run-off control structures in a planned and phased manner would ensure normal drainage and stability of rehabilitated site.
12	**GROUND WATER**	Post water quality need to indicate a positive trend/improvement.
		Post water quality need to indicate a positive trend/improvement.
13	**AIR QUALITY**	Rehabilitation of the project site would ensure that no dust is generated from exposed surfaces
14	**NOISE**	No noise attributed to solar project will be generated from the site after closure anymore. During decommissioning and closure phase some earth moving equipment and trucks would be utilized for rehabilitation.
15	**Archaeological and Cultural Sites**	No site of archaeological importance should be disturbed or damaged until the necessary permit from SAHRA has been issued.

16	**Sensitive Landscapes**	The Sout River and associated ephemeral dry water courses should be avoided. Surface run-off should return to normal after rehabilitation of the site. See Surface water section.
17	**VISUAL ASPECTS**	No residual visual impacts will remain after closure. The terrain should blend in with the surrounding landscape.
18	**SOCIO-ECONOMICS**	The economic development must deliver a multiplier effect that will contribute to the local economy long after closure.
19	**Interested and Affected Parties**	Not to be an economic, social or environmental liability to the local community or the state now or in the future. The company will ensure that the interest of all interested and affected parties will be considered.

Impact Management

This section specifies the impact management outcomes and impact management actions required for the aspects and potential impacts related to the proposed activities. The manner in which the impact management objectives and outcomes, identified above, will be achieved. Where applicable actions will include activities to:

- Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
- Comply with any prescribed environmental management standards or practices;
- Comply with any applicable provisions of the Act regarding closure, where applicable; and
- Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.

The above are detailed in table below.

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d & f) Impact Management Outcomes/Actions(Mitigation measures)

(A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved).

ACTIVITY (whether listed or not listed) **(E.g. Excavations, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, etc.)**.	**POTENTIAL IMPACT** **(e.g. dust, noise, drainage surface disturbance,, surface water contamination, groundwater contamination, air pollution etc.)**	**ASPECT/ ENVIRONMENTAL COMPONENT**	**MITIGATION TYPE** **(modify, remedy, control, or stop) Through (e.g. noise control measures, storm- water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc.)** **E.g.** ** Modify through alternative method.** ** Control through noise control** ** Control through management and monitoring** ** Remedy through rehabilitation..**	**TIME PERIOD FOR IMPLEMENTATION** **Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity.**	**COMPLIANCE WITH STANDARDS (TO BE ACHIEVED)**
1.1 Listed Activity causing the impact: GN325: 1,9,15 GN327: 12,13,14, 19 GN324: 4 See section 1(b) for more detail.	**Geology (underlying rock material) is going to be destroyed to a certain extent during the construction phase of the PVSP project. Construction material will be obtained from newly established quarries on site that is going to be used as filling material during initial ground works on the proposed PVSP project site. It is expected that some cut and fill will take place in the construction of certain project components.** **The location of the quarries will be determined as part of the Geo-Technical survey done by BES.** **Once the construction of the PVSP facility has been completed the quarries will be rehabilitated with replacing the initial stockpiled topsoil (restricted resource on site) on top of sloped quarries.**	**GEOLOGY**	Geology (underlying rock material) is going to be destroyed to a certain extent during the construction phase of the PVSP project. Construction material will be obtained from newly established quarries on site that is going to be used as filling material during initial ground works on the proposed PVSP project site. It is expected that some cut and fill will take place in the construction of certain project components. The location of the quarries will be determined as part of the Geo-Technical survey done by BES. Once the construction of the PVSP facility has been completed the quarries will be rehabilitated with replacing the initial stockpiled topsoil (restricted resource on site) on top of sloped quarries.	Construction phase. Planning phase. After completion of construction phase.	Construction material required for back-filling etc. that need to adhere to geotechnical requirements. Rehabilitation to such a standard that an alternative agricultural land use is possible (grazing capability). Rehabilitation done to prevent further erosion, therefore stabilization the barren disturbed surface areas and to control surface run-off and

			Care must be taken that the removal of construction material by means of earthmoving equipment is restricted to what is really necessary to achieve the objective.	During the Construction phase.	mitigate visual impact by establishing a vegetation cover.
2.1	**Change in landform :** **The existing topography is described as flat with some rock outcrops (rock plates) and the majority of infrastructure required for the PVSP project would have an permanent impact on topography. Some infrastructure (contractor lay–down area) will be temporary on site. Construction rock material and topsoil will be stored in temporary stockpiles for construction purposes.** **An terraced landscape will be created (where required) to serve as the footprint of the different components of the PVSP project.** *** Disturbance of the surface drainage: Construction material will be obtained from newly established quarries on site that is going to be used as filling material during initial ground works on the proposed PVSP project site. It is expected that some cut and fill workings will take place in the**	**TOPOGRAPHY:**	The **surface area** required for the PV project and associated infrastructure should be selected and **demarcated** by a surveyor with **definite beacons** and which is correlated with a **project plan. The project area need to be fenced-off.** • No surface should be disturbed unnecessarily. • Daily inspections required during the construction phase. • Disturbed surface areas should be rehabilitated. No silt (soil), as the result of erosion of newly disturbed surface areas, should be allowed to end-up in dry stream courses. Berm walls need to be put in place. • Topographical features that need to be avoided are "dry stream water courses" that are draining towards the Salt River. The necessary beacons and warning signs should be put in place.	Construction phase/ At the start-up. Concurrently during the construction phase. Concurrent rehabilitation.	Rehabilitation to such a standard that an alternative agricultural land use is possible (grazing capability). Rehabilitation done to prevent further erosion, therefore stabilization the barren disturbed surface areas and to control surface run-off and mitigate visual impact by establishing a vegetation cover.

	construction of certain project components (trenches, canals, evaporation dams, access roads, etc. Quarries , trenches, canals , will act as that act as depressions in the environment that captures run-off (standing water). **Normal surface drainage will be disturbed at a given point. Run-off if will be diverted away from the site (surface run-off control structures).** **The majority of infrastructure will remain for an estimated project life of 20-25 years. During closure the site will be rehabilitated and all infrastructure demolished. At closure certain infrastructure components could possible identified to be used in the future by the land owner .**		Rehabilitation of the new topographical landscape in such a way that it would blend in with the surrounding landscape and allow normal controlled surface drainage to continue. As soon as a section of the site would not be excavated anymore it should be rehabilitated (planned and phased manner). Normal surface drainage will be disturbed at a given point. Run-off if will be diverted away from the site (surface run-off control structures). During closure the site will be rehabilitated and all infrastructure demolished. At closure certain infrastructure components could possible identified to be used in the future by the land owner .	Construction phase Construction/operational phase At closure.	As above. As spelled out above.
3.1	**This is a proposed new PVSP project site. The soils in the whole study area were found to be of the hard rock outcrops and shallow Coega soil form. Deeper soil (Hutton) is associated with dry stream tributaries(natural depression areas) that have been filled-up with aeolian deposits with time.** **Any future construction of infrastructure should be preceded by the removal of all available topsoil/overburden material (although limited). Topsoil removal during site preparation earmarked for the proposed PVSP project.** **In the process of removing topsoil the soil layers are mixed and the structure may be disturbed. Proceeding with quarrying without proper removal of topsoil and stockpiling.**	**Soil (topsoil & access roads)**	Handling of topsoil as a natural resource: Any excavations or construction of infrastructure should be preceded by the removal of all available topsoil. The surface of any new areas to be disturbed must be kept to a minimum. All available topsoil (top 30 cm-layer) should be removed and stockpiled for rehabilitation purposes. Access roads, etc: The clearing of soil surface areas would be restricted to what is really necessary for the construction of infrastructure. Wherever possible all topsoil should be removed and stockpiled for rehabilitation purposes. Overburden material should also be stockpiled separately if practically possible. Topsoil and overburden material should be transported to an area	Construction phase (at the start-up). Construction phase. Construction phase.	Enough topsoil for rehabilitation or ameliorated underlying sand growth medium to ensure sustainable vegetation.

			earmarked for rehabilitation.		
3.2	**Soil Compaction: The initial site preparation for and establishment of infrastructure components such as access roads, PV solar field, contractor laydown area, etc. cause compaction of soil, the loss of a growth medium resource and the alienation of a particular surface area.** **The majority of the proposed PVSP project site is already disturbed by agricultural activity (grazing by sheep). The establishment, construction, operation and eventually rehabilitation (demolition) of listed structures would cause compaction of soil. All activities will be concentrated on the application area.**		Soil compaction: The PV Solar operation should only be restricted to what is really required (demarcated area) within the fenced-off area. Access roads towards the sites would be restricted only to the roads (exiting farm roads & roads established in consultation with the surface owner). No land would be disturbed unnecessarily. Construction & rehabilitation should be done in a well-planned manner and in the process ensuring that activities are only restricted to surface areas really required. Compaction of soil surface areas would be alleviated once rehabilitation of certain area starts. Certain roads would probably remain for access (in consultation with the surface owner). Those that would not be required would be ripped and rehabilitated.	Construction/Operational phases Concurrent rehabilitation during construction phase. During the closure phase.	Rehabilitation to such a standard that an alternative agricultural land use is possible (grazing capability). Rehabilitation done to prevent further erosion, therefore stabilization the barren disturbed surface areas and to control surface run-off and mitigate visual impact by establishing a vegetation cover.

3.3	**Soil erosion: Due to the fact that certain surface areas would become compacted and this would lead to lesser infiltration of rainwater and more run-off that could cause erosion on bare disturbed surfaces. Erosion would always be possible until such time a vegetation cover is provided during rehabilitation phase.** **When removing topsoil during site preparation, little storm water control structures are in place. If a severe storm hits the area, it may lead to erosion on site. Topsoil stockpiles may be prone to erosion due to lack of vegetation cover. Water control structures may fail or severe rainstorms may cause excessive run-off. Surface compaction due to activities taking place.**		**Soil Erosion:** To take preventive steps against land disturbance like erosion. Implement and maintain cut-off trenches/berms to prevent erosion. Ensuring that as little surface disturbance as possible occurs. Where vegetation is removed for construction, specific measures would need to be out in place like the minimal removal of vegetation, soil conservation measures, re-vegetation as soon as possible, and the regular monitoring of erosion. Re-vegetation of exposed soil surfaces (man-made surfaces, disturb surfaces in excavated sites, roads, etc.) should happen as soon as a particular activity has ceased in order to act as a sufficient erosion prevention measure.	Construction/Operational phases and concurrently. Construction phase All phases.	No excessive erosion from barren surface areas that cannot be stabilized.
3.4	**<u>Potential of soil contamination.</u>** **Vehicles/trucks/cranes/ earth moving equipment breakages and oil/lubricant /diesel spills may contaminate soil.** **The temporary workshop/ diesel tank facility (mobile) may contaminate soil due to spillages and bad management. Bad surface water management may divert contaminated run-off water on soil and thereby contaminating it.**		**Potential for soil contamination:** Vehicles to be inspected to ensure no oil and hydraulic fluid leaks occur. All oil spills on soil to be removed and bio-remediate immediately (certain commercial products are available such as Terrasorb or it could be rehabilitated by means of the application of fertilizer and turn with a spade from time to time in order to enhance the natural occurring soil microbial activity). No servicing of vehicles must occur except on a concrete floor or over PVC lined area in an area allocated for that. Training w.r.t pollution hazards and their impact on the environment must be given as part of induction training.	Construction/operational and closure phase	No soil contamination should be allowed to take place.

			An incidence register for this purpose must be kept. Drip trays must be available and used where emergency repairs is done. Maintain vehicles, prevent, and address spillages.		
3.5	**<u>Loss of soil structure</u>** **In the process of removing topsoil the soil layers are mixed and the structure may be disturbed.**		**Change in Soil structure**: Ensure that all available (if any) topsoil is carefully removed in different areas (where required for construction of infrastructure). The soil must also be compacted as backfilling is done. No unnecessary driving outside the active project area is allowed due to soil compaction that may occur. Use organic material e.g. manure to restore the soil structure during rehabilitation. Ensure that the rehabilitation plan makes provision for ripping of roads and spreading of organic material and that this is used during rehabilitation.	Construction phase Construction/Operational/Closure phases. Concurrently.	

3.6	<u>**Loss of soil fertility**</u> **The mixing of soil during site preparation, compaction and potential pollution (spillages form oil etc.) all may cause this situation.**		**Soil fertility:** Little can be done to preserve the moisture status of the soil once it is exposed. The soil must be used for rehabilitation as quickly as possible. The soil on the area earmarked for rehabilitation must be analysed to determine the deficiencies and fertilizer and lime must be ploughed into the soil to restore its fertility, if necessary. Ensure that stockpiled soil is kept clean and where possible ensure that the topsoil is treated with organic material (compost, manure) and fertilized. Do not use stockpiled soil for any other purpose but for rehabilitation. Do not use topsoil to construct roads. Ensure the rehabilitation plan makes provision for fertiliser. Make sure rehabilitated topsoil is analyzed in a laboratory. The type of fertilizer would depend on a soil analyses and fertilizer recommendation.	Construction phase.	Soil fertility is a crucial component for a sustainable rehabilitated vegetation cover for the long term.

4.	**<u>Temporary loss of land capability to support grazing:</u>** **Temporary loss of land capability to support grazing (20-25 years). The area where the infrastructure will be constructed will thus be alienated, until the area is rehabilitated.** **Some structures could probable remain if an alternative use is being found.**	**LAND CAPABILITY**	The disturbance of land must be restricted (kept to a minimum) to the planned fenced-off, project site only. All new areas: Remove topsoil where it is available. Take care that roads needed are restricted to one entry to the project . . All rehabilitation will be done according to the final rehabilitation plan after approval by the DEA. Topsoil will be placed in areas where it was removed and the areas will be re-vegetated accordingly after being appropriately ameliorated . Ensure that the rehabilitation plan is implemented.	Construction/Operational phases	Sustainable rehabilitated area with an grazing capability.
5.	**<u>Temporary loss of land capability to support grazing (20-25 years).</u> The area where the infrastructure will be constructed will thus be alienated, until the area is rehabilitated. Some structures could probable remain if an alternative use is found.** **Without mitigation the loss of agricultural land might be permanent. Mitigation will include rehabilitation of construction site and re-establishment of natural vegetation. Ensuring that as little surface disturbance as possible occurs, is crucial.** **It is also important to avoid al drainage systems in the site, as these areas are more prone to erosion.**	**LAND USE**	Ensuring that as little surface disturbance as possible occurs. Avoid all drainage lines/systems. Care must be taken with excavation into soils. Implement effective erosion control measures and an Erosion Management Plan. Rehabilitate construction site by using indigenous grasses. Where vegetation is removed for construction, specific measures would need to be out in place like the minimal removal of vegetation, soil conservation measures, re-vegetation as soon as possible, and the regular monitoring of erosion. The disturbance of land must be restricted (kept to a minimum) to the planned active, fenced-off project site only. Remove topsoil where it is available. Take care that roads are the only areas used to enter the area for project purposes. All rehabilitation will be done according to the final rehabilitation plan. Topsoil will be placed in areas	Construction/Operational phases	Sustainable rehabilitated area with an grazing capability.

			where it was removed and the areas will be re-vegetated accordingly will be appropriately ameliorated . Ensure that the rehabilitation plan is implemented.		
6.1	**During the initial site preparation and construction of the PVSP project vegetation clearance, disturbance of the ecosystem, habitat and trampling will happen.** **Destruction of habitats for vegetation. Due to a disturbed ecosystem, bare ground and invasion of exotics and further spreading of exotics can follow.** **The vegetation needs to be cleared to remove the topsoil.**	**VEGETATION (FLORA)**	No mitigation exists except to replace the vegetation by reseeding of grasses and natural growth. Construction should be done in a well-planned manner and in the process ensuring that activities are only restricted to surface areas really required.	Construction phase.	

