

IMPACT ASSESSMENT

1. IMPACT ASSESSMENT METHODOLOGY

The following impact assessment methodology and criteria were used to determine and evaluate significance.

Table 1: Impact Assessment Criteria

Criteria	Description
Nature	The nature of the impact is the consideration of what the impact will be and how it will be affected. This description is qualitative and gives an overview of what is specifically being considered. That is, the nature considers ‘what is the cause, what is affected, and how is it affected?’.
Status	Description of the impact as positive, negative or neutral and is deemed to be either direct or indirect in impact.
Extent	The magnitude, extent, or physical and spatial scale of the impact (Table 2).
Duration	The lifetime of the impact is measured in relation to the lifetime of the proposed development (Table 3).
Intensity	This will be a relative evaluation within the context of all the activities and the other impacts within the framework of the project. Note that intensity is weighted as this is a critical issue in terms of the overall risk and impact assessment. The intensity is thus measured as the degree to which the project affects or changes the environment (Table 4).
Probability	This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the lifecycle of the activity, and not at any given time (Table 5).
Significance	The level of significance is expressed as the sum of the area exposed to the risk (extent), the length of time that exposure may occur over in total (duration), the severity of the exposure (intensity) and the likelihood of the event occurring (probability). This leads to a range of significance values running from ‘no impact’ to ‘extreme’ (Table 6). Significance value = (Extent + Duration + Intensity) x Probability. A distinction will be made for the significance rating without the implementation of mitigation measures and with the implementation of mitigation measures. The purpose of mitigation measures is to reduce the significance level of the anticipated impact. Therefore, the reduction in the significance level after mitigation is directly related to the scores used in

Criteria	Description
	the impact assessment criteria. The effect of potential mitigation measures to reduce the overall significance level is also to be considered in each issues table (i.e. values with or without mitigation are presented).
Confidence	This is the level of knowledge/information that the environmental impact practitioner or a specialist had in his/her judgement (Table 7).
Reversibility	Examining whether the impacted environment can be returned to its pre-impacted state once the cause of the impact has been removed (Table 8).
Replaceability	Examining if an irreplaceable resource is impacted upon. Replaceability is an indication of the scarcity of the specific set of parameters that make up the affected environment. That is, if lost can the affected environment be (a) recreated, or (b) is it a common set of characteristics and thus if lost is not considered a significant loss (Table 9).
Cumulative	Synthesis of different impacts in concert, considering the knock-on impacts thereof. A cumulative impact, in relation to an activity, is the impact of an activity that may not be significant but may become significant when added to the existing and potential impacts arising from similar or other activities in the area. Cumulative impacts are those which have incremental impacts of the activity as a whole, and, others that past, present and future activities will have an impact on a common resource (Table 10).

Table 2: Extent

Description	Explanation	Scoring
Footprint / Site	The impact could affect the whole, or a significant portion of the site.	1
Local	Impact could affect the adjacent landowners.	2
Regional	Impact could affect the wider area around the site, that is, from a few kilometres, up to the wider region.	3
National	Impact could have an effect that expands throughout a significant portion of South Africa – that is, as a minimum has an impact across provincial borders.	4
International	Impact has international ramifications, going beyond South Africa's boundaries.	5

Table 3: Duration

Description	Explanation	Scoring
Short term	The impact will either disappear with mitigation or will be mitigated through a natural process, and will be relevant for 0 to 2 years.	1
Short to Medium term	The impact will be relevant for less than 5 years.	2
Medium term	The impact will be relevant for 5 to 10 years.	3
Long term	The impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter (i.e. more than 10 years).	4
Permanent	This is the only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be	5

Description	Explanation	Scoring
	considered transient (i.e. impact will remain after the operational lifetime of the project).	

Table 4: Intensity

Description	Explanation	Scoring
Low	The impact alters the affected environment in such a way that the natural processes or functions are not affected.	2
Low-Medium	The impact alters the affected environment in such a way that the natural processes or functions are slightly affected.	4
Medium	The affected environment is altered, but functions and processes continue, albeit in a modified way.	6
Medium-High	The affected environment is altered, and the functions and processes are modified immensely.	8
High	Function or process of the affected environment is disturbed to the extent where the function or process temporarily or permanently ceases.	10

Table 5: Probability

Description	Explanation	Scoring
Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience (less than 24% chance of occurring).	1
Possible	The possibility of the impact occurring is very low, either due to the circumstances, design or experience (25 – 49%).	2
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made (50 – 69%).	3
Highly likely	It is most likely that the impacts will occur at some stage of the Development. Plans must be drawn up before carrying out the activity (70 – 89%).	4
Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied upon (90 – 100%).	5

Table 6: Level of Significance

Description	Explanation	Scoring
Neutral, very low or positive impact	There is no impact or a very low impact. The impact is positive, irrespective of value.	0-10
Low	The impacts are less important, but some mitigation is required to reduce the negative impacts.	11-30
Medium	The impacts are important and require attention; mitigation is required to reduce the negative impacts.	31-60
High	The impacts are of high importance and mitigation is essential to reduce the negative impacts.	61-89
Extreme (Fatal Flaw)	The impacts present a fatal flaw, and alternatives must be considered.	90-100

Table 7: Confidence

Description	Explanation
Low	The judgement is based on intuition and not on knowledge or information.
Medium	The judgement is based on common sense and general knowledge.
High	The judgement is based on scientific and/or proven information.

Table 8: Reversibility

Description	Explanation
Yes	Affected environment able to recover from the impact.
No	Affected environment unable to recover from the impact, that is, permanently modified.

Table 9: Replaceability

Description	Explanation
Yes	Affected environment is replaceable, that is, an irreplaceable resource is not damaged, or the resource is not irreplaceable (not scarce).
No	Affected environment is irreplaceable.

Table 10: Cumulative Impacts

Description	Explanation
Low	Sufficient capacity of the environmental resources within the geographic area to respond to change and withstand further stress.
Medium	Capacity of the environmental resources within the geographic area to respond to change and withstand further stress is reduced.
High	Capacity of the environmental resources within the geographic area to respond to change and withstand further stress has been or is close to being exceeded.

2. ASSESSMENT OF IMPACTS

Environmental issues (or impacts) that were identified during the basic assessment process (including impacts or issues identified by Interested and Affected Parties) have been considered, including an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures.

Mitigation measures proposed have been included in the assessment and Environmental Management Programme (EMPr).

2.1. ECOLOGICAL IMPACTS

2.1.1. Loss of Vegetation

The total project site is approximately 19.2ha in extent, and within this area approximately 10ha will be cleared of vegetation for the solar array area, extension of the access road and construction camp. Vegetation in areas that have not been disturbed is largely intact and presents a high diversity in plant species; approximately 4ha of this vegetation will be cleared. The remaining footprint area (approximately 6ha) consists of a degraded area which includes a scrap metal stockpiling / dumping area, and transformed areas that consist of a building, foot paths and existing access roads/tracks. Vegetation type status is Least Threatened and Vulnerable.

The construction phase would have the greatest impact on the vegetation. The operational phase of the project would have a limited impact on vegetation regrowth within the solar array area and immediate adjacent area, as vegetation will need to be kept clear of tall bushes and trees as these would contribute to shaded areas over the solar panels. Vegetation underneath the solar panels would also need to be controlled in order not to interfere with the tracking system. **Vegetation under and between the frames will be physically mowed or cut in order to prevent casting of shadows on the panels or from vegetation creating barriers.**

The proposed solar infrastructure is not located within 500m of any protected area **(in relation to Section B6 (Land Use Character of Surrounding Area) of the Basic Assessment Report). The proposed site is located approximately 6.7km to the east of the Groendal Wilderness Area and within 5km of The Springs Local Authority Nature Reserve.**

With the mitigation measures in place, the impact on the vegetation would remain localised resulting in a low impact.

No-Go Alternative: No indigenous vegetation will be cleared, and impact remains at a medium positive significance.