6.2	**Habitat change, loss of species, spread of alien and invasive species.** **The change in the current habitat will be mitigated during replacement of topsoil and eventually final rehabilitation of the site.**		**Habitat change, loss of species, spread of alien and invasive species:** No mitigation exists except to replace the vegetation by reseeding of grasses. Construction should be done in a well-planned manner and in the process ensuring that activities are only restricted to surface areas really required.	Construction phase.	
			Develop and implement an **invasive and alien control programme to control the spread of weeds and other invasive species.** Eradicate exotic weeds and invader species if it invades the terrain. **All illegal invader plants and weeds shall be eradicated as required in terms of Regulation 15 & 16 of the Act on Conservation of Agricultural Resources, 1983 (Act no. 43 of 1983) which list the plants.** An invasive and alien control programme must be implemented by the company.	Construction/Operational/Closure phases	
			No associated infrastructures are to be placed in drainage lines with stream order 3, as well as their buffer areas. – **The placement of the following infrastructure, within these drainage lines, is prohibited**: On-site substation; On-site water storage tanks/reservoirs; Plant assembly facility; Offices and workshop areas; Temporary laydown. - No stockpiling of any material within a 35m buffer area for the drainage lines. - It is critical to encourage a natural vegetation cover within the 35m buffer area. -	Construction phase	

			No roads crossing these drainage lines are allowed. - Any erosion problems observed should be inspected, rectified, and monitored. - Revegetate bare areas, which formed as a result of development, with locally occurring species. - Regular monitoring of roads and disturbed areas, for erosion problems, as well as assessment of remediation success. - Where there is any possibility of topsoil erosion, silt traps should be used. - Phased development and vegetation clearing where practical, so that cleared areas are not left un-vegetated and vulnerable to erosion for long periods. - Necessary construction of stabilisation features for erosion prevention where applicable. - After large rainfall events, when soils are wet, reduce activities on site and prevent driving off hardened roads. **It is recommended that all invasive plants on the site, be removed prior to construction, and it is important that alien plants be monitored.** - When occurring, all alien plants should be controlled and cleared to ensure that the problem does not re-occur. The recommended control measures for each species should be used. - Disturbance should be kept to a minimum, by using the correct clearing methods. - When rehabilitation takes place, no planting or importing of any alien species are allowed. - It is important that regular monitoring of the footprint area be conducted for potential erosion problems and the presence of invasive plant species. - Revegetate bare areas, which formed as a result of development,		

			with locally occurring species. - All mitigation measures regarding erosion should be implemented and promptly executed. - All mitigation measures regarding the establishment and spread of declared weeds and alien invader plant species, should be implemented and promptly executed.		
			Ensure that **all roads** and the immediate area around the construction site (utilized by construction vehicles) are daily **sprayed with water to control dust**. Site i**nspections** to ensure the spraying are done. **Preconstruction walk-through of the final development footprint for species of conservation concern that would be affected and that can be translocated. –** Most of the protected individuals occur on the south-eastern parts of the study area, and can be ignored if option 1 is chosen for the layout of the development. **Since the protected species is classified as a succulent species (Hoodia gordonii), the potential for successful translocation is high.** Before construction commences	Construction phase. Construction phase.	

			individuals of **listed species within the development footprint** that would be affected, should be counted, and marked and translocated where deemed necessary by the ecologist conducting the pre-construction walk-through survey, and according to the recommended ratios. **Permits from the relevant provincial authorities, i.e. the Northern Cape Department of Environmental Affairs and Nature Conservation, will be required to relocate and/or disturb listed plant species.** - Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained. – **Preconstruction environmental induction for all construction staff** on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc. - **ECO and/or Contractor's EO to provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment, especially at the initiation of the project, when most vegetation clearing is taking place.** - Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. - All construction vehicles should adhere to clearly defined and demarcated roads and **no off-road driving** are allowed. - Regular **dust suppression** during construction, if deemed necessary, especially along access roads.	Construction phase.	

			- **Temporary lay-down areas** should be located within the development footprint or within areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.		

7.1		**WILD LIFE (FAUNA)**	**Wildlife or wildlife habitat destruction /change / disturbance :** To take care that no new or unnecessary destruction of habitats, other than the demarcated project site should take place. Restoration of habitat: - Ensure the rehabilitation plan is implemented.	Construction phase. Construction/Operational/Closure Phases.	

	Wildlife or wildlife habitat destruction /change / disturbance. **The flora which normally serves as habitat for animals would be destroyed during site preparation. The increase in activity will temporarily scare other animals. The area will serve as a new habitat after rehabilitation.**	**Wildlife (Injury and death)**	**Re-establish trees and grass cover** as soon as possible during and after closure of the PV Solar Project. Fence area off to ensure that no person can enter without permission. Ensure that the **rehabilitation plan** is compiled and executed. Keep incidence register on killings and disturbances. Make game catching, traps, snares, poaching and any other unnecessary disturbance of animals a disciplinary offence. All staff must undergo basic **environmental awareness lecture** during induction training. **Machine operators and drivers to undergo appropriate level of environmental impact training to ensure they understand their impact on the environment.** Ensure all staff working on the project undergo basic lecture during induction phase. Introduce the actions as listed above into disciplinary code as offence.	**Closure phase.**	
			Mitigation measures The following mitigation measures are proposed to address the identified perceived impacts as listed: • **Project design Option 2 is the preferred option.** • **No trapping or hunting** of any faunal species are to take place during the construction and operational phase, within the study area or within the surrounding area. • In general, the contractor and staff must **not cause any undue interferences with fauna species** within the project area and on roads leading to the project area.	Construction phase.	

			• **Security at the entrance** of the property must assess each vehicle and person entering and / or leaving the site for the position of carcasses / fauna species, traps, snares or weapons which could be used for poaching." • **Informal fires** by personnel within the study area should be prohibited. • If required, fires are only to be made within specific designated areas." • “**Natural” or “conservation significant” areas should be demarcated on all project plans as “no-go” areas.** • **Clear access routes** should be mapped out and the necessary **signage** placed to guide onsite vehicles. • **Enforce a speed limit for vehicles** (e.g. 80km/h on main road and 40km/h within project area) along route alternatives to reduce collision of vehicles with fauna. • Only **essential staff members** (e.g. security and maintenance) may travel at night, and no construction vehicles may be active after sunset. This is to reduce night time collisions with birds and other nocturnal faunal species. " • Where ever practical the new development should **avoid drainage lines,** which are a key driver to ecological diversity within the project area. • **Proper storm water management structures and practices** should be applied to ensure the flow regime and downstream habitat within the drainage lines are not to severely altered. • **Rescue and relocate fauna encountered within the construction footprint** with special mention of slower moving species such as tortoises. • “Natural” or “conservation significant” areas should be demarcated on all project plans as “no-go” areas." • Excessive **noise** should be managed on site at all times. • Upon completion of construction activities, it must be ensured that no bare areas remain and that **indigenous flora**	All phases. All phases. Construction/Operational phases. Construction phase All phases Construction phase.	

			species are reintroduced (where possible). • **Employees and contractors** must be made aware of the value of the natural environment. • **Upon finalisation of the project scale and infrastructure, it is recommended that the impact of the project on the local and regional fauna should be evaluated.** After which, applicable mitigation measures should be established. • **Consultation with the Percy FitzPatrick Institute at the University of Cape Town, should be undertaken regarding the conservation and mitigation of potential threats to the Ludwig's Bustard (Neotis ludwigii).** The following contact details can be used to contact the Percy FitzPatrick Institute: o Contact Peter Ryan, Director, Percy FitzPatrick Institute and DST/NRF Centre of Excellence o E-mail fitz@uct.ac.za o Tel. +27 21 650 3291 o Fax +27 21 650 3295 o Website www.fitzpatrick.uct.ac.za • Continue to raise awareness to **stop hunting,** and to encourage the public to report mortality from power lines etc. • All **new infrastructure (e.g. if power lines are to be used)** should be sited and mitigated appropriately, and dangerous sections of line should be **retrofitted with appropriate mitigation.**	All phases	

8.1	<u>Increased silt load.</u> Clearing topsoil for footprint areas can increase infiltration rates of water to the groundwater system and decrease buffering capacity of soils to absorb contaminants from spills on surface. This can increase the risk of contamination of the groundwater system (increases aquifer vulnerability). The clearance of vegetation and the traffic on access roads will all contribute to an increase in the silt load on the project area.	SURFACE WATER			
8.2	<u>Change in surface water quality.</u> **Spillages from vehicles, diesel tanks lacking adequate bund walls, surface run-off (water, erosion, silt) that is not adequately diverted away from the PVSP project site.** <u>Change in water quantity:</u> **As this area is very small only (less than 1032 hectares) (10,3 km²) the impact of surface water will be very low in relation to the total drainage catchment surface area of 147 km² .** **<u>"Dirty / Clean" water systems at project site</u> may impact on the quality of the surface water. The water should be contained in the surface runoff control measures provided therefore.**		**Change in surface water quality:** Storm water control measures must be implemented to divert clean water away from the site and keep contaminated water contained. Water control structures must be well designed and constructed to ensure a minimum down wash of topsoil. Vegetation disturbance must be as little as possible. Re-vegetation to be done as quickly as possible. Final re-vegetation to be done as per rehabilitation plan. **Change in surface water quantity**: Once the area is rehabilitated the controlled surface run-off (series of berms/ contour walls)will be restored and normal clean water run-off will end-up in the drainage system. Once the area is rehabilitated the normal surface run-off drainage will be restored according to rehabilitation plan. The disturbed surface area must be rehabilitated to ensure some normal drainage. Minimal run-off should end-up in trenches. Final rehabilitation will be done according to the final rehabilitation plans after approval by the DEA.	Construction/operational phases Closure phase.	

			The proposed solar facility will undoubtedly cause several significant impacts on the Sout River and its tributaries. As a result strict mitigation measures will have to be implemented to ensure that these impacts are kept to a minimum. Predicted impacts include increased sedimentation due to increased erosion, increased establishment of exotic invaders and some alteration to flood and flow regimes. The solar facility will likely require levelling of the layout area. This will require some drainage lines being levelled or disturbed through construction (Map 2). The construction phase will disturbed the soil surface and will allow sediments to be mobilised by runoff which will then increase the sediment load within the ephemeral streams and ultimately the Sout River. The disturbance of the drainage lines will also increase the sediment load. It is therefore important to limit the sediment input to the ephemeral streams and Sout River. Measures which can be utilised should include contouring the site so that runoff velocity is decreased and contours can also be bermed to capture sediment. Furthermore it is recommended that attenuation structures be implemented where affected drainage lines enter the ephemeral streams. The central significant stream will be excluded from the site as per layout plans. However, the upstream section of the stream will be included in the layout and here attenuation structures should also be implemented. Due to the disturbance caused by construction coupled with the sandy soils of the area erosion monitoring will have to form a critical part of the construction and operational phases. Adequate erosion measures will have to be implemented where this is necessary. Within the study area survey it was determined that the exotic invader,		

			Mesquite Tree (Prosopis glandulosa), occurs sporadically within the study area (Appendix B). Disturbance during construction is likely to cause susceptible condition for increased establishment of this exotic. The ability of the species to invade watercourses in this arid region is well known, i.e. Ongers River, and this should be prevented. It is therefore recommended that all specimens on the site be removed prior to construction and that monitoring of establishment of the species on the site be done throughout the operational phase. Any seedlings or established trees should be removed throughout the operational phase. Although the Sout River does not form part of the site it should also be monitored as there is a high risk that specimens from the site may invade this watercourse. Due to the clearing of vegetation, levelling of the site, contouring and attenuation structures the runoff will be altered and in so doing the input volumes into the ephemeral streams and Sout River. This will therefore alter the flow regime within these watercourses. During previous studies (Burch et al 2014), it has been shown that through construction soil compaction occurs which decreases infiltration and increases runoff. Furthermore, the rain shadow caused by the panels cause an are not utilised for infiltration thus increasing runoff. This will also affect the inflow into the ephemeral streams and thus alter the flow regime. As per the layout plans it is also recommended that the central, significant ephemeral stream be excluded from the facility.		

9.1	<u>**Reduction of groundwater quality**</u> **The proposed PVSP project activities are not likely to impact on local ground-water quality.** **All project components forms part of a closed system.** **Storage of diesel/lubricants/oil, etc. will be done within bunded facilities. Therefore other than accidental spillages form vehicles/earthmoving equipment/storage facilities, PVSP facility breakages no further impact that could infiltrate and contaminate of the groundwater system is foreseen.**	**GROUND WATER**	**Reduction of groundwater quality**: Storm water control measures must be implemented to divert clean water away from the site and keep (silt) contaminated water contained. **Vehicles to be inspected to ensure no oil and hydraulic fluid leaks occur**. All oil spills on soil to be removed and bio-remediate immediately. No servicing of vehicles must occur except at the workshops. Training w.r.t pollution hazards and their impact on the environment must be given as part of induction training. **Storage of fuel and oil** should be done according to best practices, within a bunded area and in containers of which the integrity is sound (self-containment tanks). . The PV Solar project construction and operational processes will not introduce any harmful or toxic substances and the most likely sources of pollution to the groundwater system would be associated with the infrastructure and / or workshop area. The most likely contaminants is therefore nitrate and bacteria (from sewage / pit latrines), as well as hydrocarbons (from vehicle accidents, diesel storage and the workshop area). An **incidence register** for this purpose must be kept. **Drip trays** must be available and used where emergency repairs is done. **All waste** must be temporarily stored according to best practices and disposed at an **authorized waste disposal facility**.	Construction/Operational phases All phases.	

9.2	<u>**Process water for PVSP facility:**</u> **Water from a desalination plant (to be constructed) and water abstracted from newly drilled boreholes on the farm and stored in a reservoir/tank facility.** **Water will be used for abstracted from a borehole for dust suppression on the roads and potable water will be brought in with a tanker.**		**Water should be handled as a scares resource**. Water will be abstracted responsible from **boreholes** and only enough for process water purposes (construction, cleaning of PV Cells, dust suppression, fire extinguishing, etc.). Care should be taken that the **groundwater supply** from adjacent **surface owners** is not seriously impacted. An **groundwater monitoring programme** will be implemented based on the recommendations of the geohydrologists and in line with the new **Water Use Licence (WULA).** Any **waste** generated from the **desalination plant** shall be handled according to recommendations of the geohydrologist.	Construction/operational phases Operational phase and at closure.	Water supply should be used responsible as a scarce natural resource.

10.	**Dust will be generated during the initial site preparation and construction phase (18 months) of the PVSP project (loading with an excavator on to a dump truck) and transportation on site/gravel/dirt/farm roads. Maintenance of the road would be a priority.** **Initial construction work with regard to infrastructure that involves the use of earth moving equipment.** **During the operational phase (20-25 years) dust could be generated by vehicles travelling on the public gavel road that will possible have an impact on the keeping the PVSP facility clean.**	**AIR QUALITY**	**Dust**: Ensure that road surfaces are moist during maximum vehicle movement periods. Use existing roads as far as possible and minimize impact on undisturbed ground. **Daily spraying of roads and office /storage/workshop areas with water**. Inspection should be done on a daily basis. If new roads are constructed, dust pollution must be mitigated by means of spraying the roads with water. The **main access road** on site will be provided with **permanent cover.** The **public road will be provided with a temporary Dustex cover** (or any other similar environmentally friendly product) for the duration of the construction phase. Only the public road for the length of the project site will be provided with the temporary cover that need to be applied several times for the duration of the construction phase of 18 months.	**Construction/Operational/ Closure phases**	**No excessive dust that can be harmful to the environment and humans/animals and plants.**

11.	**Generators, vehicles, trucks, earth-moving equipment construction equipment, etc. will generate noise , especially during the construction phase. Reverse warning alarms on earthmoving machines is a main source of nuisance and noise pollution.** **The operational phase the noise will be restricted to the immediate worker environment at the PV solar facility and vehicles traveling the existing provincial road.** **The PVSP project site will be constructed within a rural landscape with dwellings located further than 280m south , 482m and 391m west from site.** **The impact would also be of importance regarding the direct worker environment that should adhere to the requirements in terms of the Occupational Health and Safety Act.**	**NOISE**	Ensure the required **silencers** are placed on all engines and compressors. No mitigation to reverse hooters is allowed due to safety standards. **Inspection of vehicles and machinery** to ensure silencers are fitted. Ensure that a **complaints registe**r is created, managed and maintained. Vehicles and earthmoving equipment should be equipped with the necessary silencers and **regularly maintained** in a good working condition.	All phases of the project.	
12.1	**There are no known graves on the proposed PVSP project site (preferred alternative 1). The majority of surface area is already disturbed by agricultural activities.** **The development footprint is sited approximately 500 meters away from feature 1 resulting in no direct impact on the site (Figure 22). Furthermore, two find spots (Field number 707 & 708) is also located outside of the development footprint. Therefore, the impact on heritage sites by the proposed development is considered low.** **Any direct impacts that may occur would be during the construction phase only and would be of very low significance. Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. This and other**	**ARCHAEOLOGICAL AND CULTURAL SITES**	All **graves** needs to be avoided if found. However, the potential occurrence of unmarked graves or subsurface finds not recorded during this survey can never be excluded, so it is advised that **SAHRA and a qualified archaeologist are informed immediately if archaeological objects are uncovered**. **The impact of the proposed project on heritage resources is considered low** and it is recommended that the proposed project can commence on the condition that **the following recommendations are implemented as part of the EMPr and based on approval from SAHRA.** • **Implementation of a chance find procedure.** **• Although the Later Stone Age site (Feature 1) will not be impacted on directly the site should be preserved with a 50-m buffer zone.**	**Construction phase.**	

	projects in the area could have an indirect impact on the heritage landscape.				
12.2			**<u>Chance Find Procedures</u>** The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP. A short summary of chance find procedures is discussed below. This **procedure** applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below. • If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the **find and report** this find to their immediate supervisor, and through their supervisor to the senior on-site manager. • It is the responsibility of the senior on-site Manager to make an **initial assessment** of the extent of the find, and confirm the extent of the work stoppage in that area. • The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then **contact a professional archaeologist for an assessment of the finds who will notify the SAHRA**.		

13.	The proposed PVSP project will only be visible from the gravel provincial road. (See location on satellite image , Part 3).	**VISUAL IMPACT**	Visual impact would be addressed by means of; * re-vegetation of disturbed areas with grasses; * removal of any temporary building, scrap, domestic waste, etc. that would otherwise contribute to a negative visual impact. Concurrent rehabilitation should be done simultaneously as construction activities progress.	Construction/Operational/Closure phases.	
13.1	**Increase in Socio – economic activity at local level.** The project in itself would ensure that approximately 300 workers would be assured of a job during the construction phase of the project. The operational phase will require probable 20 -30 workers in total. The majority will be responsible for regular maintenance work. Job creation plays a major role in increasing the economic wellbeing of employees and their dependants in the Kakamas area (District: ZF Mgcawu district). The increase in socio-economic activity will add to the current growth and development in Kakamas already created by similar solar projects.	**SOCIO-ECONOMICS**	**In order to enhance local employment and business opportunities associated with the construction phase the following measures should be implemented:** **<u>Employment</u>** • Where reasonable and practical, the proponent should appoint **local contractors** and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area. • Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria; • Before the construction phase commences the proponent should meet with representatives from the KGLM to establish the existence of a skills database for the area. If such as database exists it should be	**Construction/Operational/Closure phases**	

			made available to the contractors appointed for the construction phase. • The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project. • Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. **Business** • The proponent should liaise with the KGLM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work; • Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information. • The KGLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the		

			project. Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.		
13.2			**The findings of the SIA indicate that the development of the proposed Brypaal CSPF will create employment and business opportunities for locals during both the construction and operational phase of the project.** **The establishment of a Community Trust** will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximse the potential benefits. The significance of this impact is rated as High Positive. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives. The establishment of the proposed Brypaal CSPF is therefore supported by the findings of the SIA. Due the number of other renewable energy projects proposed in the KGLM, it is recommended that the KGLM liaise with the proponents to investigate how best the Community Trusts can be established and managed so as to promote and support local, socio-economic development in the region as a whole. However, the potential impacts associated with large, solar energy facilities on an areas sense of place and landscape cannot be ignored. These impacts are an issue that will need to be addressed by the relevant environmental authorities, specifically given the large number of applications for solar facilities in the area.		

14.	**The main impact on the landowner is visual impact and the PVSP project area of smaller than 1032ha that will not be available for agricultural activities (grazing for sheep) at any given time for the next 20-25 years.** **According to the I & AP's job creation is one of the main issues that need to be addressed by the project. Other issues that are of concern is safety (due to the influx of workers) on farms; maintenance of the main access road (gravel road), water sources for the project, socio-economic support for schools, training opportunities/skills development for workers at the solar facility.** **Communication with local Business Chamber: - The Chamber will be used for communication in order to get the message out and to educate the rest of the community.**	**INTERESTED & AFFECTEDPARTIES**	Construction/operational phases. Access control should always be a priority. Active project site should be fenced off. If any problem should arise, meetings will be held with the landowners and affected parties to consult them. With regard to **Job creation**, etc., see previous section on socio-economics) and also reference to the establishment of a local Business Chamber. The **maintenance of the public road** (only the portion directly bordering the project site …………………….. …………………………… Water sources for the project are currently still under investigation. The construction of a desalination plant will be required if borehole water is being utilized for the project. An **Water Use Licence application (WULA)** will be compiled and submitted to the Department of Water and Sanitation.		Access control and safety should always be a priority at the solar facility. Keep good relations with landowners, etc. Sustainable job creation should always be a priority. Water should be abstracted/stored/ used and managed in a responsible manner in accordance with the WULA requirments of The Department of Water and Sanitation.

DEDICATED EM PLANS AS REQUESTED BY DEA IN THE LETTER OF 28 SEPTEMBER 2017		
No.	**EMPLANS**	**Section/ Doc. Reference/Where?**
1	**EROSION MANAGEMENT PLAN**	**2017/BES/MPR/01**
2	**STORM WATER MANAGEMENT PLAN**	**2017/BES/MPR/02**
3.1	**PLANT RESCUE AND PROTECTION PLAN**	**2017/BES/MPR/03**
3.2	**ALIEN INVASIVE VEGETATION MANAGEMENT PLAN**	**2017/BES/MPR/03**
4	**AVIFAUNA MONITORING AND PROTECTION PLAN:** **From an avifaunal impact perspective, the proposed development could go ahead, provided the proposed mitigation measures are strictly implemented. No further monitoring will be required during the operational phase.**	**2017/BES/SR/13**
5	**OPEN SPACE MANAGEMENT PLAN**	**EMP**
6	**TRAFFIC MANAGEMENT PLAN INCLUDING TRANSPORTATION PLAN**	**2017/BES/SR/16 & 2017/BES/MPR/04**
7	**HAZARDOUS SUBSTANCES LEAKAGE OR SPILLAGE MONITORING SYSTEM**	**EMP**
8	**FIRE MANAGEMENT PLAN**	**EMP**
9	**REHABILITATION PLAN**	**See section f(iv) B – Rehabilitation plan, etc.** **See also 2017/BES/MPR/03**

SOIL EROSION MANAGEMENT PLAN

Reference 2017/BES/MPR/01

Erosion and sediment control principles

On-site Erosion Management

Erosion control mechanisms

Engineering Specifications

Monitoring

Mitigation Considerations

C Faul & PW van Deventer - April 2018

10. Erosion Management Plan

Background and objectives of an Erosion management Plan

Exposed and unprotected soils are the main cause of erosion. This erosion management plan and the revegetation and rehabilitation plan are closely linked to one another. The Erosion Management Plan addresses the management and mitigation of significant impacts relating to soil erosion. Therefore, it is crucial to construct a general framework for soil erosion and sediment control and to provide an outline of general methods to monitor, manage and rehabilitate erosion throughout all the phases of development.

The technology used for this development is known as the Screw-In Pilon technology, which eliminates the problem of topsoil stripping, terracing or concrete mattress foundation systems. This technology ensures minimal environmental disturbance therefore a Soil Management Plant will not be acquired.

Relevant Aspects of the Site

One land type (Ag3) dominates the entire study area. According to the Land Type Survey Staff (2003), 40% of land type Ag3 consists of freely drained, shallow (< 300 mm deep), red, eutrophic, apedal soils with yellow-brown soils comprising less than 10% of this land type. The average depth of all soils is 280.5 mm. Approximately 77% of land type Ag3 consist of soils with a depth of ≤ 300 mm (depth class D1), whereas 12.5% consist of soil with a depth of 901 mm to 1200 mm (depth class D4). The average topsoil clay percentage of land type Ag3 is 10.7%. Around 88.5% of land type Ag3 consist of loamy sand soils (clay class C2) with an average clay percentage of 6.1% to 15% in the topsoil, whilst 1% consist of sandy loam soils (clay class C3) with an average clay percentage of 15.1% to 25% in the topsoil (Land Type Survey Staff, 2003).

The soils of land type Ag3 can be divided into three soil classes. Table 9 illustrates the different soil classes, description of soil classes, soil forms and percentage occupancy of each soil class within land type Ag3.

Table 4: Description of soil classes within land type Ag3 (Land Type Survey Staff, 2003).

Soil Classes	Description	Soil Form	Percentage occupancy
S2	Freely drained, structureless soils.	*Hutton, Clovelly, Griffen, Shortlands, Oakleaf.*	58,3%
S13	Lithic soil (shallow soils on hard weathering rocks).	*Mispah, Glenrosa.*	31,2%
S16	Non-soil land classes	*Pans, rivers, stream beds, erosion structures, marshes, reclaimed land,*	0,5%

		dunes, gravel, etc.	

Approximately 58.3% of land type Ag3 consists of freely drained, structureless soils, whereas 31.2% consist of characteristic lithic soils. A small part (0.5%) of land type Ag3 is occupied by structures like pans, rivers, stream beds, erosion structures, marshes, reclaimed land, dunes and gravel.

Due to climatic restrictions as well as poor quality and lack of water, the major use of this area is for grazing. The expected impact of the proposed solar facility on soils is considered to be low, however, mitigation measures need to be implemented in order to prevent and contain erosion associated with soil disruptions during the construction phase.

Erosion and sediment control principles

In order to control and prevent soil erosion during and after construction it is important to:

- Protect the land surface from erosion;
- Avoid the disturbance of natural drainage systems; or intercept and redirect run-off water; and
- Progressively revegetate the disturbed areas.

The following management practices are described for the purpose of preventing soil erosion.

On-site Erosion Management

Note the following factors regarding erosion risk at the site:

- Soil erosion will be greater during wet periods (occasional summer thunder storms), therefore precautions to prevent soil erosion should be present throughout the year.
- Steeper slopes are more prone to soil erosion, therefore, no not disturb or remove vegetation on steep slopes, as it will increase erosion potential.

- The time passed before rehabilitation will also influence soil loss. Keep the gap between construction activities and rehabilitation to a minimum.
- Erosion is also influenced by the extent of disturbance; therefore, site clearance should be restricted to areas required for construction purposes. According to the design specifications used for this proposed project, the only site clearing necessary is for access and maintenance roads, the lay-down area, the substation, temporary workshops, mobile offices vehicle parking areas etc. and for permanent buildings. No soil stripping is acquired for the area where the solar panels are places.
- The planning and construction of roads and infrastructure should occur in a manner to minimise erosion potential. Roads should follow the contour as far as possible and be built on water sheds.
- Constructed roads should include water diversion structures if necessary according to the Storm Water Management Plan.
- Disturbed areas should be regularly monitored for erosion during the routine maintenance program. Erosion problems should be rectified and monitored thereafter.
- Drainage systems are required for compacted areas. Heavy machinery, which causes surface compaction, should keep on the constructed roads or directed areas as described by engineers.
- Revegetation of bare areas with appropriate locally occurring species is necessary to limit erosion potential.
- On-site activity after rainfall should be kept to a minimum to keep erosion risk at a minimum.
- Regular monitoring of erosion problems during construction and operation phase is recommended.
- **Erosion control mechanisms**

The following mechanisms can be used in order to minimise erosion:

- Reno Mattresses
- Gabion Baskets
- Storm water channels and catch pits
- Soil stabilisation chemicals approved by the Department of Agriculture

- Hydro-seeding or revegetation together with rock rip rap or rock armour covers
- Boulders and rocks of different sizes

Engineering Specifications

A detailed Storm Water Management Plan describing and illustrating the proposed storm water control measures is attached to the EMP report. Requirements for project design include the following:

- Erosion control measures including the final Storm Water Management Plan, should be implemented before and during the construction period.
- An on-site Environmental Officer will be responsible for ensuring the implementation of the erosion control measures on site during the construction period.
- The Developer holds ultimate responsibility for remediation in the event of damage to the environment.