Theme	Ecological			
Impact	Loss of vegetation			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Clearing of vegetation for construction activities	Clearing of vegetation for operational activities	No indigenous vegetation cleared
Status		Direct, Negative	Direct, Negative	Direct, Positive
Extent		Footprint / Site: 1	Footprint / Site: 1	Footprint / Site: 1
Duration		Long term: 4	Long term: 4	Long term: 4
Intensity		Medium: 6	Medium: 6	Low: 2
Probability		Definite: 5	Definite: 5	Definite: 5
Confidence		High		
Level of significance	None	$(1+4+6)*5=55$	$(1+4+6)*5=55$	$(1+4+2)*5=35$
		Medium (-)	Medium (-)	Medium (+)
Reversibility		No	No	Yes
Replaceability		Yes	Yes	Yes
Cumulative		Low	Low	Low
Mitigation measures	<p>Construction Phase: The site camp to be located in an already disturbed area with existing access, to minimise additional disturbance and clearing of vegetation. Only shrubs are to be removed for the construction camp area and laydown areas. Grass is to be left in place. Work areas must be clearly demarcated, e.g. with droppers and/or orange netting but not with danger tape, so that construction workers limit their impact to these areas alone. All construction vehicles must stay on single demarcated access tracks to avoid compaction of soil and roots. Limit any disturbance to the vegetation only to that which is essential for the development. All remaining indigenous vegetation to be left intact. Rehabilitation should be undertaken in a progressive manner. Re-vegetation of the disturbed areas with indigenous material should be undertaken as soon as construction activities at an individual site have been completed.</p> <p>Operational Phase: Vegetation regrowth within the solar array area to be controlled, i.e. removed physically or through chemical means by operational contractor.</p>			No mitigation measures
Level of significance after mitigation	None	$(1+4+4)*3=27$	$(1+4+4)*3=27$	$(1+4+2)*5=35$
		Low (-)	Low (-)	Medium (+)

2.1.2. Loss of Habitat containing Species of Special Concern

The Eastern Cape Provincial **Bioregional Biodiversity** Conservation Plan (2007) classes the site as falling within Terrestrial Critical Biodiversity Area (CBA) 2 (Corridor 2). This places it within Terrestrial Biodiversity Land Management Class (BLMC) 2: 'maintain near natural state' i.e. with minimal loss in ecosystem integrity and functioning. According to the Nelson Mandela Bay Municipality's Bioregional Plan (2010), the site does not fall within a Critical Biodiversity Area or Ecological Support Area. The terrestrial ecosystem is classified as Least Threatened.

One hundred and thirty plant species were identified on site. Of these four (4) are Species of Special Concern (SSC), twenty seven (27) species are protected plants, and one (1) protected tree species i.e. *Sideroxylon inerme subsp. inerme*, was identified on site. The majority of these species are located on the boundaries of the proposed site, and a few are scattered within the proposed solar array area.

With the mitigation measures in place, the impact on the loss of habitat would remain localised resulting in a medium impact.

No-Go Alternative: No protected or endangered species will be physically removed, however a risk remains that these species will be lost to animals as a food source. Impact remains at a medium negative significance.

Theme	Ecological			
Impact	Loss of habitat containing Species of Special Concern			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	Removal of SSCs within the footprint area	Removal of SSCs within the footprint area	Loss of protected species and SSC from associated operational activities	Loss of protected species and SSC from wildlife grazing
Status	Direct, Negative	Direct, Negative	Direct, Negative	Direct, Negative
Extent	Regional: 3	Regional: 3	Regional: 3	Regional: 3
Duration	Permanent: 5	Permanent: 5	Permanent: 5	Long term: 4
Intensity	Medium: 6	Medium: 6	Medium: 6	Medium: 6
Probability	Definite: 5	Definite: 5	Definite: 5	Likely: 3
Confidence	High			
Level of significance	$(3+5+6)*5=70$	$(3+5+6)*5=70$	$(3+5+6)*5=70$	$(3+4+6)*3=39$
	High (-)	High (-)	High (-)	Medium (-)
Reversibility	No	No	No	Yes
Replaceability	Yes	Yes	Yes	Yes
Cumulative	Low	Low	Low	Low
Mitigation measures	<p>Planning & Design Phase: Permits must be obtained from the DAFF and/or DEDEAT prior to the removal of protected and SSCs. The access road to be aligned away from SSCs.</p> <p>Construction Phase: The site camp to be located in an already disturbed area with existing access, to minimise additional disturbance to habitat and SSCs. Only shrubs are to be removed for the construction camp area and laydown areas. Grass is to be left in place. Work areas must be clearly demarcated, e.g. with droppers and/or orange netting but not with danger tape, so that construction workers limit their impact to these areas alone. All construction vehicles must stay on single demarcated access tracks to avoid creep into surrounding areas. Limit any disturbance to the vegetation only to that which is essential for the development. All remaining indigenous vegetation to be left intact. Rehabilitation should be undertaken in a progressive manner. Re-vegetation of the disturbed areas with indigenous material should be undertaken as soon as construction activities at an individual site</p>			There are no mitigation measures

	have been completed.			
	Operational Phase: Shrubs and trees located on the boundary of the site should be left intact and not removed. Area surrounding the solar array should be grassed with an indigenous grass species.			
Level of significance after mitigation	(3+5+4)*3=36	(3+5+4)*3=36	(3+5+4)*3=36	(3+4+6)*3=39
	Medium (-)	Medium (-)	Medium (-)	Medium (-)

2.1.3. Potential Spread of Alien Vegetation

A low level of alien plant invasion is scattered across the site. Five alien invasive species were identified on site i.e. *Opuntia ficus-indica* (L.) Mill., *Acacia cyclops* A.Cunn. ex G.Don, *Acacia mearnsii* De Wild., *Acacia saligna* (Labill.) H.L.Wendl. and *Eucalyptus camaldulensis* Dehnh.

The potential of alien plants spreading is likely if not managed during the site establishment, construction and operational phases.

With the mitigation measures in place, the impact on the indigenous vegetation would remain localised, with natural re-vegetation happening within a short time period, resulting in a low risk and low impact significance.

No-Go Alternative: The risk remains that the current alien vegetation may spread into surrounding areas, if not controlled. Impact can be reduced to a low negative significance.

Theme	Ecological			
Impact	Potential spread of alien vegetation			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Spread of alien vegetation	Spread of alien vegetation	Spread of alien vegetation
Status		Direct, Negative	Direct, Negative	Direct, Negative
Extent		Local: 2	Local: 2	Local: 2
Duration		Permanent: 5	Permanent: 5	Permanent: 5
Intensity		Medium: 6	Medium: 6	Medium: 6
Probability		Highly Likely: 4	Likely: 3	Likely: 3
Confidence		High		
Level of significance	None	(2+5+6)*4=52	(2+5+6)*3=39	(2+5+6)*3=39
		Medium (-)	Medium (-)	Medium (-)
Reversibility		Yes	Yes	Yes
Replaceability		Yes	Yes	Yes
Cumulative		Low	Low	Low
Mitigation measures	Construction Phase: Disturbed areas should be kept to a minimum, keeping the width and length of the earth works to a minimum. Rehabilitation should be undertaken in a progressive manner. Re-vegetation of the disturbed areas with indigenous material should be undertaken as soon as construction activities at an individual site have been completed. The shallow topsoil layer to be stockpiled separately from the subsoil layers, should the excavation exceed 0.5m. When the			Alien plant growth to be monitored and area to be kept free of alien invasive and noxious plants by the landowner

	<p>construction has been completed, then the topsoil layers, which contain seed and vegetative material, should be reinstated last thus allowing plants to rapidly re-colonise the bare soil areas. No stockpiling within 32 m of a drainage line. Alien plant regrowth is to be monitored during construction on-site by the Contractor's Environmental Officer and any such species to be removed either by physical (preferable) or chemical means by the Contractor.</p> <p>Operational Phase: Alien plant growth to be monitored and area to be kept free of alien invasive and noxious plants by the operational contractor.</p>			
Level of significance after mitigation	None	(1+1+4)*2=12	(1+1+4)*2=12	(1+1+4)*2=12
		Low (-)	Low (-)	Low (-)

2.1.4. Potential Loss of Aquatic Habitats

The Eastern Cape Biodiversity Conservation Plan (2007) classes the site as falling within an Aquatic CBA 2 area. This places it within an Aquatic BLMC 2a: 'important sub-catchments' (Coega River), being support zones required for preventing degradation of A1 rivers, requiring moderate or high protection. The recommended permissible land uses for Aquatic BLMC 2a sites are conservation, game farming, and communal livestock grazing.