Monitoring

Continuous monitoring during construction and operational phase is required, in order to establish the indication and degree of erosion. If erosion features as a result of the activities on site are recorded, the Environmental Officer (construction phase) or Environmental Manager (operational phase) must:

- Assess the degree of erosion.
- Take photographs and notes of the soil degradation.
- Determine the cause of soil erosion.
- Inform the operator about the problem and that rehabilitation must take place. The operator must implement a rehabilitation method statement and management plan.
- Report and monitor the process of rehabilitation weekly and record all findings in a site register.

- All actions with regard to the incidents must be reported monthly by means of a monthly compliance report which will be submitted to the Competent Authority (construction phase) and filed for consideration during annual audits (construction and operational phase).

Conclusion

The Erosion Management Plan assist the Developer with guidelines on how to manage erosion. This document forms part of the EMPr and is required to be considered during the design, construction, operation and decommissioning phases of the project.

Mitigation Considerations

With respect to erosion control and minimising of dust generation, it is important to implement measures to minimise these problems.

Objective	Erosion Control	
Project components	Erosion control measures: Soil stabilisation, construction of impoundments and erosion mitigation structures.	
Potential impact	Water erosion, loss of topsoil, erosion gullies.	
Activity risk/source	Inadequate planning of road network and poor planning of rainfall surface and storm water management.	
Mitigation objectives	Prevent soil erosion.	
Action/control	**Responsibility**	**Timeframe**
Adequate planning of roads, contour walls and other erosion control measures if necessary.	Civil engineers and construction team.	Throughout the duration of the project.
Performance indicator	That no soil erosion occurs on and/or directly downstream of the site (with specific reference to gully erosion) as result of overland flow from the proposed development. Assessment of storm water structures and erosion mitigation measures.	
Monitoring	Periodic visual site inspections, especially following rain events. Use updated satellite imagery to compare with imagery prior to development, in order to determine whether	

	existing erosion drainage systems expanded. If expansion did occur, more intensive monitoring will be acquired where suspended sediments are measured during and after rain events to ensure that rehabilitation actions are effective.

Objective	**Dust generation due to vehicle activity on the site**	
Project components	Limit the generation of dust associated with vehicle activity.	
Potential impact	Dust generation, potential health risk for humans and animals.	
Activity risk/source	Excessive traffic on dirt roads.	
Mitigation objectives	Prevent soil erosion.	
Action/control	**Responsibility**	**Timeframe**
Restrict vehicle movement to a minimum, ensure that dirt roads are moist using dust suppressants during peak construction periods.	Civil engineers and construction team.	Throughout the duration of the project.
Performance indicator	Excessive dust generation does not degrade natural veld, no complaints from excessive dust from local inhabitants.	
Monitoring	Visual observations and ensure compliance with National Dust Control Standards.	

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
a) CONSTRUCTION PHASE					
10.1 Increased wind erosion and resultant deposition of dust 10.2 Excessive loss of natural vegetation in development footprint area	Prevent wind erosion and resultant deposition of dust on the surrounding indigenous vegetation Prevent loss of natural vegetation through erosion	10.1.1 Sand, stone and cement are stored in demarcated areas, and are covered or sealed to prevent wind erosion and resultant deposition of dust on the surrounding indigenous vegetation, 10.1.2 During construction, efforts should be made to retain as much natural vegetation as possible on the site, to reduce disturbed areas and maintain plant cover, thus reducing erosion risks. All measures required for the treatment of runoff generated on the building platform during construction should be in place before site clearing commences. 10.2.1 Vegetation clearing during construction must be restricted to the footprint of the solar field and planned infrastructure only. It should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time. 10.2.2 During construction the top soil should be removed and separately stored from sub-soil (inas soon as possible (10.2.2,piles not > 2 m). Stockpiles not used in 3 months 10.2.3). after stripping must be seeded to prevent dust and erosion.	Check that sand, stone and cement are stored and handled as instructed (10.1.1) ECO to be on site to monitor vegetation clearing (10.2.1). Regular monitoring for erosion to ensure that no erosion problems are occurring at the site. All erosion problems observed should be rectified as soon as possible. (10.2.2,	Daily(10.1) Daily (10.2.1). Weekly initially, then monthly	Construction manager and ECO(10.1) ECO and management team (5.12.5,

a) OPERATIONAL PHASE					
10.3 Excessive loss of natural vegetation in development footprint area and resulting impacts on species of special concern 10.4 Manage habitat fragmentation (loss of Landscape connectivity) and loss of Fauna) Habitat	Prevent loss of loss of natural vegetation through erosion. Minimise habitat habitat fragmentation and loss of connectivity	10.3.1 To prevent erosion, indigenous grasses that seed themselves below the solar arrays should be left to form a ground cover and kept short, 10.3.2 The use of silt fences and sand bags must be , implemented in areas that are susceptible to erosion. Other erosion control measures that can be implemented are as follows: 1) Brush packing with cleared vegetation, 2) Planting of vegetation, 3) Hydro seeding/hand sowing. All erosion control mechanisms need to be regularly maintained. 10.4.1 Regular monitoring for erosion to ensure that no erosion problems are occurring at the site as a result of the roads and other infrastructure. All erosion problems observed should be rectified as soon as possible.	ECO to advise on seed to be used, based on plant checklist for that area (Annexure 6.1 of Chapter 6 of the EIA report) (10.3.1) Monitor efficiency of erosion control measures (10.3.2) Regular monitoring for erosion to ensure that no erosion problems are occurring at the site. All erosion problems observed should be rectified as 10.4.1).	Monthly (10.3.1) Weekly or monthly (10.3 .2) Monthly (10.4.1)	ECO and operations manager (10.3.1 and 10.3.2) ECO and Project Operator (at this stage: South Africa Mainstream Douglas Solar (Pty) Ltd) (10.4. 1)
c) DECOMMISSIONING PHASE					
		10.5 No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going occupation of the area. 10.6 Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas. Monitoring: Final external audit of area to confirm that area is rehabilitated to an acceptable level (once off event to be conducted by ECO).			

Pro Project aspect	Mitigation Objectives	Management actions	*Methodology*	Monitoring *Frequency*	*Responsibility*
a) DESIGN PHASE					
1.1. Impact of project *(in* particular, storm water run-off) on the functioning and character of the watercourses (including the ephemeral streams and drainage lines) on site. Impact of the project if a detailed storm water management plan is not correctly prepared.	The to retain its existing functioning and character through-out the lifetime of the solar facility	9.1.1 In the project layout and design, ensure that the project infrastructure is at least 100m from the edge of the watercourse on site. Intervening open space should be managed as a buffer area to protect the watercourses from runoff or other impacts. 9.1.2 Prepare a detailed storm water management to ensure that appropriate measures are implemented at the design phase in order to prevent any change in the volume or rate of runoff into the water courses during all development phases. The ephemeral water courses should retain its existing, localised catchment area and runoff characteristics or, where these will be altered, the storm water runoff model must be adapted to ensure that runoff from a proportionally smaller surface area passes, dissipated, into the ephemeral water courses, in the event that the surface includes portions that have been hardened with roads, solar panels or other structures and infrastructure.	Check compliance with specified conditions (9.1.1 to 9.1.3)	Once-off during design followed by regular to control ensure respect of the design specifications during all development phases (9.1.1 to 913)	Project Developer, and ECO (9.1.1 to 9.1.3)

Monitoring

Project aspect	Mitigation Objectives	Management actions	*Monitoring*		
			Methodology	*Frequency*	*Responsibility*
b) CONSTRUCTION PHASE					
1.2. Impacts on freshwater ecosystem onsite due to construction phase activities	Prevent attenuating the flow rate of runoff from both the road and the construction site upstream (allow for the collection of sediment, litter and other material washed or blown from upstream areas).	1.2.1 Ensure that runoff of water from the proposed development would not, during its construction or operational phases, result in impacts to freshwater ecosystems. 1.2.2 No water that is likely to be contaminated with construction material, including sediment-rich water, should be passed into the ephemeral water courses during construction. Such water should be treated to remove sediments and other contaminants, as appropriate . 1.2.3 The ephemeral water courses should be demarcated as a "no go" area during construction, and managed such that neither vehicles nor personnel have access to it during this phase; 1.2.4 Strict controls should be asserted over access to the Construction site (lay-down site, demarcated access road, etc.)	Fixed-point photographic record of the ephemeral water courses (1.2.1) Site Audit (1.2.3, 1.2.4, 1.2.5)	Once-off (1.2.1) Monthly and after rainfall events (9.2.3, 9.2.4, 9.2.5)	ECO (1.2.1, 1.2.2 1.2.3, 1.2.4, 1.2.5)

Project aspect	Mitigation Objectives	Management actions		Monitoring	
			Methodology	Frequency	Responsibility
c) OPERATION PHASE					
1.3 Impact due to release of wash water in the environment after use	Prevent change in the water volume or rate of runoff into the ephemeral water courses during the operational phase of the development	1.3.1 Wash water should be contained in a separate system, ideally recycled (if feasible) and no wash water should be passed into the water courses.	ECO must monitor activities and record and report non-compliance (9.3.1)	Continuously during operation phase (i.e. regular interval to be determined by the ECO) (1.3.1)	Project Manager and ECO(1.3.1)

d) DECOMMISSIONING PHASE	1.4 The solar facility would be expected to run for a minimum period of 20-25 years, after which it would either be decommissioned, alternatively upgraded or an application submitted to obtain a new license. Should the plant be decommissioned, the solar field would be rehabilitated to its original (pre-development) state. In the (unlikely) event that none of the mitigation measures outlined for the Construction and Operational Phases of the project had been implemented, the period of time for recovery to take place would be extended. In the event that decommissioning occurred, and assuming implementation of mitigation measures, there should over time be recovery to present day conditions. Depending on subsequent land use, the prognosis for freshwater ecosystems could be positive or negative.

2.2. SUMMARY AND RECOMMENDATIONS

2.2.1. Summary of observations:

• The 100-m exclusion zone (100m from the drainage line centre line) is wider than the 100 yr floodline crossing the project site

• The maximum flow depth in the drainage line during a 1:100-year flood event is approximately 0.5 m deep

• The flow velocity in the drainage line during a 1:100 yr storm event is less than 1m per second

2.2.2. Recommendations:

• Apply for exemption of Reg 4 of GN 704 to allow construction of the solar panels within the 100m exclusion zone agreeing to the following mitigation measures:

• Move the laydown area 170m in a north eastern direction as depicted.

Regulation 4: Restrictions on locality No person in control of a mine or activity may- (a) ………………….. or any other facility within the 1:100 year flood-line or within a horizontal distance of 100 metres from any watercourse ……………;

Extract: Regulation 4 of GN 704.

2.2.3. Mitigation:

• All horizontal structures will be constructed higher than 0.5 m above the deepest point of any drainage line.

• Plinths or vertical risers supporting the PV cells will be placed as far as possible from the centreline of the drainage line – equidistant from the centre line

• No concentration of runoff may result from the infrastructure

• All roads / access routes will be monitored to prevent concentration of runoff

• All waste and oil spills need to be managed during the construction, operational and decommissioning phases.

3.1	PLANT RESCUE AND PROTECTION PLAN	2017/BES/MPR/03
3.2	ALIEN INVASIVE VEGETATION MANAGEMENT PLAN	2017/BES/MPR/03

VEGETATION ENVIRONMENTAL MANAGEMENT PLAN (REPORT REFERENCE: 2017/BES/MPR/03

Species search and rescue
Invasive plant management
Retaining agricultural potential
Rehabilitation and revegetation

C FAUL & M COHEN - APRIL 2018

1. Design Phase

1.1. Optimal design and pre-commencement activities

OBJECTIVE 1	Ensure the selection of the best environmental option for the development area as well as the associated infrastructure and access roads.
OBJECTIVE 2	Ensure all possible impacts are fully accounted for that the methods are in place for the mitigation prior to commencement of activities.
Opportunities to mitigate the associated negative impacts largely arise during the planning and design stages. The correct choice of footprint locality and layout design is crucial, therefore biodiversity and ecosystem function should be given full consideration during the design phases, as determined by the Environmental Impact Assessment. Once the layout has been designed, a detailed investigation of the footprint area during the optimal growth season must be conducted before the layout is finalised and activity commences.	

Project Components	• Solar field • Water supply pipeline • Water storage tanks • Water treatment facility • Wastewater treatment facility • Substations; • Access roads (temporary & permanent roads) and fencing around the development area; • Temporary laydown area (workshops, mobile offices, mobile ablution facilities, material storage area, vehicle parking area, water tanks fencing, etc.); • Permanent office/workshop building; • Permanent living quarters for operational phase workers; • Surface run-off control system (trenches, canals, run-off dissipating structures, evaporation ponds, etc.).
Potential Impact	• Habitat destruction; • Loss of indigenous flora and conservation worthy species; • Potential disturbance to drainage lines; • Establishment and persistence of alien invasive plants; • Erosion.
Activities / Risk Sources	• Positioning of solar components and internal access routes; • Positioning of workshop, substation and other associated infrastructure; • Alignment of access roads to development; • Positioning of temporary sites.
Mitigation: Target / Objective	• Ensure the selection of the optimum environmental option for positioning alignment of proposed infrastructure; • Ensure that environmental sensitivities are taken into consideration and avoided as far as

	possible (mitigating potential impacts).		
Mitigation: Action / Control		**Responsibility**	**Timeframe**
Undertake pre-construction walk-through footprint investigations for protected flora. This walk-through is aimed to inform the developer, responsible conservation authority (that will issue the relevant permits and authorisations), contractors, EO and ECO about the following: • Potential micro-siting requirements; • Protected species that will be affected by the development (indicating the protection status of each species observed); • Locality of the protected plant species within the footprint area (individually mapped or approximate areas of occurrence); • Identification of the affected species by providing a representative photo record that enables ECOs and contractors to identify these species; • The estimated number of specimens per species that will be affected; • Identification of species which can be successfully relocated; • Estimation of the number of specimens per species that will be destroyed; • Location and nature of any invasive species that will have to be cleared by the contractor; • Location and nature of any significant environmental concerns (for instance gully erosion) that need to be addressed to prevent degradation of the development footprint; • Should more than 1000 specimens of any critically endangered, endangered or protected species be affected, a risk assessment report for that species must be prepared according to Section 15 of the NEMA:BA Draft Threatened or Protected Species Regulations, Gazette General Notice 388 of 2013, and		Developer, carried out by Specialist	Design review phase

amendments (2014).		
The above pre-construction footprint investigations will be used together with the results from the vegetation report to draft the following: • A comprehensive search and rescue program for vegetation. • A comprehensive alien invasive species eradication and management plan.	Developer carried out by Specialist	Design review phase
Obtain permits for protected plant removal and relocation prior to commencement of any activity related to this development. As a minimum, permits will be required to remove all or some of the following species, found within the development footprint: • *Hoodia gordonii* • *Avonia albissima* • *Euphorbia spinea* • *Lithops julii subsp. fulleri var. fulleri*	Developer or contractor responsible for vegetation clearing	Pre-commencement
Use design-level mitigation measures recommended in respect of habitat and ecosystem intactness and prevent the loss of species: • Position development components close together and in close proximity to other existing or planned developments in the area; • Exclude all drainage lines that are considered as very high to highly sensitive areas, including their recommended buffers, from the layout; • Infrastructure including road crossings and trough infrastructure may only be placed within the specified drainage line sections which has already been severely altered and transformed; • Strictly adhere to existing roads where possible to gain access to the site; • Introduced materials including machinery or processing implements must be kept in a botanical least sensitive area. These sites must be clearly indicated in site plans and the drafting of relevant detailed method statements and	Developer	Prior to submission of final construction layout plan.

management plans.		
Access roads and machinery turning points must be planned to minimise the impacted area, avoid the initiation of accelerated soil erosion, prevent unnecessary soil compaction and prevent the alteration of natural water flow.	Developer	Design phase
Compile a comprehensive stormwater management and erosion control plan for the footprint area and the final design.	Developer and relevant specialist	Design phase
Depending on the final layout and maintenance requirements taken into consideration, the permissible biodiversity needs to be determined: • Permissible vegetation: maximum height, desirable density and composition; • Maintenance of this vegetation: Mowing, small livestock grazing, etc.	Developer with relevant specialist	Design phase
After determining the permissible biodiversity, a comprehensive vegetation rehabilitation management plan needs to be compiled.	Developer and relevant specialist	Design phase
A response and management plan must be drafted and available to deal with accidental breakages and potential release of harmful substances. This plan must include: • Specifications of harmful substances that could be released from accidental leakages and breakages; • How such harmful substances can best be removed as soon as an accidental breakage has occurred; • How and where broken components and potential harmful substances can be disposed of. If possible, recycling methods should be described in terms of how and where. This should be incorporated into a waste management plan.	Developer and relevant waste management specialist	Design phase
Performance Indicator	• Ecosystem fragmentation is kept to a minimum;	

	• Ecosystem functionality is retained, and degradation is prevented; • Solar components and associated infrastructure and road alignments meet environmental objectives; • Grid connection and road alignments meet environmental objectives.
Monitoring	• Ensure that the implemented design meets the objectives. • Review of the design by the Project Manager and the ECO prior to the commencement of activity.