A non-perennial drainage line is located adjacent to the site on the western and northern boundary. The drainage line forms part of the Coega River catchment area. There are no identified watercourses in terms of the National Freshwater Ecosystem Priority Areas (NFEPA), within or adjacent to the site.

An artificial wetland is located in the adjacent property to the south, and has a NFEPA condition of Z3 and NFEPA rank of 6 (NFEPA, 2011). The artificial wetland is a man-made structure that provides a watering point for game and/or livestock. A man-made dam is located in the south eastern corner of the property that provides a watering point for game within the property.

The Subtropical Thicket Ecosystem Project (STEP, 2007) identifies the drainage areas adjacent to the site as Process Areas, and this is reflected similarly in the NMBM Bioregional Plan, 2010 as a riverine corridor. Thicket clumps become denser along the western and northern drainage lines.

Sediment entering the dry drainage line located to the west and north of the site may impact on water quality and aquatic ecosystem functioning. The proposed activities fall outside of the 32m buffer of the nearest drainage line, and no removal of riverine vegetation will be undertaken. Although the proposed site is located within 500m of an artificial wetland (manmade dams), located to the south, the proposed development will not impact on this area.

The impact can be mitigated to a very low negative impact significance, from a medium negative impact.

No-Go Alternative: No change in status.

Theme	Ecological			
Impact	Changes to the hydrological systems			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	Potential loss of aquatic habitats	Potential loss of aquatic habitats	Potential loss of aquatic habitats	No change in status
Status	Direct, Negative	Direct, Negative	Direct, Negative	
Extent	Local: 2	Local: 2	Local: 2	
Duration	Medium term: 3	Medium term: 3	Medium term: 3	
Intensity	Medium: 6	Medium: 6	Medium: 6	
Probability	Likely: 3	Likely: 3	Likely: 3	
Confidence	High			
Level of significance	(2+3+6)*3=33 Medium (-)	(2+3+6)*3=33 Medium (-)	(2+3+6)*3=33 Medium (-)	- Neutral
Reversibility	Yes	Yes	Yes	No change in status
Replaceability	Yes	Yes	Yes	
Cumulative	Low	Low	Low	
Mitigation measures	<p>Planning and Design Phase The access road and perimeter fence to be located outside of the 32m buffer of the drainage line.</p> <p>Construction Phase: The construction camp and temporary toilet facilities to be located outside the 32m buffer of the drainage line. No access, construction activities or stockpiling to occur within 32 m of the drainage line. Sedimentation into drainage lines must be minimised through the effective stabilisation (e.g. gabions and Reno mattresses) and the re-vegetation of cleared areas.</p> <p>Operational Phase: No access, maintenance activities or stockpiling to occur within 32 m of the drainage line</p>			
Level of significance after mitigation	(2+1+2)*1=5 Very low (-)	(2+1+2)*1=5 Very low (-)	(2+1+2)*1=5 Very low (-)	- Neutral

2.1.5. Soil, Surface and Groundwater Pollution Impacts

Soil and water pollution impacts relate to spillages from construction materials, such as diesel, oils and cement, if dispersed via surface run-off, or are allowed to permeate into the soils and groundwater. The potential negative changes to water quality during the operational phase would be limited to sedimentation. The potential risk of trace metals leaching from installed solar PV panels into soils, surface or groundwater is low due to the sealed nature of the solar PV panels, however this risk may increase with broken or aged solar panels.

The impact can be mitigated to a low negative impact significance, from a medium negative impact.

No-Go Alternative: No change in status.

Theme	Ecological			
Impact	Pollution of soils, surface and groundwater			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Potential pollution of soils, surface and groundwater from construction activities	Potential pollution of soils, surface and groundwater from operational activities	No change in status
Status		Direct, Negative	Direct, Negative	
Extent		Regional: 3	Regional: 3	
Duration		Medium term: 3	Long term: 4	
Intensity		Medium: 6	Medium: 6	
Probability		Likely: 3	Likely: 3	
Confidence	High			
Level of significance	None	$(3+3+6)*3=36$	$(3+4+6)*3=39$	Neutral
		Medium (-)	Medium (-)	
Reversibility		Yes	Yes	
Replaceability		Yes	Yes	
Cumulative		Low	Low	
Mitigation measures	<p>Construction Phase: Chemicals must be stored safely on site, on an impermeable lined surface and surrounded by lined bunds, as per SANS 10128. Chemical storage containers must be regularly inspected so that any leaks are detected early. Littering and contamination of water sources during construction must be prevented by effective construction camp and site management. Emergency plans must be in place in case of spillages onto road surfaces and drainage lines. No stockpiling within 32 m of a drainage line. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised. Stormwater must be directed around the stockpiles. The construction camp and temporary ablution facilities meant for construction workers must be beyond 32m of the drainage line. The topsoil layer (300mm of the top surface layer, including organic matter) must be stockpiled separately from the subsoil layers and used during reinstatement thus allowing plants to rapidly re-colonise the bare soil areas. Spill kits for small spills to be kept on site. Borehole water samples are to be taken prior to construction to determine a baseline for the water quality.</p> <p>Operational Phase: Sedimentation into drainage lines must be minimised through the effective stabilisation (e.g. gabions and Reno mattresses) and the re-vegetation of cleared areas. Broken, cracked or aged solar panels are to be replaced immediately. Borehole water sample testing to be done annually for an agreed period, to test the water quality and determine if any pollution is coming from the solar farm. If any pollution is found and is associated with the solar farm, then the developer is responsible to correct the pollution.</p>			No change in status
Level of significance after mitigation	None	$(1+3+4)*2=16$	$(1+4+4)*2=18$	Neutral
		Low (-)	Low (-)	

2.1.6. Impacts to Fauna and Avifauna

The site does not fall within an Important Bird Area (BGIS).

Faunal impacts relate to the disturbance and restriction of fauna movement due to the area being fenced. Construction activities may disturb any fauna and avifauna located within the immediate location, however this will be limited to the construction phase. Potential impacts to avifauna include sun glinting from the solar panels and connecting transmission line interrupting flight during the operational phase. Fauna will need to remain out of the solar panel (solar array) area; as a result the solar array (approximately 10ha) will be fenced.

Solar PV panels are dark rather than reflective, and are designed to absorb rather than reflect sunlight. However there may still be a limited amount of light being reflected from the glass outer casing. Overhead transmissions lines may present a potential collision risk or electrocution to avifauna. The PV plant can be flexibly designed to meet either under or above ground requirements without negatively influencing the effectiveness of the PV plant. It is anticipated that the connecting cables (from the inverters to the transformer) will be underground. The transformer will adapt the voltage to the voltage required. It is anticipated that the connecting transmission / distribution line will be underground.

The solar farm will not change the microclimate in the area.

The solar site will be positioned in a degraded vegetation area and presents little grazing value to animals.

The impact can be mitigated to a low negative impact significance.

No-Go Alternative: No change in status.