2. Construction and Operational Phase

The expected lifetime of the development is approximately 25 years after construction. After that, the development will either be decommissioned or upgraded with newer technology to remain functional and economical. Due to these given timeframes, an irreversible negative shift in natural biodiversity composition may result if impacts are not maximally mitigated.

For optimal implementation and updating of the management plans, it is recommended that the ecological specialist (familiar with the site) visit the site after construction has started and when rehabilitation work is under way. This will support the ECO and ensure that minimum requirements of the mitigation plans are sufficient to retain adequate functionality of the ecosystem.

The ECO will most likely only be present on site for the duration of construction activities. An EO must be appointed where continued monitoring and possible mitigation is required during operational phase. The revision of the current EMP, after completion of the design and again after the construction phase, is recommended. It is also recommended that new EMPs be drafted for the decommissioning phase to continue with mitigations and prevention of all related environmental impacts.

2.1. Species search and rescue

OBJECTIVE 1	Minimise indigenous biodiversity loss
Prior to commencement of all activities (grading, road construction, etc.) within the development and footprint area, a plant Search and Rescue program should be developed and implemented, preceded by a thorough investigation of all footprint areas, conducted during the optimal growth season (January to April), by a qualified botanist.	
Project Components	• Solar field • Water supply pipeline • Water storage tanks • Water treatment facility • Wastewater treatment facility • Substations; • Access roads (temporary & permanent roads) and fencing around the development area; • Temporary laydown area (workshops, mobile offices, mobile ablution facilities, material storage area, vehicle parking area, water tanks fencing, etc.); • Permanent office/workshop building; • Permanent living quarters for operational phase workers; • Surface run-off control system (trenches, canals, run-off dissipating structures, evaporation ponds, etc.).
Potential Impact	• Loss of species of conservation concern as well as natural vegetation (during construction phase), waste of on-site plant resources, lack of locally sourced material for rehabilitation of disturbed areas;
Activities / Risk Sources	• Loss and damage to remaining natural and semi-natural vegetation during construction phase.
Mitigation: Target /	• Rescue, maintain and replant all protected plant species within the development and footprint areas.

Objective		
Mitigation: Action / Control	**Responsibility**	**Timeframe**
Botanical footprint investigation and recording by GPS of localities of all species of conservation concern.	Ecologist	Prior to commencement of activity
• Search and Rescue (S&R) of all protected plants that will be affected by the development should take place. The necessary permits must be in place. • Plants that can be considered for rescue and included in subsequent rehabilitation programs are all tubers, bulbs and indigenous succulents. • The development footprints must be barricaded before an experienced horticulturist undertake the S&R. • All rescued species should be bagged and returned to the site once all construction is completed and rehabilitation is required. • To facilitate establishment, replanting should occur in spring to early summer once sufficient rains have fallen. • List of protected species so far recorded on site: ○ *Hoodia gordonii* ○ *Avonia albissima* ○ *Euphorbia spinea* ○ *Lithops julii subsp. fulleri var. fulleri*	Horticultural Contractor monitored and approved by ECO	Prior to construction
In line with specifications regarding authorised biodiversity and rehabilitation, a minimum percentage vegetation cover must be established and permanently maintained post construction.	Developer and horticultural contractor	After construction and throughout the operational phase

Performance Indicator	• Rescue of species of conservation concern. • Re-establishment of rescued species.
Monitoring	• ECO must monitor Search and Rescue and continue search and rescue operations where necessary. • Geophytic species that were not accounted for in the original S&R plan, may emerge during construction. Once observed the ECO should consult the botanist on identification and S&R possibility.

2.2. Retaining agricultural potential on the site

OBJECTIVE 1	Minimise or avoid potential negative impacts on current and future farming activities.
Loss of productive agricultural land due to either loss of topsoil and soil seed banks (where applicable), loss of natural vegetation, erosion or pollution during construction and operational phase. It is recommended that once it has been determined what the staffing requirements will be during construction and operation of the proposed facility, an open space management plan be drafted in addition to all other management plans, related to ecosystem integrity to ensure the safeguarding of the productivity of the land and the functionality of the ecosystem.	
Project Components	• Solar field • Water supply pipeline • Water storage tanks • Water treatment facility • Wastewater treatment facility • Substations; • Access roads (temporary & permanent roads) and fencing around the development area; • Temporary laydown area (workshops, mobile offices, mobile ablution facilities, material storage area, vehicle parking area, water tanks fencing, etc.);

	• Permanent office/workshop building; • Permanent living quarters for operational phase workers; • Surface run-off control system (trenches, canals, run-off dissipating structures, evaporation ponds, etc.).
Potential Impact	• The footprint of the development will result in loss of land for productive farming activities. • Decrease in productivity and agricultural potential within the footprint, due to a change in plant species composition. • A decrease in vegetation cover will leave the ecosystem prone to erosion. • Disturbance of indigenous vegetation could lead to the establishment of invasive vegetation or create surfaces that do not support vegetation establishment.
Activities / Risk Sources	• Clearing of vegetation on footprint areas. • Introducing the distribution of invasive plant species. • Accelerated erosion with loss of topsoil and associated natural seedbanks and nutrients.
Mitigation: Target / Objective	• Minimise the loss of land and indigenous vegetation and enable selected farming activities to continue where possible.

Mitigation: Action / Control	**Responsibility**	**Timeframe**
Minimise footprint of the development where possible. Avoid all impacts on sensitive habitats. • The footprint for all development components must be defined before the construction phase. • EMPs shall provide for the mitigation of the impacts of the different types of development components.	Contractor and relevant specialists, to be monitored by ECO	Before and during construction and operational phase
Rehabilitate disturbed areas on completion of the construction phase. • Rehabilitation targets based on original vegetation. • Detailed rehabilitation programme contained in relevant EMP.	Contractor rehabilitation	During construction

	specialists, to be monitored and approved by ECO	phase
Monitor and manage erosion according to the erosion management plan as stipulated in the Soil Impact Assessment.	Contractor, to be monitored and approved by ECO and EO	From construction to decommissioning phase
• Remove all weeds and alien invasive plants. • Monitor the re-emergence of these species and manage according to the invasive plant management plan.	Contractor, to be monitored and approved by ECO and EO	From construction to decommissioning phase

Performance Indicator	• Stable vegetation cover throughout the development area. • Footprint of development components included in the EMP.
Monitoring	• Regular monitoring and audits of construction activities and the footprint area by the ECO to prevent degradation of the ecosystem. • A photographic record must be established before, during and after mitigation. • An incident reporting system used to record non-conformances to the EMP, followed by the necessary action from the developer to ensure dull compliance.

2.3. Rehabilitation and revegetation

OBJECTIVE 1	Minimising disturbance and loss of topsoil and ecosystem functionality
After completion of construction erosion stabilisation with the help of vegetation cover (if possible) should be implemented. A 30% perennial vegetation cover is desirable. Species that can be used to rehabilitate the disturbed areas should include the species recorded pre-construction.	
Project Components	• Solar field • Water supply pipeline • Water storage tanks • Water treatment facility • Wastewater treatment facility • Substations; • Access roads (temporary & permanent roads) and fencing around the development area; • Temporary laydown area (workshops, mobile offices, mobile ablution facilities, material storage area, vehicle parking area, water tanks fencing, etc.); • Permanent office/workshop building; • Permanent living quarters for operational phase workers; Surface run-off control system (trenches, canals, run-off dissipating structures, evaporation ponds, etc.).
Potential Impact	• Lower productivity and agricultural potential within the footprint due to removal, disturbance and continued long-term shading of vegetation. • The ecosystem will be more prone to erosion and irreversible degradation due to r educed vegetation cover. • Disturbance of indigenous vegetation could lead to the establishment of invasive vegetation or create surfaces that do not support vegetation establishment. • Loss of agricultural potential of soils.
Activities / Risk	• Site preparation and earthworks.

Sources	• Excavation of foundations for associated infrastructure. • Construction of site access road. • PV pilon screw-in activities.		
Mitigation: Target / Objective	• Re-establish a vegetation cover that will facilitate the establishment of desirable and/or indigenous species. • Prevent accelerated erosion.		
Mitigation: Action / Control		**Responsibility**	**Timeframe**
Rehabilitation of surface			
Based on the Screw-In Technology that will be used, no surface flattening or topsoil stripping will occur during construction of the solar field. In the solar field, some surface disturbance will occur due to vehicles obtaining access to the specified localities where these screw-in pilons will be established. These localities must be marked appropriately in order to minimise surface disturbance.		Contractor, ECO to control	Construction and operational phase
Once localities of surface disturbance have been identified, soil stabilisation can begin. • Compacted soil shall be ripped with a mechanical ripper or by hand to a depth of at least 25 cm. • Mulch (if available) shall be applied by hand to achieve a layer of uniform thickness, and rotovated into the upper 10 cm layer of the soil. • In order to protect all areas susceptible to erosion, it is necessary to install temporary and permanent (if applicable) drainage work. • Erosion channels developing shall be backfilled and restored to a proper condition. • Where erosion cannot be remediated with available mulch and rocks, geotextiles shall be used to reduce erosion.		Contractor, ECO to control	Construction and Operational phase, followed up until desired end state is reached.
Borrow-pits (if required) • Shall be shaped to have low-gradient slopes and surfaces that are rough and irregular (suitable for trapping sediments and facilitating vegetation		Contractor, ECO to control	After construction

growth. • Upon completion of rehabilitation these reshaped and revegetated areas shall blend into the natural environment.		
Revegetation		
Revegetation will be done according to an approved planting/landscaping plan according to the desirable end stated and permissible vegetation.	Contractor, ECO to control	Construction and Operational phase, followed up until desired end state is reached.
Revegetation can be increased where necessary by hand-seeding indigenous species. • Previously collected and stored seeds shall be sown evenly over the designated areas and be covered by means of rakes or other hand tools. • Commercially available seed of grass species naturally occurring on site can be used as alternatives. • Re-seeding shall occur at the recommended time to take advantage of the growing season. • In the absence of sufficient follow-up rains after germination started, irrigation of the new vegetation cover is necessary, until vegetation has been established.	Contractor, ECO to control	Construction and Operational Phases, followed up until desired end state is reached.
Planting of species • The composition of the final acceptable vegetation will be based on the vegetation descriptions of the original botanical EIA investigation, and will include rescued plant material.	Contractor, ECO to control	Construction and Operational phases

• Geophytic plants shall be planted in groups or as features in selected areas. • Limit damage to roots during the transplant. • In order to facilitate the new growth and function of roots, plants should be watered immediately after transplanting.		
Traffic on revegetated areas • Designated tracks shall be created for pedestrians of vehicle traffic where necessary. • Disturbance of vegetation must be kept to a practical minimum. No unauthorised off-road driving will be allowed. • All livestock shall be excluded from newly revegetated areas, until vegetation is well established.	Contractor, ECO to control	Construction and operational phases
Monitoring and follow-up treatments		
Monitor success of rehabilitation and revegetation and take remedial actions as needed according to the respective plan. • Erosion shall be monitored at all times and measures taken as soon as detected. • If necessary reseeding or replanting will have to be done of no acceptable plant cover has been created.	ECO during construction, suitable designated person or contractor after that.	Construction and Operational phases
Weeding • It can be anticipated that invasive species and weeds will germinate on rehabilitated soils. ○ These need to be hand-pulled before they are fully established and/or reaching a mature stage where they can regenerate.	Contractor	Construction and Operational phases

Performance	• No activity in identified no-go areas.

Indicator	• Ecosystem function of natural landscapes and their associated vegetation is improved or maintained. • The structural integrity and diversity of natural plant communities is recreated or maintained. • Indigenous biodiversity continually improves according to the pre-determined desirable end state.
Monitoring	• Fortnightly inspections of the site by ECO during construction. • An incident reporting system must record non-conformances to the EMP. • Quarterly inspections and monitoring of the site by the ECO or personnel designated to the rehabilitation process until 80 % of the desired plant species have been established. Inspections should be according to monitoring protocol set out in the rehabilitation plan. • Thereafter annual inspections according to the minimal monitoring protocol.

2.4. Invasive plant management

OBJECTIVE 1	Manage and reduce the impact of invasive vegetation.
Invasive species (indigenous and alien) occur within the project area. These species have a potential of reproducing to such an extent that the ecosystem within and beyond the project site could be impaired. Alien invasive plant species confirmed on site that need to be eradicated as much as possible includes the alien invasive plant species confirmed within the project site. Alien Invasive Plants confirmed within the study area: *Prosopis glandulosa* No alien invasive plants however were found within the proposed project site. It might be that additional species be found after the pre-commencement walk-through survey. A detailed Invasive Management Plan need to be drafted after this walk-through. The use of chemicals may only commence with the approval of the relevant authorities.	
Project Components	• Permanent and temporary infrastructure. • Access roads
Potential Impact	• Impacts on natural vegetation • Impacts on soil • Degradation and loss of agricultural potential.
Activities / Risk Sources	• Transport of construction materials to site. • Movement of construction machinery and personnel. • Construction of site access road. • Site preparation and earthworks causing disturbance to indigenous vegetation. • Routine maintenance work.
Mitigation:	• Significantly reduce the presence of weeds and alien invasive species.