Theme	Ecological			
Impact	Disturbance to Fauna and Avifauna			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Disturbance to fauna and avifauna from construction activities	Disturbance to fauna and avifauna from operational activities	No change in status
Status		Direct, Negative	Indirect, Negative	
Extent		Local: 2	Local: 2	
Duration		Short term: 1	Long term: 4	
Intensity		Medium: 6	Medium: 6	
Probability		Likely: 3	Possible: 2	
Confidence	High			
Level of significance	None	$(2+1+6)*3=27$	$(2+4+6)*2=24$	Neutral
Reversibility		Low (-)	Low (-)	No change in status
Replaceability		Yes	Yes	
Cumulative		Yes	Yes	
Mitigation measures	Construction Phase: Work areas must be clearly demarcated, e.g. with droppers and/or orange netting but not with danger tape, so that construction			

	<p>workers limit their impact to these areas alone. All construction vehicles must stay on single demarcated access tracks to avoid small fauna. The site camp to be located in an already disturbed area with existing access. Fires are to be prohibited on and adjacent to the site. Vegetation that was cleared may provide useful fauna habitat. Logs, limbs and stumps should be cleared and stockpiled separately to the topsoil stripping operation. An expert who holds a Competency Certificate to handle Dangerous and Venomous Reptiles should be contracted to remove animals. A search and rescue to be undertaken prior to construction and animals to be removed from the solar site.</p> <p>Operational Phase: All overhead power lines to include bird deflectors. Electrical cabling and connecting distribution lines to be underground. The fence line is to be checked on a weekly basis for any fauna species caught in the strands. An expert who holds a Competency Certificate to handle Dangerous and Venomous Reptiles should be contracted to remove animals.</p>			
Level of significance after mitigation	None	(1+1+4)*2=12	(2+4+4)*2=20	Neutral
		Low (-)	Low (-)	

2.2. AIR QUALITY IMPACTS

Dust and air pollution impacts relate to the generation of dust during construction related activities, poorly maintained construction vehicles and burning materials for warmth during winter by contraction staff. In relation to operational phase activities, the impact relates mainly to dust from cleared areas, e.g. the gravel access road and solar array area. The operation of solar PV systems does not produce any emissions.

The impact can be mitigated to a low negative impact significance, from a medium negative impact.

No-Go Alternative: Evidence of burning of waste was noted on site, and the risk remains that periodic burning of waste materials may continue. Impact can be reduced to a very low negative significance.

Theme	Air Quality			
Impact	Dust and Air Pollution			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Dust and air emissions emanating from construction related activities	Dust from cleared areas	Periodic burning of waste materials
Status		Direct, Negative	Direct, Negative	Direct, Negative
Extent		Local: 2	Local: 2	Local: 2
Duration		Short term: 1	Long term: 4	Long term: 4
Intensity		Medium: 6	Medium: 6	Medium: 6
Probability		Definite: 5	Likely: 3	Likely: 3
Confidence		High		

Level of significance	None	$(2+1+6)*5=45$	$(2+4+6)*3=36$	$(2+4+6)*3=36$
		Medium (-)	Medium (-)	Medium (-)
		Yes	Yes	Yes
		Yes	Yes	Yes
Reversibility		Low	Low	Low
Replaceability				
Cumulative				
Mitigation measures	<p>Construction Phase: Prompt rehabilitation and wetting down of recently cleared areas to minimize dust creation. Until vegetation used in rehabilitation efforts has established, temporary stabilization methods must be used (e.g. protecting exposed soils with coarse granular materials, mulches, or straw). Construction should be undertaken in a phased manner, so as to limit the size of the area to be exposed at any one time. Dust levels are not to exceed 600mg/m²/day averaged over an annual period for rural areas. Dust suppression techniques (e.g. wetting of areas) to be used on all dust generating surfaces. Potable and contaminated water not to be used as a dust-suppressing agent. All work must stop during high wind conditions (i.e. when wind speeds exceed 35km/h). Construction vehicles must adhere to speed limits. No materials shall be burnt. Trucks transporting any form of soil or waste should be covered with a tarpaulin. Vehicles and machinery will be maintained in good running condition. No waste may be buried. Contact details (e.g. telephone number) should be located at the entrance of the site for reporting of excessive dust after hours.</p> <p>Operational Phase: Vehicles must adhere to speed limits on gravel roads. No materials shall be burnt. Maintaining re-vegetated areas to limit exposed soils. No waste may be buried. Contact details (e.g. telephone number) should be located at the entrance of the site for reporting of excessive dust after hours.</p>			No burning of waste materials.
Level of significance after mitigation	None	$(2+1+4)*3=21$	$(2+4+4)*2=20$	$(2+1+2)*2=10$
		Low (-)	Low (-)	Very Low (-)

2.3. HERITAGE RESOURCE IMPACTS

The loss of heritage resources relates to the possible loss of cultural heritage resources, including archaeological artefacts.

A few isolated weathered quartzite stone tools (most probably of Middle Stone Age origin) were observed in tracks or where the yellowish top soils were disturbed. These stone tools were in secondary context and not associated with any other archaeological material. The stone tools are of low cultural significance and no further action is required. The area is of low cultural sensitivity and it is highly unlikely that any archaeological remains of any significance will be found *in situ* or exposed during the development. There are no known graves or historical buildings older than 60 years on the site.

The impact can be mitigated to a very low negative impact significance, from a low negative impact.

No-Go Alternative: There is a potential risk that loss or damage of artefacts may occur with the current land use, however this is of low significance. Impact remains at a low negative significance.

Theme	Heritage Resources			
Impact	Loss of heritage resources			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Loss of / damage to artefacts due to construction activities	None	Loss of / damage to artefacts due to additional stockpiling of old equipment / waste
Status		Direct, Negative		Direct, Negative
Extent		Footprint / Site: 1		Footprint / Site: 1
Duration		Permanent: 5		Permanent: 5
Intensity		Medium - High (8)		Medium - High (8)
Probability		Possible: 2		Possible: 2
Confidence		High		
Level of significance	None	$(1+5+8)*2=28$	None	$(1+5+8)*2=28$
		Low (-)		Low (-)
Reversibility		No		No
Replaceability		No		No
Cumulative		Low		Low
Mitigation measures	<p>Construction Phase: Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the find brought to the immediate attention of the Resident Engineer or his representative who will report it to the Eastern Cape Provincial Heritage Resources Authority (043 6422811). The area will be fenced off with a radius of 20m around the unearthed item, demarcated as a no-go area and access will be prohibited. Human remains confirmed younger than 60 years (to be confirmed by the police forensic unit or archaeologist) are to be reported directly to the nearest police station. Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the National Heritage Resources Act (Act No. 25 of 1999), Section 51.(1).</p>			No mitigation measures
Level of significance after mitigation	None	$(1+1+2)*2=8$	None	$(1+5+8)*2=28$
		Very Low (-)		Low (-)

2.4. LAND USE IMPACTS

2.4.1. Loss of Agricultural Land

Agricultural potential of the site is low as it is classified as non-arable agricultural land, classification VIII (8), according to the land capability classification. As such, the site is not suitable for cultivation purposes. The site is currently utilised partially as a grazing area for game / wildlife, and historically has been utilised as a grazing area for livestock. A large

portion of the site is currently being used to stockpile old equipment and waste materials. The proposed solar PV site is currently zoned as Agriculture and will require subdivision and rezoning.

The impact remains as a medium negative impact.

No-Go Alternative: The stockpiling of old equipment or waste materials continues, with the risk that these areas may increase. Impact can be reduced to a low positive significance

Theme	Land Use			
Impact	Loss of agricultural land			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	None	Solar PV site leading to the loss of agricultural land	Area for stockpiling of old equipment and waste materials increases
Status			Direct, Negative	Direct, Negative
Extent			Footprint / Site: 1	Footprint / Site: 1
Duration			Long term: 4	Long term: 4
Intensity			Medium: 6	Medium: 4
Probability			Definite: 5	Highly Likely: 4
Confidence			High	
Level of significance	None	None	$(1+4+6)*5=55$	$(1+4+4)*4=36$
			Medium (-)	Medium (-)
Reversibility			Yes	Yes
Replaceability			Yes	Yes
Cumulative			Low	Low
Mitigation measures	Operational Phase: No mitigation measures.			Removal of old equipment and waste materials
Level of significance after mitigation	None	None	$(1+4+6)*5=55$	$(1+4+2)*2=14$
			Medium (-)	Low (+)

2.4.2. Soil Erosion

Soils towards the northern section of the site, is classed as 'freely drained structure-less' soils, and soils to the south are classed as 'non soil land classes' i.e. rock. In general, the geology of the site can be described as 'rock with limited soils'.