Target / Objective	• Avoid the introduction of additional alien invasive plants to the project control area. • Avoid the distribution of existing alien plants on the project area.		
Mitigation: Action / Control		**Responsibility**	**Timeframe**
Compile a detailed invasive plant management and monitoring programme as guideline for the entire construction, operational and decommissioning phase. This programme must include a continuous monitoring programme to detect new infestations and must contain WfW-acepted (Work for Water-accepted) species-specific eradication methods.		Specialist	Pre-construction
Avoid or minimise conditions favourable to invasive plants. • Keep disturbance of indigenous vegetation to a minimum. • Rehabilitate disturbed areas as soon as possible. • Where possible, destroy seeding material of weeds and invasives by piling burning (in designated areas or suitable containers). • Do not import soil from areas with alien plants		Contractor, monitored by ECO	Construction and Operational phase
Eradicate all invasive plants that occur within the temporary and permanent footprint areas of the development. Ensure that material from invasive plants that can regenerate are adequately destroyed and not further distributed.		Contractor, monitored by ECO	Construction and Operational phase
Risks from alien invasives do not only arise from invasives present within the development footprint, but also from alien invasives along the verges of the major transport routes, especially invasive grasses and smaller weeds. Similarly, invasives can be spread by construction processes to surrounding areas. To avoid the distribution of weeds and invasive plants, establish a routine amongst contractors/all staff to regularly check: • That clothing and shoes are free of mud and seeds; • That foot well inside vehicles and mats are cleared of weed seed; • Radiator and grill, along wheel trims, around wheels, mud flaps, undercarriage of vehicle or other moving machinery for mud and seed.		Contractor, monitored by ECO	Construction and Operational phases

Performance Indicator	• Visible reduction of number and cover of alien invasive plants within the project area. • No establishment of additional alien invasive species.
Monitoring	• On-going monitoring of area by ECO during construction and operational phases. • Audit every two to three years by a qualified botanist to assess the status of infestation and success of eradication measures.

Pro Project aspect	Mitigation	Management actions	Monitoring		
a) DESIGN PHASE					
3.1.1. Impact on Ecosystem integrity as a result of the layout and location of the facility and directly associated infrastructure planning for the project	3.1.1. Minimise fragmentation and loss of pristine habitat important for ecosystem processes through careful siting and layout planning for the project	3.1.1.1 Sensitive habitats must be avoided by the solar project infrastructure footprint. Group all building and solar arrays together to reduce impacts and of avoid fragmentation of the habitat. 3.1.1.2 Locate the infrastructure on transformed areas or areas adjacent to disturbed areas that are partly transformed if possible. Existing access roads must be used and should be located along the boundaries of existing disturbed areas. 3.1.1.3 A buffer zone of 5m is needed for the ephemeral streams, in which no development or activities should take place. Note: The Environmental Authorisation from DEA may require that the Final Layout be submitted to DEA (and possibly other authorities such as government conservation bodies) prior to the start of construction. In this case, such specifications must be included info this section of the updated EMP.	Prepare final layout plan and include that in the updated EMP (with submission to DEA if required)	Once-off during design phase (3.1.1.1 to 3.1.1.3)	Project Manager,ECO
b) CONSTRUCTION PHASE					
		3.1.2.1 Existing access roads/servitudes must be used and should be located along the boundaries of existing disturbed areas, if possible. It is recommended to restrict the clearance for the servitude to 4 meters on either side of the line except bending at points. 3.1.2.2 Sensitive habitats should be clearly demarcated as no go areas during the construction phase to avoid accidental impacts. 3.1.2.3 The storm-water management plan must	Compile plan pre-construction Strict the behaviour control over of construction workers, restricting activities to within demarcated areas for construction . Monitor storm water management efficiency . ECO must monitor activities and record and report non-compliance.	When finalising layout plan Daily , After rainfall events . Daily As needed Weekly.	Project Manager, ECO and Contractor

		be implemented during the construction phase 3.1.2.4 Pylons must be positioned a minimum of 50 m outside of watercourse boundaries. 3.1.2.5 Unnecessary impacts on surrounding natural vegetation must be avoided during construction. No construction vehicles should be allowed to drive around the veld. All construction vehicles should remain on properly demarcated roads. 3.1.2.6 Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction. 3.1.2.7 The collection, hunting or harvesting of any plants, fuel wood or animals at the site during construction should be strictly forbidden and the staff educated to prevent this from happening. 3.1.2.8 All hazardous materials should be stored in the appropriate manner to prevent impacts on vegetation. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. 3.1.2.9 Fires should only be allowed within fire-safe demarcated areas.			
		3.1.3.1 Mesh fencing (e.g. clearvu type) that has mesh at bottom (ground-level) can allow passage of small and medium-sized mammals and prevent human access (including children) for security and health and safety reasons.	Monitor and record passage of small and medium-sized mammals through fence (3.3.1)	Monthly or as needed (3.3.1)	ECO and contractor (3.3.1)

		3.1.4.1 Unnecessary impacts on surrounding natural vegetation must be avoided. All construction vehicles to remain on the roads and no driving off road allowed. No unauthorized persons should be allowed 3.1.4.2 The harvesting of any protected trees for fuel wood, or collection of other species of special concern, should be strictly forbidden and the staff educated to prevent this from happening. 3.1.4.3 No protected plant may be removed or disturbed unless if the necessary permit or license was applied for and obtained from the relevant regulating authority.	Strict control over the behaviour of construction workers, restricting activities to within demarcated areas . ECO must monitor activities and record and report non-compliance .	Weekly	ECO and contractor
c) OPERATION PHASE					
3.1.5 Excessive loss of natural vegetation in development footprint area and resulting impacts on species of special concern	Control loss of natural vegetation during operation. Prevent impacts on natural vegetation in sensitive habitats and species of special concern.	3.1.5.1 Unnecessary impacts on surrounding natural vegetation must be avoided. All operation and maintenance vehicles to remain on the roads and no driving off road allowed. 3.1.5.2 The collection, hunting or harvesting of any plants, any protected trees, fuel wood or animals at the site should be strictly forbidden and the staff educated to prevent this from happening. 3.1.5.3 All hazardous materials should be stored in the appropriate manner to prevent impacts on vegetation. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. 3.1.5.4 Fires should only be allowed within fire-safe demarcated areas. 3.1.5.5 No unauthorized persons should be allowed onto the site. 3.1.5.6 Existing access roads/ servitudes must be used and should be located along the ~ boundaries of existing disturbed areas, if possible. It is recommended to restrict the clearance for the servitude to 4 meters on	Strict control over the behaviour of operation workers, restricting activities to within demarcated areas for operation. Strict control and education of staff to proper prevent misconduct. If ECO is absent, there should be a designated EO present to deal with any urgent issues (3.1.5.1 to 3.1.5.6)	Weekly	ECO and operations manager

		either side of the line except at bending points.			
3.1.6 Manage habitat fragmentation (loss of landscape connectivity) and loss of Faunal Habitat	Minimise habitat fragmentation and loss of connectivity Promote the conservation of Fauna communities in the area	3.1.6.1 Ensure that no larger fauna enter and become trapped within the fenced-off area, either by leaving a gate open so that animals can move freely between the site and the adjacent farm or by keeping all gates closed to ensure that they are excluded. 3.1.6.2 Search and Rescue during operation to be undertaken.	Monitor and record small and medium-sized mammals through fence (3.1.6.1 and 3.1.6.2)	Daily if possible or weekly	Security staff ECO (3.1.6.2)

d) DECOMMISSIONING PHASE					
3.1.7 Rehabilitation of flora on site	Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to operation.	3.1.7.1 All damaged areas shall be rehabilitated upon completion of the contract. 3.1.7.2 All natural areas must be rehabilitated with species indigenous to the area. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction. 3.1.7.3 Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas.	Final external audit of area to confirm that area is rehabilitated to an acceptable level (3.1.7.1 to 3.1.7.3)	Once off (3.1.7.1 to 3.1.7.3)	Contractor/ECO And advice from specialist

4	**AVIFAUNA MONITORING AND PROTECTION PLAN:** **From an avifaunal impact perspective, the proposed development could go ahead, provided the proposed mitigation measures are strictly implemented. <u>No further monitoring will be required during the operational phase.</u>**	**2017/BES/SR/13**

5	**OPEN SPACE MANAGEMENT PLAN**	

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
a) DESIGN PHASE					
5.1. Visual impact of the design of the facility and directly associated infrastructure	Locate and design the project to harmonise as best as possible with the sense of place and landscape character of the local area	5.1.1 The solar panels and solar arrays should have uniform design, colour, height, in order for the facility to harmonise with the local area as best as possible. 5.1.2 Develop a lighting plan that documents design, layout and technology used for lighting. It should indicate how nightscape impact will be minimised. 5.1.3 A proper set of traffic signs should be planned in order to indicate the solar facility within 5 km of the site within the view shed of the final layout . 5.1.4 Plan to use natural earth-coloured materials for structures to blend in with the natural environment. Materials, coatings and paints should be chosen based on minimal reflectivity where possible. Grouped structures should be painted the same colour to reduce visual complexity and contrast.	Ensure that solar panel/array design and layout is uniform and well-adapted to the surrounding environment (5.1.1 and 5.1.4) Ensure proper planning is undertaken regarding design and layout of facility and security lighting such that glare and light trespass on observers and motorists are limited as much as possible (5.1.2 and 5.1.3)	Once-off during design (5.1.1 to 5.1.4)	Project Manager/ECO

b) CONSTRUCTION PHASE					
5.2. Visual impacts of Construction activities on the regional environment.	Limiting negative visual impact caused by construction	5.2.1 Maintain good housekeeping on site to Monitor throughout construction avoid litter and minimise waste. 5.2.2 Demarcate clearance areas and minimise surface disturbance. 5.2.3 Rehabilitation of temporarily cleared sites should start as soon as possible. 5.2.4 Erosion risks to be assessed and minimised. 5.2.5 Limit access to construction site to existing roads. 5.2.6 Implement dust suppression management actions. 5.2.7 Fire hazards to be managed appropriately ;	Monitor throughout construction phase (5.2.1 to 5.2.7)	Continually as required (5.2.1 to 5.2.7)	Project Manager/ECO (5.2.1- 5.2.7)
c) OPERATIONAL PHASE					
		5.3.1 Maintain re-vegetated surfaces and rehabilitated areas until vegetation is established and visually adapted to surrounding undisturbed vegetation. 5.3.2 Dust and weed control should be part of maintenance activities. 5.3.3 Painted features and buildings should be maintained, and repainted when colour fades or paint flakes.			
		5.4.1 Ensure that lighting plan is respected. Lighting of the facility should not exceed, in number of lights and brightness, the minimum required for safety and security. 5.4.2 Uplighting and glare (bright light) should be minimised using appropriate screening. 5.4.3 Low-pressure sodium light sources should be used to reduce light pollution. 5.4.4 Light fixtures should not spill light beyond the project boundary. 5.4.5 Timer switches or motion detectors should be used to control lighting in areas that are not occupied continuously. 5.4.6 Lights should be switched off when not in	Monitor the impact of night Lighting interviewing visual receptors ' required for safety and security. of the surrounding landscape (5.4.1) Check that all specifications of the lighting plan are implemented during operation be used to reduce light pollution. phase (5.4.2 to	Monthly for the first year and then yearly (5.4.1 to 54.6)	Operation manager and ECO (5.4.1 to 5.4.6)

		use whenever it is in line with safety and security.			

5.5 Visual impacts due to the intrusion of a utility-scale solar energy facility on views of sensitive visual receptors.	Reduce effects of the intrusion of a utility-scale solar energy facility on views of sensitive visual receptors.	5.5.1 Solar panel backs and structures should be colour-treated to reduce visual contrast with the landscape setting. 5.5.2 Painted features should be maintained and repainted when colour fades or paint flakes. 5.5.3 Traffic signs should be installed within 5 km ~ of the site within the viewshed of the final layout The signs should indicate the solar facility and warn motorists of potential glint and glare effects.	Check that solar panel backs and structures paint is in a good state (5.5.1) Ensure a good maintenance of the paint on all painted surface of the solar facility and associated buildings (5.5.2) Check that traffic signs are in a good state and visible for all motorists (5.5.3)	Twice a year (5.5.1 to 5.5.3)	Operations Manager (5.5.1 to 5.5.3)
d) DECOMMISSIONING PHASE					
		5.6 No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going occupation of the area.			

Project aspect	Objectives of mitigation	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
a) CONSTRUCTION PHASE					
Local Traffic disturbance due to employee and material transportation during the construction phase	Minimize the impact of the construction activities on the local traffic. Avoid accidents with local pedestrians and employees and animals on all roads	1. Limited construction vehicles on regional roads during peak traffic. 2. Ensure that all construction vehicles comply with all roadworthy and safety regulations from Industry and Province. 3. Comply with all National and Provincial traffic regulations with special reference to road signals and with special attention to intersections. 4. Implement a comprehensive and safe and adequate road management plan including Provincial and Private roads and ensure that all employees and contractors comply with all Provincial and Company regulations. 5. Avoid unnecessary traffic in the site to limit soil erosion and dust emission. 6. Emphasize road safety on all Safety meetings	Road and safety requirements to be monitored throughout construction.	During construction	Construction/Site manager and safety manager
Generation of pollution air emissions by vehicles, earth moving. Construction of access roads and hard standing areas during construction	Limit the release of air pollutants from vehicles and construction equipment. Limit dust emission	Comply with all roadworthy and safety standards of the Province and Company at all time for all construction and maintenance vehicles	Ensure to limit release of air pollutants to an adequate level during construction phase. Measure dust emission on strategic localities	Four times during the estimated 18 month construction period, i.e. Before and then every six months	Project Developer. Site manager and Environmental and safety managers

Project aspect	Objectives of mitigation	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
Generation of pollution emission	Maintain lowest emission of air pollution	Compliance of all Company and Provincial roadworthy and safety regulations and standards at all time for all operation vehicles	Ensure release of air pollutants are limited and maintain adequate level during operation activities	Before operations and then Yearly	Project Operator and Safety and Environmental managers
Generation of dust due to the state of the road network on the solar site	Maintain lowest production of dust	Cover all materials and products which have potential to generate dust (e.g. topsoil or cement). Ensure that road network is maintained to a good state during the entire operation phase to avoid dust and erosion. Implement management strategies for dust generation e.g. apply dust suppressant on exposed areas and stockpiles.	Limit dust generation to minimum and comply with industrial standards	Monthly	Project Operator as well as Safety and Environmental managers
Noise generation	Maintain lowest production of noise	Limit noisy maintenance/operational activities to daytime only	Compliance with all safety regulations pertaining to noise during the operational/maintenance activities. Noise at the nearest farmsteads to be less than the 45 dBA presented in SANS 10103:20012 for rural areas.	Every three months	Project Operator as well as Safety and Environmental managers

Project aspect	Objectives of mitigation	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
Disturbance of local traffic due to material and workers transport onto and from site during the duration of the decommissioning activities	Minimize the impact of the decommissioning activities on the local traffic and avoid accidents with pedestrians, animals and other drivers on all the local, private and Provincial roads	Avoid vehicles movement on the regional road during peak traffic time. Comply with all roadworthy regulations of the Company and Province. Implement clear and visible signalization around the site indicating movement of vehicles to ensure safe entry and exit roads.	Road and safety requirements to be monitored throughout decommissioning	During decommissioning	Safety and Environmental managers
		Implement a comprehensive and adequate road management plan including external and internal roads to be applied by all employees and contractors on site. Determine and restrict use of transportation routes during the decommissioning phase.			