Soil exposed by the clearing of vegetation during construction and maintaining cleared areas during the operational phase will have substantially elevated erosion levels. The risk of soil erosion increases in areas where vegetation and rocks are removed on steeper slopes in order to cater for solar PV infrastructure and access road.

Areas that may require clearing include the solar array area, trenches for cabling, construction and laydown areas in order to undertake the required construction. Some of these areas may not be required for operational phase.

The impact can be mitigated to a low negative impact significance, from a medium negative impact.

No-Go Alternative: No change in status.

Theme	Land Use			
Impact	Soil erosion			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	Solar PV infrastructure and access road leading to soil erosion	Construction activities leading to soil erosion	Soil erosion from increased run off due to cleared areas	No change in status
Status	Indirect, Negative	Indirect, Negative	Indirect, Negative	
Extent	Footprint / Site: 1	Footprint / Site: 1	Footprint / Site: 1	
Duration	Long term: 4	Medium term: 3	Long term: 4	
Intensity	Medium: 6	Medium: 6	Medium: 6	
Probability	Highly Likely: 4	Highly Likely: 4	Highly Likely: 4	
Confidence	High			
Level of significance	(1+4+6)*4=44 Medium (-)	(1+3+6)*4=40 Medium (-)	(1+4+6)*4=44 Medium (-)	Neutral
Reversibility	Yes	Yes	Yes	No change in status
Replaceability	Yes	Yes	Yes	
Cumulative	Low	Low	Low	
Mitigation measures	<p>Planning and Design Phase: Solar PV infrastructure and access road surrounding the solar array area to be located outside of steep terrain.</p> <p>Construction & Operational Phases: During construction silt fences to be included around stock piles and along the western and northern boundary adjacent to the drainage line. No access or activities allowed in areas with steep terrain. Anti-erosion measures to be included to disperse run-off so as to reduce the volume and velocity of surface water flow and vulnerable areas to be stabilised. Maintenance of erosion control structures. Areas not required to be kept cleared of vegetation are to be re-vegetated.</p>			
Level of significance after mitigation	(1+4+4)*3=27 Low (-)	(1+3+4)*3=24 Low (-)	(1+4+4)*3=27 Low (-)	Neutral

2.5. WASTE MANAGEMENT IMPACTS

Impacts relating to ineffective waste management procedures may lead to the dumping of building rubble, littering and pollution of the surrounding areas as well as unsanitary (toilet) conditions and an increase in vermin. Domestic and construction waste as well as decommissioned solar panels and batteries will increase the amount of waste disposed to landfill, including old equipment and cleared vegetation. No vermin will be attracted during the operational phase.

During the construction phase chemical toilet facilities will be provided at construction areas and secured to the ground, and cleaned at least weekly. During the operational phase, the operational contractor will not be on site full time, and toilet facilities will not be required.

The impact can be mitigated to a low negative impact significance, from a medium negative impact.

No-Go Alternative: The stockpiling of old equipment or waste materials continues, with the risk that these areas may increase. Impact can be reduced to a low positive significance.

Theme	Waste Management			
Impact	Liquid and solid waste, vermin control			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	Removal of old equipment remaining on site	Liquid and solid waste	Solid waste	Old equipment remaining on site
Status	Direct, Negative	Direct, Negative	Direct, Negative	Direct, Negative
Extent	Local: 2	Regional: 3	Regional: 3	Local: 2
Duration	Short term: 4	Short term: 1	Long term: 4	Long term: 4
Intensity	Medium: 6	Medium: 6	Low-Medium: 4	Medium: 6
Probability	Highly Likely: 4	Highly Likely: 4	Likely: 3	Highly Likely: 4
Confidence	High			
Level of significance	(2+4+6)*4=48 Medium (-)	(3+1+6)*4=40 Medium (-)	(3+4+4)*3=33 Medium (-)	(2+4+6)*4=48 Medium (-)
Reversibility	Yes	Yes	Yes	Yes
Replaceability	Yes	Yes	Yes	Yes
Cumulative	Medium	Medium	Medium	Medium
Mitigation measures	<p>Planning & Design Phase: Old waste equipment to be removed from site and recycled. Waste that cannot be recycled will be disposed of at a registered landfill site.</p> <p>Construction Phase: Cleared vegetation to be mulched or disposed of at the Koedoeskloof licensed landfill site. Stockpiles of vegetation not to be left on site due to fire hazard. Good housekeeping to be undertaken at all times. No illegal dumping or burning of waste allowed. Waste is not to be buried. Where possible, the contractor must register with the local waste exchange programme for re-use and recycling of construction rubble. Awareness raising to be undertaken with the construction workers regarding health and environmental impacts from illegal dumping. Any excavated material not reused on site, to be disposed of at the Koedoeskloof licenced landfill site in Uitenhage. Waste bins are to be located at the construction camp and construction site. Bins are to have secured lids to prevent waste from being blown into the surrounding area and to prevent animals scavenging in the bins. Domestic and general construction waste to be disposed of at the Koedoeskloof licensed landfill site. The Contractor may not utilise the municipal waste collection services. Proof of disposal must be kept at the site office by the Contractor. Chemical Toilet facilities to be provided at construction areas and secured to the ground, cleaned at least weekly. Water should be provided for washing and sanitary bins for women. Waste to be disposed of at a wastewater treatment works. No hazardous waste material to be disposed of as general waste. Hazardous waste (e.g. old oil) to be stored separately in impermeable (i.e. leak proof) containers, and sent for recycling. Proof of waste disposal must be kept on site.</p>			Old waste equipment to be recycled

	A Waste Management Method Statement must be submitted by the appropriate contractor to the Resident Engineer or his representative for approval.			
	Operational Phase: Decommissioned, faulty or broken solar panels, equipment or cabling is to be taken off site and recycled. If items are unable to be recycled, to be disposed of at an appropriate landfill site. No illegal dumping, burying or burning of waste allowed. Waste is not to be buried. No hazardous waste material to be disposed of as general waste. Proof of waste disposal must be kept.			
Level of significance after mitigation	(1+1+4)*3=18	(1+1+4)*2=12	(1+4+4)*2=18	(1+1+4)*3=18
	Low (+)	Low (-)	Low (-)	Low (+)

2.6. TRAFFIC IMPACTS

Traffic impacts relate simply to potential increases in traffic within the area, with resultant potential congestion, road damage, noise, etc. issues.

2.6.1. Increased Traffic

The DR01940 presently carries low traffic volumes related to the farms situated along the road. The results from the traffic survey undertaken on 20 November 2014 at the DR01940 and R75 intersection indicate four vehicles exiting the DR01940. In terms of the Rural Road Category (as defined by traffic volumes) the DR01940 is categorised in the 'low' category, i.e. 0-50 vehicles per day (Traffic Impact Assessment, Appendix D).

During the construction phase, the additional daily traffic will increase current daily volumes between the R75 and the solar site by 4 heavy vehicle trips per day. During the operational phase, the additional daily traffic is anticipated to be 4 vehicle trips per day (Traffic Impact Assessment, Appendix D).

Additional vehicle (predominantly heavy vehicles / trucks) trips generated by the proposed development will have a low impact in terms of peak hour intersection capacity given the low peak hour volumes at the affected intersection (R75 and DR01940) (Traffic Impact Assessment, Appendix D).

The impact can be mitigated to a low negative impact significance.

No-Go Alternative: No change in status.

Theme	Traffic			
Impact	Increased traffic in greater area			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Increased traffic on local roads	Increased traffic on local roads	No change in status
Status		Direct, Negative	Direct, Negative	
Extent		Regional: 3	Regional: 3 Local: 2	

Duration		Short term: 1	Long term: 4	
Intensity		Medium : 6 Medium – High: 8	Low-Medium: 4 Medium – High: 8	
Probability		Highly Likely: 4 Definite: 5	Likely: 3 Highly Likely: 4	
Confidence		High		
Level of significance	None	$(3+1+6)*4=40$ $(3+1+8)*5=60$	$(3+4+4)*2=22$ $(2+4+8)*4=56$	Neutral
Reversibility		Medium (-)	Low (-) Medium (-)	
Replaceability		Yes	Yes	
Cumulative		No	No	
Mitigation measures	Construction Phase: Flagmen to be posted when construction works are being undertaken adjacent to roads. Signage is to be displayed regarding construction activities. Construction vehicles are to keep to the speed limits. Regular maintenance of road during construction phase.			No change in status
	Operational Phase: Vehicles are to keep to the speed limits. Maintenance of road immediately after construction period.			
Level of significance after mitigation	None	$(3+1+4)*2=16$	$(3+4+4)*2=22$ $(2+4+3)*2=18$	
		Low (-)	Low (-)	Neutral

2.6.2. Traffic Safety

In addition to safety aspects related to lack of advanced warning road signage and possible deterioration of the road due to a lack of maintenance, the following safety issues may arise as a result of additional vehicle movements along DR01940 (Traffic Impact Assessment, Appendix D):

- Heavy vehicles travelling through sections with limited sight distance albeit that truck drivers will have better visibility due to their higher seat position.
- Lack of maintenance leads to a loss of fine material which creates dusty and slippery conditions in dry and wet weather conditions respectively.

The impact can be mitigated to a low negative impact significance.

No-Go Alternative: No change in status.

Theme	Traffic			
Impact	Traffic Safety			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Traffic safety impact due to construction traffic	Traffic safety impact due to additional traffic	No change in status
Status		Direct, Negative	Direct, Negative	
Extent		Regional: 3	Local: 2	
Duration		Short term: 1	Long term: 4	
Intensity		Medium – High: 8	Medium – High: 8	
Probability		Highly Likely: 4	Highly Likely: 4	

Confidence	High			
Level of significance	None	$(3+1+8)*4=48$	$(2+4+8)*4=56$	Neutral
		Medium (-)	Medium (-)	
Reversibility		Yes	Yes	
Replaceability		No	No	
Cumulative		Medium	Low	
Mitigation measures	<p>Construction Phase: Flagmen to be posted when construction works are being undertaken adjacent to roads. Signage is to be displayed regarding construction activities. Construction vehicles are to keep to the speed limits. Regular maintenance of road during construction phase. Additional warning signage regarding sharp bends in road. Vegetation is cleared on the DR01940 road verge at the entrance to the solar site.</p> <p>Operational Phase: Vehicles are to keep to the speed limits. Maintenance of road immediately after construction period. Additional warning signage regarding sharp bends in road. Vegetation is cleared on the DR01940 road verge at the entrance to the solar site.</p>			No change in status
Level of significance after mitigation	None	$(3+1+4)*2=16$	$(2+4+3)*2=18$	Neutral
		Low (-)	Low (-)	

2.6.3. Deterioration of Public Road Network

The surface of the DR01940 appears to be in a poor condition based on the visual condition assessments conducted, and is conducive to relatively low operating speeds. Substantial loose material is evident along the whole length of the DR01940. Given the status of DR01940, it is assumed that DR01940 has been constructed to primarily cater for access to agricultural properties along its length. Based on the surveyed peak hour traffic volumes, the road accommodates between 0 and 50 vehicles per day – a low category gravel road – with a gravel pavement layer of 75mm. Construction vehicles transporting materials to the site for use during construction may also damage the road (Traffic Impact Assessment, Appendix D).

The impact can be mitigated to a low negative impact significance.

No-Go Alternative: No change in status.

Theme	Traffic			
Impact	Deterioration of Public Road Network			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Deterioration of public road network	Deterioration of public road network	No change in status
Status		Direct, Negative	Direct, Negative	
Extent		Regional: 3	Local: 2	
Duration		Short term: 1	Long term: 4	
Intensity		Medium – High: 8	Medium – High: 8	
Probability		Highly Likely: 4	Highly Likely: 4	

Confidence	High		
Level of significance	None	$(3+1+8)*4=48$	$(2+4+8)*4=56$
		Medium (-)	Medium (-)
Reversibility		Yes	Yes
Replaceability		No	No
Cumulative		Medium	Low
Mitigation measures	Construction Phase: Construction vehicles are to keep to the speed limits. Regular maintenance of road during construction phase. Contractor to leave the road in the same state as when construction started.		No change in status
	Operational Phase: Vehicles are to keep to the speed limits. Maintenance of road immediately after construction period.		
Level of significance after mitigation	None	$(3+1+4)*2=16$	$(2+4+3)*2=18$
		Low (-)	Low (-)

2.7. SOCIAL IMPACTS

2.7.1. Noise Pollution

Noise impacts relates to potential changes in the nuisance impacts from noise generation from the site.

Noise creation from construction workers and vehicles may impact on surrounding landowners during the construction phase. This includes noise emanating from construction machinery, power tools and compressors, construction vehicles and general construction activity.

Noise activities during the operational phase would be limited to periods when maintenance activities are being undertaken. No significant noise levels are expected from the operating solar tracking system.

The impact can be mitigated to a low negative impact significance.

No-Go Alternative: No change in status.

Theme	Social			
Impact	Noise pollution			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Noise from construction activities	Noise from maintenance activities & solar tracking system	No change in status
Status		Indirect, Negative	Indirect, Negative	
Extent		Local: 2	Local: 2	
Duration		Short term: 1	Long term: 4	
Intensity		Medium: 6	Low: 2	
Probability		Definite: 5	Possible: 2	

Confidence	High			
Level of significance	None	$(2+1+6)*5=45$	$(2+4+2)*2=16$	Neutral
		Medium (-)	Low (-)	
Reversibility		Yes	Yes	
Replaceability		N/A	N/A	
Cumulative		Low	Low	
Mitigation measures	<p>Construction Phase: Limit intrusive construction activity to daylight hours and normal working days; i.e. weekdays between 07:00 and 17:00; and Saturdays until 13:00. To limit the impact on adjacent sensitive receptors, construction not to occur on Sundays or public holidays. No construction staff to be housed on site. All construction vehicles must be in sound working order with the prescribed mufflers and silencers.</p> <p>Operational Phase: Maintenance activities not to occur on Sundays or public holidays.</p>		No change in status	
Level of significance after mitigation	None	$(2+1+4)*3=21$	$(2+4+2)*2=16$	Neutral
		Low (-)	Low (-)	

2.7.2. Visual Impacts

This impact relates to the visual intrusion on neighbouring landowners and hikers in the Groendal Wilderness Area and Springs Local Nature Reserve. During construction visual impacts are associated with cleared areas of vegetation, the construction camp; and during the operational phase visual impacts are associated with the solar array area consisting of the solar panels impacting on aesthetics and potential glinting of the sun off the solar panels.

The current landscape is of a gently undulating topography, with steeper areas along the drainage line to the western and northern boundaries. The site is bordered on all sides by natural areas, and includes dense thicket to the north, grassy fynbos mix to the west and south; and a mixture of thicket clumps and grassy fynbos to the east. Old cultivation lands are also located to the west of the site. The current landscape can be defined as a very attractive landscape and with the proposed solar array area would be changed to that of a good quality landscape.

Visibility of the solar infrastructure will be dependent on the height from which the development will be viewed. The solar panel frames are low in height, below 1m. The highest elevation point on the site is approximately 305m above sea level and the lowest point is approximately 260m above sea level. On a lower or similar elevation level (e.g. along drainage lines or valley) the vegetation will screen the development, however with a rise in elevation more of the solar infrastructure will become visible. The neighbouring residences to the east of the site, are located at an elevation of 296m and 291m above sea level.

Vegetation consisting of shrubs and trees are located on along the fence line of the property and will screen the majority of the solar infrastructure from the neighbouring residences, however the lower portion of the site may be visible to these neighbours. The neighbouring residence to the south of the site is located at a higher elevation, approximately 325m above

sea level, however a hill is located between this residence and the proposed solar infrastructure which will assist in reducing the visibility on the southerly neighbours.