7	HAZARDOUS SUBSTANCES LEAKAGE OR SPILLAGE MONITORING SYSTEM	EMP

Project aspect Pro	Mitigation	Management actions	Monitoring		
			Methodology	*Frequency*	Responsibility
a) CONSTRUCTION PHASE					
7.1. Contamination of soil and risk of damage to vegetation and/or fauna through **spillage of concrete** 7.2. Contamination of soil and risk of damage to vegetation and/or fauna through **spillage of fuels and oils**	Avoid soil contamination and risk of damage to vegetation and/or fauna through spillage of concrete Avoid soil contamination and risk of damage to vegetation and/or fauna through spillage of fuels and oils	7.1.1 Concrete mixing area (if any) must be defined in the site map and restricted to this area. If any concrete mixing takes placed on site, this is be done on board or plastic sheeting, which is to be removed from the site once concreting is completed; or in areas to be covered by further construction. 7.1.2 Any excess sand, stone and cement must be removed from site at the completion of the construction period 7.2.1 Check construction equipment daily (by Contractor) to ensure that no fuel spillage takes place from construction vehicles or machinery, and monitored weekly by ECO. 7.2. 2 Spilled fuel, oil or grease is retrieved where possible, and contaminated soil removed, cleaned and replaced. 7.2.3 Contaminated soil to be collected by the Contractor (under observation of ECO) and disposed of at a waste site designated for this purpose. 7.2.4 Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required.	Check that sand, stone and cement are stored and handled as instructed Check that no spills have taken place (7.1.1 to 7.2.5) Ensure that a well-maintained Portable bioremediation kit (to remedy chemical spills) is available on site and that site workers and contractors knows its location and instructions (7.2.6).	Daily(7.1.1, 7.1.2) Daily (7.2.1 to 7.2.5)	

		7.2.5 Bunded containment to be provided below. 7.2.6 Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required. 7.2.7 Bunded containment to be provided below and around any fuel storage containers. 7.2.8 Cover the spills with absorbent material. 7.2.9 Obtain Material Safety Data Sheet (MSDS) if the substance is known. 7.2.10 The person who reported the spill must fill out an incident report and forward it to the Environmental Department after a thorough investigation. 7.2.11 The spillage should be contained (bund earth walls) by all means. Depending on the amount of spillage it could be remediated in situ or in the case of large amount of spillage that is contained, could be removed by Oilkol, etc. 7.2.12 Leakage from the vehicle, tanker, etc. that caused the emergency, should be stopped and the vehicle removed to the workshop area for repairs. 7.2.13 In all cases of spillage, irrespective of the chemical, remove or extinguish any fire (naked flame) to within at least 10 metres from the spill.			
c) DECOMMISSIONING PHASE					
		7.3 No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going occupation of the area.			

8	**FIRE MANAGEMENT PLAN**	**EMP**

Project aspect	Mitigation Objectives	Management actions	Monitoring		
a) ALL PHASES OF THE PROJECT			*Methodology*	*Frequency*	Responsibility
8.1 The occurrence of natural fires as the result of lightning and man-made fires that can cause the damage to the solar infrastructure, damage to vegetation and killing of fauna.	All fires in the veld, , buildings, diesel tanks, etc. should be extinguish and prevented to spread to any other piece of land, building, etc.	8.1.1 During the winter months a adequate fire breaks should be put in place around the property.		At the beginning of winter.	Project Manager, Safety officer, Fire Brigade, ECO
		8.1.2 The necessary equipment should be in place and ready to be used if an accidental fire is started.	All contractors and the project facility need to be equipped with all the necessary fire extinguishers, water tanker, etc.	Immediately	Project Manager/Safety Officer/Contractors
		8.1.3 There shall be an emergency preparedness plan in place in order to fight accidental fires and veld fires, should they occur. The adjacent land owners/users/managers should also be informed and/or involved.	The safety officer should compile a emergency preparedness plan.	At the start of the project get the necessary documentation in place.	Project Manager/Safety Officer
		8.1.4 The use of branches of trees and shrubs for fire making purposes must be strictly prohibited. 8.1.5 No fires may be lit except at places approved by Project Manager, but not for the purpose of waste disposal. 8.1.6 All contractors shall ensure that the basic fire-fighting equipment is to the satisfaction of the Safety Officer. 8.1.7 All contractors must take precautions when working with welding or grinding equipment near potential sources of combustion. Such precautions include having a suitable, tested and approved fire extinguisher immediately at hand and the use of welding curtains.	Inspections using checklists.	Daily	Project Manager/Safety Officer

		8.1.8. The regulatory requirements with regard to fire-fighting equipment, storage and handling of flammable materials, training, fire breaks, reporting and fire management procedures will be adhered to, including membership of the local fire protection association if required.			
		8.1.9 The local authority's fire management requirements for the area shall also be taken into account. This may include stipulations relating to fire breaks (width, locations, and frequency and procedure for burning)			
		8.1.10 Anthropogenic causes of fires shall be minimised through implementation of control measures relating to smoking, littering, storage and handling of flammable materials, and burning on site; and	Records shall be kept of any fires on or close to the site.		

Financial Provision for rehabilitation & Rehabilitation plan:

f(iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;

(a) Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under the Regulation.

The main closure objective of **Vintage Energy (Pty) Ltd.** is to rehabilitate the entire project site in such a way to ensure that the new man-made topographical landscape would blend in with the surrounding landscape, not pose a safety hazard to humans and animals, while at the same time allow for alternative land uses. Establish a self-sustaining and stable vegetation cover in order to mitigate the visual impact, to control erosion and to create some habitat for animals. The rehabilitated environment also needs to be aesthetically acceptable according to the principle of BPEO. Another main objective is to manage the surface water in such way that an acceptable water standard is achieved when a closure certificate is issued.

Vintage Energy (Pty) Ltd. will ensure that the Operation/Sites are:

- Neither a danger to public health and safety nor to animal health and safety;
- Not a source of any pollution;
- Stable (ecological and geophysical);
- Rehabilitated to the state that is suitable for the predetermined and agreed land use;
- Compatible with the surrounding biophysical environment;
- A sustainable environment;
- Aesthetically acceptable;
- Not an economic, social or environmental liability to the local community or the state now or in the future.

Vintage Energy (Pty) Ltd. will furthermore:

- ensure that the physical and chemical stability of the rehabilitated site will be such that risk to the environment is not increased by naturally occurring forces to the extent that such increased risk cannot be contended with by the installed measures;
- ensure that the project site is closed efficiently and cost effectively.
- ensure that the operation is not abandoned but closed in accordance with the relevant requirements;
- ensure that the interest of all interested and affected parties will be considered;
- ensure that the all-relevant legislation regarding mine closure will be adhered to, and all relevant application procedures followed.

(b) Provide a rehabilitation plan

Rehabilitation: (See Surface layout plan 1)

The clearing of soil surface areas would be restricted to what is really necessary for the construction of infrastructure. During rehabilitation of these sites, or where vegetation is lacking or compacted, the areas would be ripped or ploughed and levelled in order to re-establish a growth medium and if necessary appropriately fertilised to ensure the re-growth of vegetation and the soil ameliorated based on a fertilizer recommendation (soil sample analysed).

Cognisance should be taken of climatic and environmental limitations that makes rehabilitation difficult.

A. Rehabilitation of access roads:

- Whenever an environmental authorisation is suspended, cancelled or abandoned or if it lapses and the holder does not wish to renew the environmental authorisation, any access road or portions thereof, constructed by the holder and which will no longer be required by the landowner/tenant, shall be removed and/or rehabilitated to the satisfaction of the Competent Authority.
- Any gate or fence erected by the holder which is not required by the landowner/tenant, shall be removed and the situation restored to the pre-project situation.
- Roads shall be ripped or ploughed, and if necessary, appropriately fertilised (based on a soil analysis) to ensure the re-growth of vegetation. Imported road construction materials which may hamper re-growth of vegetation must be removed and disposed of in an approved manner prior to rehabilitation.
- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the soil be analysed and any deleterious effects on the soil arising from the mining operation, be corrected and the area be seeded with an indigenous grass seed mix.

B. Rehabilitation of project surface area:

The project surface area shall be levelled and the compacted surface areas shall be ripped or ploughed to a depth of at least 300mm and the topsoil previously stored adjacent the site, shall be spread evenly to its original depth over the whole area.

In the case of excavations/pits/holes in the it will be backfilled and also compacted and levelled off and further rehabilitated as spelled out above.

Side slopes in the case of quarries for construction material: After all the foreign matter has been removed from the sites, the side slopes of quarries will be sloped to 18° and levelled and the previously stored topsoil replaced or ameliorated as in the case of no topsoil available.

The area shall then be **fertilised if necessary (based on a soil analysis).** The site shall be seeded with a vegetation seed mix (section C) adapted to reflect the local indigenous flora. Where the site has been rendered devoid of vegetation/grass or where soils have been compacted owing to traffic, the surface shall be scarified or ripped.

Photographs of the site, before and during the operation and after rehabilitation, shall be taken at selected fixed points and kept on record for the information of the Competent authority (CA= DEA).

Rehabilitation of the **new topographical landscape** in such a way that it would blend in with the surrounding landscape and allow normal (controlled) surface drainage to continue. **Implement water control systems** in order to prevent erosion on the disturbed surface areas.

Silt traps and berms must be placed (where required) in the preferential flow paths throughout the project area to prevent sedimentation of the watercourse.

Temporary storm water channels should be filled with aggregate and/or logs (branches included) to dissipate flows.

Seed the area (see C. (below) for recommended seed mixture).

Visual impact would be addressed by means of;
- re-vegetation (grasses);
- removal of any building, scrap, domestic waste, etc. that would otherwise contribute to a negative visual impact.

C. Fertilising of Areas to be Rehabilitated

If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a seed mix to specification.

D. Seeding of Grass Seed Mixture and planting of Woody Species

The eventual seed mixture takes into account the availability of seed, different soil situations and the prevailing climatic conditions of the area. The seed will be collected from the immediate surrounding environment with industrial vacuum collectors and be seeded at 50kg/ha with the application of brush packing and rip rap. Material collected within the immediate environment will act as a mulch that helps to conserve water and impact from the sun.

E. Demolition of infrastructure/buildings:

On completion of operations, all buildings, structures or other on the project terrain shall be demolished. The possibility exist that the surface owner can possible make use of certain structures (buildings, access roads, etc.). **See section G for further actions.**

F. Invasive and alien control programme

Develop and implement an invasive and alien control programme to control the spread of weeds and other invasive species. Eradicate exotic weeds and invader species if it invades the terrain. All illegal invader plants and weeds shall be eradicated as required in terms of Regulation 15 & 16 of the Act on Conservation of Agricultural Resources, 1983 (Act no. 43 of 1983) which list the plants.

G) Decommissioning and Rehabilitation Actions suggestions :

(According to: DES/TACTUS TRANSACTION ADVISOR, August 2017)
(SEE APPENDIX A FOR FULL REPORT).

Decommissioning, reclamation, and restoration activities will adhere to the requirements of appropriate governing authorities. The reclamation and restoration process comprises removal of above ground structures; removal of below ground foundations and infrastructure; and restoration of topsoil, re-vegetation, and seeding. Appropriate temporary erosion and sedimentation control practices will be used during the reclamation phase of the Project. The control practices will be inspected on a regular basis to ensure their function.

G.1 Timing of Removal
Reclamation of each phase of the Project will begin within six (6) months of the cessation of operations in association with the project's final power contract. The duration of infrastructure removal is estimated to be 6 to 12 months, followed by a soil reclamation and crop planting phase which will occur over a further 12-month period, depending upon the summer or winter weather conditions.

G.2 Retention of Infrastructure
Certain aspects of the development may be retained by mutual agreement with the landowner at the time of decommissioning as they may be of value to the ongoing agricultural activities at this location. This may include but not be limited to;
a. Site Fencing
b. Vegetation Buffer to a portion of the development area
c. Operations and Maintenance Building and the Battery Storage building, including the crossover and parking area, which would be repurposed for storage of agricultural equipment.
d. Established Pasture Grasses, should the land owner at the time, propose grazing of the land with stock as opposed to dryland farming

Council would be notified in writing in the event that any of these elements are to be retained, including a copy of the agreement with the landowner at the time of decommissioning.

G.3 Decommissioning and Removal Procedure
Typically, the reclamation of the Project proceeds in reverse order of the installation;
a. The Solar PV facility will be disconnected from the utility power grid at the substation gantry.
b. Solar PV modules will be disconnected, collected, and either shipped to another project, salvaged, or submitted to a collection and recycling program.
c. Aboveground and underground electrical connection and distribution cables that are no longer deemed necessary will be removed and recycled off-site by an approved recycling facility.
d. Solar PV module racking system will be removed and recycled off-site by an approved metals recycler.
e. Electrical and electronic devices, including transformers and inverters will be removed and recycled off-site by an approved recycler.
f. Concrete foundations will be removed and recycled off-site by a concrete recycler.
g. Fencing will be removed and recycled off-site by an approved recycler, unless it is requested to be retained by mutual agreement with the landowner.
h. Vegetation buffer will be cleared, grubbed, mulched, composed and respread on site to increase the organic matter in the soil structure.
i. Removal of the Operations Building and Battery Storage building by an approved demolition contractor, unless it is requested to be retained by mutual agreement with the landowner.
j. Gravel pavement material to the perimeter access tracks will be recovered and recycled as general fill at an approved location.
k. Areas subject to plant compaction such as access tracks, substation and vegetated buffer will be deep ripped and nourished using the composed organic matter from the removed vegetation buffer.

G.4 Removal of Electrical Equipment, Solar PV Modules and Infrastructure
Above ground electrical wiring, equipment on the inverter pads and the interconnection transformer pads, and other associated equipment will be removed as part of decommissioning.
Prior to commencing electrical equipment removal activities, the system will be de-energised and all the external electrical lines feeding into or out of the project will be disconnected. The electrical components comprising the inverter pads and interconnection transformer pad will be salvaged and placed in appropriate shipping containers and secured in a truck transport trailer for shipment to the next location where it will be reused or recycled. The equipment on the inverter pads includes inverters, combiners, low voltage switch

gear and medium voltage transformers. The equipment on the interconnection transformer pad includes medium and high voltage switchgear and a high voltage transformer. All of the equipment is modular and easily disassembled for removal.

The electrical connectors to each panel will be unfastened along with the combiner boxes and disconnect switches and the bolts and fasteners attaching each module to the racks will be removed. Each module will be removed from the rack and placed in secure transport crates and placed into a trailer for storage and ultimately for transportation to the next location where it will be reused or recycled. The bolts and reusable fasteners will be saved for reuse also.

Once the solar modules have been removed, the racks will be disassembled and the piers supporting the racks removed. These components will require a tracked excavator to extract the beams by pulling them out vertically. The racks and pipe metals will be recovered and transported to a metal recycler for reuse. Underground electrical equipment, including electrical wiring, will be extracted and removed from the site. The wiring is either copper or aluminium (depending on the function/location) encapsulated in an insulating plastic material. Electrical materials consist primarily of recyclable commodities.

Unless the landowner requests that the buildings be repurposed for agricultural use the O&M and battery storage buildings would be disassembled, and recycled or disposed of offsite. Concrete pads supporting inverters, transformers, and O&M buildings will be removed. All fences and gates will be maintained at all times until the equipment decommissioning and removal process is complete and the area is ready to be demobilised. Unless the landowner requests that they remain, the fence and gates will be removed and all materials recycled to the greatest extent possible. The area will be thoroughly cleaned and all debris removed. Gravel pavement material to the perimeter access tracks will be recovered and recycled as general fill at an approved location. Unless the landowner requests that they remain, the Vegetation buffer will be cleared, grubbed, mulched, composed and respread on site to increase the organic matter in the soil structure.

G.5 Use and Removal of Hazardous Material

Relatively small quantities of hazardous materials would be used during project construction and operation. Materials of concern that would be used during construction and operation include gasoline, diesel fuel, transformer cooling oil and sulphur hexafluoride. Hazardous and non-hazardous wastes that are likely to be generated from the project construction and operation at the Project include waste motor oils, used transformers and transformer oil, waste hydraulic fluids, and waste solvents and adhesives. During decommissioning activities, minor spills and leaks of hazardous materials from vehicles or equipment could also occur. All wastes would be required to be handled, stored, transported and disposed of according to appropriate laws, ordinances, regulations, and standards.

Fuels, lubricants, and other materials would not be stored on the Project site, and the proposed project applicant would not maintain an inventory of any hazardous materials on the project site. Project operations would not generate hazardous wastes.

On-site transformers would be filled with oil at the manufacturing company and subsequently checked in four-year intervals for integrity. Oils used would be 98 percent plant seed based. All oils, lubricants, and spent filters would be collected and removed for recycling at the time of replacement and decommissioning.

G.6 Reinstatement of Agricultural Use

Following removal of all solar equipment and related infrastructure, the site will undergo a series of steps to ensure successful return to agricultural use that existed prior to development of the Solar PV facility. Portions of the site subject to compaction, such as access tracks, substation and the vegetated buffer will be deep ripped to a depth of 400mm and nourished using the composed organic matter from the removed vegetation buffer. In the event that the landholder at the time intends to use the area for grazing of stock, the disturbed areas will be rehabilitated, by establishing pasture grasses consistent with the mix of grasses that was growing before the establishment of the Solar PV facility.

G.7. Rehabilitation Performance Criteria

The site rehabilitation activities shall be deemed successful if the following criteria are achieved;

a. Decommission of solar farm occurs in one stage;

b. All aboveground infrastructure is removed from the site and recycled or disposed of in an appropriate manner in accordance with all laws governing at the time of reclamation, with minimal disturbance to the land;

c. All belowground infrastructure is removed to a minimum depth of 1 metre and reinstated so that subsoil material (>300mm deep) is not placed on the infilled land surface; or as approved by local authorities at the time of reclamation;

d. After soil conditioning an appropriate dry-land cover crop is capable of being maintained on the site for grazing, subject to drought or other extenuating circumstances at the time of decommissioning.

(c) Confirm that Rehabilitation Cost can be provided for from operating expenditure

The financing for this project will be done from the account Vintage Energy (Pty) Ltd., the applicant himself out of own funds.

<u>All financial cost incurred from the beginning of the project for rehabilitation will be regarded as part of the operating cost from day one until closure.</u>

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including:

g) Monitoring of Impact Management Actions
h) Monitoring and reporting frequency
i) Responsible persons
j) Time period for implementing impact management actions
k) Mechanism for monitoring compliance

<table>
<tr><th colspan="2">SOURCE ACTIVITY</th><th>IMPACTS REQUIRING MONITORING PROGRAMMES</th><th>FUNCTIONAL REQUIREMENTS FOR MONITORING</th><th>ROLES AND RESPONSIBILITIES
(FOR THE EXECUTION OF THE MONITORING PROGRAMMES)</th><th>MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS</th></tr>
<tr><th></th><th>Environmental Aspect</th><th></th><th></th><th></th><th></th></tr>
<tr><td rowspan="2">Listed Activity causing the impact:
<table><tr><th>GN325</th><th>GN327</th><th>GN324</th></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td><td>Geology</td><td>• The progress with the construction operation.</td><td>• Update construction plan
• Visual inspections in order to verify if stripping and stockpiling is done as stipulated in the EMP.</td><td>• Project manager</td><td>• Weekly update of construction plan
• Daily</td></tr>
<tr><td>Topography</td><td>See soil.</td><td></td><td>• Project manager</td><td></td></tr>
</table>

	Environmental Aspect				
	Soil	• During the initial site preparation for project infrastructure (where required) **all topsoil, will be removed and stockpiled (ONLY where required).** • The stockpile area is therefore alienated (although only temporarily) and will be compacted. • Soil erosion from compacted sites • In the process of removing topsoil the soil layers are mixed and the original structure may be disturbed. • Vehicle equipment breakages and oil/lubricant/diesel spills may contaminate soil. • Loss of soil fertility	• Daily visual inspection to verify if the placement of the material is as stipulated in the EMP and surface areas compacted is kept to a minimum. • Diesel/oil/lubricant spillages are handled as stipulated in the EMP.	• Project manager	• Daily • Immediately
	Land Capability	Existing loss of land capability to support agricultural activity such as grazing.	• Weekly update of mining plan (progress on operation & rehabilitation of sites). • Visual inspections in order to verify that the EMP is implemented.	• Project manager	• Weekly • Daily
	Land Use	Existing loss of land capability to support agricultural activity such as grazing.	• . Weekly update of mining plan (progress on operation & rehabilitation of sites). • Visual inspections in order to verify that the EMP is implemented.	• Project manager	• Weekly • Daily

<table>
<tr>
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See section 1(b) for more detail.</td>
<td>Vegetation</td>
<td>Vegetation clearance, disturbance and trampling.
Destruction of habitats for vegetation.
Due to a disturbed ecosystem, bare ground and spreading of exotics can follow.
Surface area disturbance must be restricted to demarcated construction sites .
Dust coverage of plants</td>
<td>Daily visual inspections to verify that the surface area disturbance is always kept to a minimum as required in the EMP.
Daily visual inspection of the active project area to verify if dust suppression is done on the roads and trucks on a daily basis.
To ensure that the rehabilitated areas become self-maintaining.</td>
<td>Project manager</td>
<td>Daily
Daily
Monitoring will be done at the rehabilitated areas on a twice a year basis (mid-summer and mid-winter), where species diversity and vegetation cover will be investigated.</td>
</tr>
<tr>
<td>Wildlife/Animals</td>
<td>Injury and death to wildlife , etc.)
Animals may fall in excavations/trenches.</td>
<td>Daily visual inspection on the roads travelled and project site.</td>
<td>Project manager</td>
<td>Daily</td>
</tr>
</table>

Listed Activity causing the impact: **GN325** / **GN327** / **GN324** **1,9,15** / **12,13,14, 19** / **4** **See section 1(b) for more detail**.	Surface Water	• The clearance of vegetation and the traffic on access roads will contribute to an increased silt load. • Spillages from vehicles, excavator and also surface water run-off that is not adequately diverted away from the project sites. • Surface run-off from project sites if not adequately contained on site could end-up in the adjacent undisturbed natural veld.	• Daily visual inspection of potential spillages and also to determine if sufficient containment structures have been constructed.	• Project manager	• Daily • Monitoring will be done to monitor the quality of the surface water collecting in excavations .
	Ground Water	• Possible spillages from diesel or oil from drilling rig, earth moving equipment, truck, etc., if not handled responsibly, could become a source of groundwater pollution.	• Visual inspection of the roads, project sites for any indication of oil/diesel/lubricant spillages on a daily basis.	• Project manager	• Daily • Monitoring will be done to monitor the levels and quality in boreholes utilized for process water (on site and adjacent land owners).
	Dust	• Dust will be generated during the loading and transportation and also movement on gravel roads.	• Visual inspection of the project area should be done and also verify if dust suppression is done on the roads on a daily basis.	• Project manager	• Daily
	Noise	• Noise will be generated during the construction operation and transportation.	• Visual inspection of all equipment, trucks on a daily basis in order to determine if maintenance is required.	• Project manager	• Daily • Quarterly reports on noise monitoring will be conducted as required by legislation. • If any complaints are received from the public or state department regarding noise levels the levels will be monitored at prescribed monitoring points.

<table>
<tr><td></td><td>Sensitive landscapes</td><td>N/A.</td><td>N/A</td><td></td><td></td></tr>
<tr><td rowspan="2">Listed Activity causing the impact:
<table><tr><td>GN325</td><td>GN327</td><td>GN324</td></tr><tr><td>1,9,15</td><td>12,13,14, 19</td><td>4</td></tr></table>
See section 1(b) for more detail.</td><td>I & APs</td><td>Speeding of vehicles (accidents/killing animals)</td><td>Daily visual inspection of project site and surrounding environment with regard to any fire danger or damage.
Drivers should be given specific instructions on driving and regularly reminded on the movement on project site and public roads.</td><td>Mine manager</td><td>Daily</td></tr>
<tr><td></td><td>EMP implementation</td><td>Compile a site checklist (based on the EMP requirements).
Regularly verify that EMP requirements are implemented.
Regularly appoint an independent third party to assess EMP performance.</td><td>Project manager</td><td>Weekly
Bi –Annually (construction phase) and annually (operational phase)</td></tr>
</table>

l) Indicate the frequency of the submission of the Regulation 34 Audit Report:

As per NEMA and associated **Regulation 34** , this Environmental Management Programme will be continually assessed in terms of its appropriateness and adequacy. In order to achieve this, Vintage Energy (Pty) Ltd. will undertake the following:

- Implement the necessary monitoring programmes, as discussed as part of this EMPR;
- Conduct performance assessments of this EMPR; and
- Compile and submit the afore-mentioned performance assessment reports to the DEA.
- The **frequency** of the performance assessments will be **bi-annually for the construction phase and annually for the operational phase**.
- An independent and competent person will undertake all performance assessments. EMP performance assessments will be conducted until closure.
- Reporting : An **EMP Audit Report** will be submitted to the Management and the DEA on **6 monthly bases for the construction phase and annually for the operational phase**.

m) Environmental Awareness Plan

1. **Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.**

2. **Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.**

Employee communication process :

VINTAGE ENERGY (PTY) LTD. believes in seven key principles to achieving effective environmental training and awareness:

- Communication
- Urge
- Leadership
- Teamwork
- Understanding
- Recognition
- Empowerment (Culture).

For further information see the table on the next page.

Environmental Awareness Plan

Aspect	Objectives	Description	Time/period	Responsible person/party
Communication	Describe the manner in which the applicant intends to inform his or her employees of any environmental risks which may result from their work and; The manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment	Method: How do the employees receive the information? • Workplace meetings with the Operations Manager • At safety training sessions; • Induction programmes; • Regular publications and information leaflets; • Bulletin boards (posters), • Electronic mail messages, • Forum meetings, which involves the local I & AP's and the DEA. VINTAGE ENERGY (PTY) LTD. engages and communicates with communities, with due regard and respect for local interests, cultures and customs, and contribute meaningfully to the economic, social and educational well-being of the communities in which they operate.	Ongoing	Project Manager/EM (Environmental manager) ECO (Environmental Control Officer)
Information		Information from internal (EMP, etc.) and external sources will be communicated in a language understandable to every worker. Environmental information will be communicated via the methods spelled out above.	Ongoing	Project Manager/EM,ECO
Training		All employees should receive basic environmental awareness training, either as induction training or later at a special training session. Different levels of responsibility in relation to individual's potential impact on the environment must be addressed in the training session. The further motivation of the workforce would be achieved	Ongoing	Project Manager EM/ECO

Aspect	Objectives	Description	Time/period	Responsible person/party
		through in-house and training through attending short courses with regard to environmental management, etc. Appropriate training relevant to the implementation of the environmental management plan should be provided to all personnel. Employees should have an appropriate knowledge base. The company should also ensure that the contractors working on site provide evidence that they have the requisite knowledge and skills to perform the work in an "environmentally responsible manner". Education and training is needed to ensure that the employees knowledge of regulatory requirements, internal standards and the company's policies and objectives is current. Issues to be considered during training: • handling of topsoil • prevention of oil/diesel spillages • handling of industrial and domestic waste • dust suppression • rehabilitation • use of chemical toilets • use of water • surface run-off control • invasive and alien control programme , etc. Make game catching, traps, snares, poaching and any other unnecessary disturbance of animals a disciplinary offence.		

Reporting		Every environmental incident that might happen and which the workers become aware off should be reported to the manager. The worker can only report on incidents if he is made aware off the possible environmental risks through the communications methods indicated in section 1. A written reporting format should be put in place. Communication includes establishing processes to report internally and, where desired, externally on the environmental activities of the mine in order to: Demonstrate management commitment to responsible environmental management; Deal with concerns and questions about environmental issues (handled within the Forum); Raise awareness of the organization's environmental policies, environmental management program; and Inform internal or external interested parties about the mine's management system; A formal complaints/concerns reporting system to address I &AP's interaction with the mine must be put in place (complaints register); The mine must regulatory communicate with the affected community. This communication must address new developments, problems, achievements and all other relevant aspects of mutual interest.	Ongoing	ALL

n) Specific information required by the Competent Authority

SEE **APPENDIX E** FOR CORRESPONDANCE RECEIVED FORM STATE DEPARTMENTS , LOCAL AUTHORITIES , ETC.

Any OTHER inputs from the departments for the final document?????

o) UNDERTAKING

The EAP herewith confirms

a. the correctness of the information provided in the reports

b. the inclusion of comments and inputs from stakeholders and I&APs ;

c. the inclusion of inputs and recommendations from the specialist reports where relevant; and

d. the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed;

Signature of the environmental assessment practitioner/s:

BOSCIA ENVIRONMENTAL SOLUTIONS C.C.

Name of company:

Date:

-END-

APPENDICES