The proposed site is located approximately 6.7km to the east of the Groendal Wilderness Area. The solar infrastructure may be visible from the Groendal Wilderness Area, specifically Vermaakskop being at a higher elevation than the solar plant. However the visibility may be reduced due to the undulating topography of the area. The solar infrastructure would not be visible from the Springs Local Nature Reserve.

The visual impact can be offset by vegetation providing a natural screening.

Solar PV panels are dark rather than reflective, and are designed to absorb rather than reflect sunlight. However there may still be a limited amount of light being reflected from the glass outer casing, and likely to be visible at higher elevations.

The impact can be mitigated to a low negative impact significance, from a medium negative impact.

No-Go Alternative: No change in status.

Theme	Social			
Impact	Visual Intrusion			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Visual intrusion from construction activities	Visual intrusion from solar infrastructure	No change in status
Status		Direct, Negative	Direct, Negative	
Extent		Regional: 3	Regional: 3	
Duration		Short term: 1	Long term: 4	
Intensity		Medium: 6	Medium: 6	
Probability		Definite: 5	Definite: 5	
Confidence		Medium		
Level of significance	None	$(3+1+6)*5=50$	$(3+4+6)*5=65$	Neutral
Reversibility		Yes	Yes	
Replaceability		No	No	
Cumulative		Low	Low	
Mitigation measures	<p>Construction Phase: Construction workers are not to be accommodated on-site. Only shrubs are to be removed for the construction camp area and laydown areas. Shrubs and trees located on the boundary of the site should be left intact. Cleared areas not required for operational use to be re-vegetated with indigenous vegetation.</p> <p>Operational Phase: Shrubs and trees located on the boundary of the site should be left intact and not removed. Area surrounding the solar array should be grassed with an indigenous grass species. Additional trees to be planted along the property boundary for screening.</p>			No change in status

Level of significance after mitigation	None	$(2+1+4)*3=21$	$(2+4+4)*2=20$	
		Low (-)	Low (-)	Neutral

2.7.3. Health, Safety and Security

This impact refers to public health, safety and security concerns including linkages to fire management, crime and promiscuous sexual behaviour during construction. Fire management is further considered during the operation phase.

Health and Safety:

General safety of persons is a concern due to construction activities, e.g. open excavations and machinery, resulting in potential injury to construction staff; health and safety aspects relate to the potential spread of HIV and STDs.

Potential health and safety risks (e.g. exposure to toxic chemicals and gases) related to the solar panels are prevalent with the manufacturing process of the solar panels. The risks associated with the manufacturing process are not applicable as manufactured solar panels will be installed. Although tiny amounts of semiconductor materials are imbedded in the solar panel / module, toxic compounds cannot cause any adverse health effects unless they enter the human body in harmful doses through ingesting flakes or dust particles; or inhaling dust and fumes. The solar panels or modules are enclosed by thick layers of glass or plastic and unless these components are ground into particles or exposed to fire, the risk of ingestion or inhalation is minimal. Solar PV panels have a zero vapour pressure at ambient conditions and the risk of inhalation of any vapours or dust during normal use of solar PV panels are minimal (Markvart and Castaner, 2003). No chemical cleaning agents are utilised during the operational phase. The solar panels are cleaned with water.

During the operational phase, cleaning activities create a risk of damage to the solar panels and array components, as well as the potential for electric shock. Cracked or broken modules represent a shock hazard due to leakage currents, and the risk of shock is increased when modules are wet. The manufacturer's user guide details the correct procedures to be undertaken for installation, maintenance and cleaning procedures.

The developer is to take a water sample prior to construction (for baseline) and then annually to test the water quality and determine if any pollution is coming from the solar farm. If any pollution is found and is associated with the solar farm, then the developer will need to correct the pollution.

Security:

Security aspects relate to potential theft of construction materials and theft of neighbouring farmers livestock or equipment. The presence of workers on the site for construction related activities, irrespective of whether or not they are local, may create an increased safety and security risk to local households in the area. In addition, any changes in the local crime rates are likely to be attributed to the influx of construction workers, whether such changes can be attributed to their presence or not.

The security risks would be higher during the construction phase. The contractor would have security on-site full time during the construction phase. During the operational phase the operational contractor would check the site periodically and it is anticipated that some security checks will be made on a regular basis.

Fire:

Fire is a potential risk with any electrical system. Veld fires are a potential risk considering the vegetation types occurring within and adjacent to the site. During construction the risk may be attributed to inappropriate construction activities (e.g. hot work, welding) on dry, windy days. During the operational phase, fire risks may be associated with incorrect or loose wiring of the solar panels or transmission lines, or when wiring is inadequate and cannot withstand electricity generation.

The impact can be mitigated to a low negative impact significance, from a medium negative impact.

No-Go Alternative: No change in status.

Theme	Social			
Impact	Health, safety and security			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Health, safety, security and fire management	Health, safety, security and fire management	No change in status
Status		Indirect, Negative	Indirect, Negative	
Extent		Regional: 3	Regional: 3	
Duration		Short term: 1	Long term: 4	
Intensity		Medium: 6	Medium: 6	
Probability		Likely: 3	Likely: 3	
Confidence		High		
Level of significance	None	$(3+1+6)*3=30$	$(3+4+6)*3=39$	Neutral
		Medium (-)	Medium (-)	
Reversibility		Yes	Yes	
Replaceability		Yes	Yes	
Cumulative		Low	Low	
Mitigation measures	<p>Construction Phase: Health and Safety: A general STD and HIV/AIDS awareness programme should be provided to all workers prior to the commencement of the construction phase. Construction vehicles must adhere to speed limits and must be made aware of the possibility of people walking and living in close proximity to the site. A health and safety method statement/program is essential. Signage is to be displayed regarding construction activities. General risks associated with the construction activities should be addressed through compliance with the relevant health and safety procedures and regulations. Installation of solar panels to be undertaken by trained personnel only. Water samples are to be taken prior to construction to determine a baseline for the water quality.</p>			No change in status

Security:

No construction workers, apart from security personnel, should be allowed to overnight at the construction site.
Access to and from the construction site(s) should be closely monitored and contractors should be required to make the necessary arrangements for the transport of workers to and from the site on a daily basis.
The construction area must be demarcated and access controlled for the duration of the construction period.
Visitors to report to the Site Office, and appropriate Protective Personal Equipment to be worn by visitors.
Discuss the safety and security issues, as well as construction schedule with the local community policing forum and local SAPS.
The solar security to check with the Hurn family during construction. Adjacent landowners are to be notified 14 days prior to construction commencement.

Fire:

Fire-fighting equipment in proportion to the fire risk that is presented by the type of construction and other on-site activities and materials used on site is to be available and kept in good operating order at all times.
Any welding or other sources of heating of materials must be done in a controlled environment, under appropriate supervision, in such a manner as to minimise the risk of fires and/or injury to staff. No "hot work" is to be undertaken on days where the Fire Danger Index is "orange" or "red".
Smoking will not be permitted in those areas where there is a fire hazard. These areas include the fuel storage areas and any area where the vegetation or other material may support the rapid spread of an initial flame. Where possible, these areas (e.g. at the chemical and hazardous substances storage area) are to be demarcated with no-smoking signs.
Installation of solar panels to be undertaken by trained personnel only and in accordance with the manufacturer's guide.

**Operational Phase:
Health and Safety:**

Maintenance to be undertaken by trained personnel only.
Only properly trained personnel who understand the risks of applying water to electrical components should clean modules.
Trained personnel shall wear appropriate electrically insulating Personal Protective Equipment (PPE) during cleaning and inspection operations.
Before cleaning, thoroughly inspect modules for cracks, damage, and loose connections.
Cleaning of solar panels to be undertaken per the manufacturer's guidelines.
Water sample testing to be done annually to test the water quality and determine if any pollution is coming from the solar farm. If any pollution is found and is associated with the solar farm, then the developer is responsible to correct the pollution.

Security:

Solar PV site to be enclosed by a fence with a locked gate.
The solar security to check with the Hurn family during operations. Adjacent landowners are to be notified 14 days prior to operational commencement.
If work needs to be undertaken on the perimeter fence then the neighbouring landowners to be notified.
Additional security aspects to be considered, e.g. security to check the site on a regular basis for any breaks in the fence and security alarms to be considered.

Fire:

Fire-fighting equipment in proportion to the fire risk that is presented

	by the type of materials used on site is to be available and kept in good operating order at all times. The access road surrounding the solar array area to act as a potential firebreak. Maintenance procedures to include regular inspection of electrical connections. Faulty solar panels or wiring to be replaced immediately. Proper grounding of the electrical system to reduce the risk of fire. Maintenance to be undertaken in accordance with the manufacturer's guide. A Fire Management Plan be compiled and implemented.			
Level of significance after mitigation	None	(3+1+4)*2=16	(3+4+4)*2=22	
		Low (-)	Low (-)	Neutral

2.7.4. Employment Opportunities

Approximately 50 and 6 employment opportunities will be created during the construction and operational phases respectively. An adverse effect on this impact may occur in that high expectations are formed regarding construction employment opportunities and that these expectations cannot be sustained.

The impact can be mitigated to a medium positive impact.

No-Go Alternative: Employment opportunities will not be created during the construction and operational phases. The impact remains at a medium negative significance.

Theme	Social			
Impact	Employment Opportunities			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	Skilled and unskilled employment opportunities	Skilled employment opportunities	Employment opportunities will not be created during the construction and operational phases
Status		Indirect, Positive	Indirect, Positive	Indirect, Negative
Extent		Regional: 3	Regional: 3	Regional: 3
Duration		Short term: 1	Long term: 4	Long term: 4
Intensity		Medium: 6	Low-Medium: 4	Low-Medium: 4
Probability		Definite: 5	Highly Likely: 4	Likely: 3
Confidence		High		
Level of significance	None	(3+1+6)*5=50	(3+4+4)*4=44	(3+4+4)*3=33
		Medium (+)	Medium (+)	Medium (-)
Reversibility		Yes	Yes	Yes
Replaceability		Yes	Yes	Yes
Cumulative		Low	Low	Low
Mitigation measures	Construction Phase: Local labour from the surrounding community to be used for unskilled positions. Operational Phase: Up skilling of local labour to skilled positions.			No mitigation measures
Level of significance after mitigation	None	(3+1+6)*5=50	(3+4+4)*4=44	(3+4+4)*3=33
		Medium (+)	Medium (+)	Medium (-)

2.7.5. Reduction in Property Values

This impact considers the reduction of surrounding property values due to the solar infrastructure. There is no evidence that solar farms affect property prices either positively or negatively.

The impact can be mitigated to a low negative impact significance.

No-Go Alternative: No change in status.

Theme	Social			
Impact	Reduction in property values			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	None	Potential reduction of existing property values	No change in status
Status			Indirect, Negative	
Extent			Regional: 3	
Duration			Long term: 4	
Intensity			Medium: 6	
Probability			Possible: 2	
Confidence	Medium			
Level of significance	None	None	(3+4+6)*2=26	Neutral
			Low (-)	
Reversibility			Yes	
Replaceability			Yes	
Cumulative			Low	
Mitigation measures	Operational Phase: Mitigation measures related to visual and noise impacts to be implemented.			No change in status
Level of significance after mitigation	None	None	(3+4+4)*2=22	
			Low (-)	Neutral

2.7.6. Existing Services and Infrastructure

The proposed solar production entails a solar panel tracker mounting system, 1000V DC PV system and 11kV distribution system and transmission / distribution line to connect to the existing 11kV transmission / distribution line (Eskom). The existing Eskom 11kV transmission / distribution line is located adjacent to the proposed solar array area. There are no Eskom substations within 5km of the proposed solar plant.

The impact relates to disruption of or damage to existing services and infrastructure, e.g. Eskom 11kV distribution line. The impact can be mitigated to a low negative impact.

No-Go Alternative: No change in status.

Theme	Social			
Impact	Existing Services and Infrastructure			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go

Nature	Disruption of or damage to existing services and infrastructure, e.g. Eskom 11kV distribution line	Disruption of or damage to existing services and infrastructure, e.g. Eskom 11kV distribution line	Disruption of or damage to existing services and infrastructure, e.g. Eskom 11kV distribution line	No change in status
Status	Direct, Negative	Direct, Negative	Direct, Negative	
Extent	Regional: 3	Regional: 3	Regional: 3	
Duration	Long term: 4	Short term: 1	Long term: 4	
Intensity	Medium: 6	Medium: 6	Low-Medium: 4	
Probability	Highly Likely: 4	Highly Likely: 4	Likely: 3	
Confidence	Medium			
Level of significance	$(3+4+6)*4=52$ Medium (-)	$(3+1+6)*4=40$ Medium (-)	$(3+4+4)*3=33$ Medium (-)	Neutral
Reversibility	Yes	Yes	Yes	No change in status
Replaceability	Yes	Yes	Yes	
Cumulative	Medium	Medium	Medium	
Mitigation measures	Planning & Design Phase: Eskom approval per requirements for work in or near Eskom servitudes or infrastructure. Construction Phase: Eskom approval per requirements for work in or near Eskom servitudes or infrastructure. Operational Phase: Eskom approval per requirements for work in or near Eskom servitudes or infrastructure.			
Level of significance after mitigation	$(3+1+2)*2=12$ Low (-)	$(3+1+4)*2=16$ Low (-)	$(1+4+4)*2=18$ Low (-)	
	Low (-)	Low (-)	Low (-)	

2.8. RENEWABLE ENERGY INFRASTRUCTURE

Renewable energy infrastructure relates to the production of cleaner energy from renewable sources, and moving to a less carbon-intensive electricity production (i.e. reducing carbon emissions associated with coal power stations).

The Eastern Cape Province is reliant on electricity imports from other provinces yet houses significant industrial and rural development potential. Power from the national grid is largely generated from coal power stations, and transmitted considerable distances to the Eastern Cape (e.g. from Mpumalanga). This leads to significant transmission losses and local grid instabilities. Electricity supply to the Eastern Cape Province and the Nelson Mandela Bay Metro (NMBM) in particular, is further constrained by transmission infrastructure. Eskom currently supplies approximately 1,400 MW of electricity to the Eastern Cape Province, with approximately 600 to 700 MW utilised by the Nelson Mandela Metro (which includes the Coega IDZ). With the development of the IDZ, the Coega Development Corporation (CDC) has projected an ultimate demand for the IDZ and the Metro of up to 5000MW. Faced with such an increase in electricity demand, the Eastern Cape Province will need to import more power from the national grid (in particular for base-load power supply for large industrial projects), as well as increase local generation capacity. Although only 2.46MW will be fed

into the electrical grid, the proposed project forms a source of zero carbon electricity generation and contribution to the renewable energy targets.

The impact can be mitigated to a high positive impact significance.

No-Go Alternative: Other renewable energy sources will need to be sourced to contribute to the renewable energy targets, and reduction of carbon-intensive electricity production. The impact remains at a medium negative significance.

Theme	Renewable Energy Infrastructure			
Impact	Production of cleaner energy			
Phase	Planning & Design Phase	Construction & Decommissioning / Closure Phases	Operational Phase	No Go
Nature	None	None	Production of cleaner energy from renewable sources	Electricity production reliant on coal power stations
Status			Direct, Positive	Direct, Negative
Extent			National: 4	National: 4
Duration			Long term: 4	Long term: 4
Intensity			Medium: 6	Medium: 6
Probability			Highly Likely: 4	Highly Likely: 4
Confidence			High	
Level of significance	None	None	$(4+4+6)*4=56$	$(4+4+6)*4=56$
			Medium (+)	Medium (-)
Reversibility			Yes	Yes
Replaceability			Yes	No
Cumulative			Medium	Medium
Mitigation measures	Operational Phase: Implementation of identified mitigation measures and EMPr.			No mitigation measures.
Level of significance after mitigation	None	None	$(4+4+6)*5=70$	$(4+4+6)*4=56$
			High (+)	Medium (-)