



Environmental
Management
Group (Pty) Ltd.

**IMPACT ASSESSMENT
FOR:
PROPOSED
132 KV GRID CONNECTION
TRANSMISSION LINE
BETWEEN THE ORANGE
RIVER SOLAR FACILITY 1
AND ESKOM'S HIGH
VOLTAGE GROBLERSHOOP
SUBSTATION, NORTHERN
CAPE PROVINCE**

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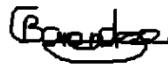
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1. Introduction:

The social and environmental impacts assessment generated by the proposed **132 kV sub-transmission line, Groblershoop** is presented as the risk assessment methodology and associated results. This process aims to identify possible impacts associated with the proposed development and evaluate their significance to ensure appropriate mitigation is applied. The recommendations of suitable mitigation measures that should be implemented to reduce the consequences of likely impacts associated with the project have been formulated by industry best practice principles, professional experience, and relevant legislation.

2. Methodology:

Management and risk assessment plays a key role in the proponent's business. Managing the risks must be integrated into day-to-day business-related processes to ensure that both operational and strategic decisions are risk-based. The risk management system provides a framework to identify both threats and opportunities. The system then compensates and initiates resources that are allocated to treat the risks. It is required to review the risks as an ongoing process and then proceed to review the efficacy of the controls.

The risk assessment comprises quantifying the magnitude of potential impacts and the likelihood of these impacts to occur. The Consequence (**C**) and Likelihood (**L**) matrix combine the qualitative and or semi-quantitative ratings of consequence and the likelihood that a specific consequence will occur to calculate a risk score and risk rating (Equation 1). Essentially, the greater a probability of an adverse impact occurring, the greater the risk level associated with it will be.

C = Overall consequence

L = Likelihood of occurrence

Equation 1: Calculation of environmental significance.

$$\text{Environmental Significance} = C \times L$$

2.1. Determination of consequence:

Consequence analysis is a combination of quantitative and qualitative information, and the outcome can be positive or negative. Several factors can be used to determine consequence. For the purpose of determining the environmental significance in terms of consequence, the following factors were chosen: **Severity/Intensity**, **Duration** and **Extent/Spatial Scale**. Each factor is assigned a rating between 1 to 5, as described in the tables below.

2.1.1. Determination of intensity:

Intensity relates to the nature of the event, aspect or impact to the environment and describes how intense a given aspect's impact on the biophysical and socio-economic environment will be.

Table 1: Rating criteria describing the intensity of a given aspect.

Type of criteria	Rating				
	1	2	3	4	5
Quantitative	0-20%	21-40%	41-60%	61-80%	81-100%
Qualitative	Insignificant / Non-harmful	Small / Potentially harmful	Significant / Harmful	Great / Very harmful	Disastrous / Extremely harmful
Social/ Community response	Acceptable / I&AP satisfied	Slightly tolerable / Possible objections	Intolerable/ Sporadic complaints	Unacceptable / Widespread complaints	Totally unacceptable / Possible legal action
Irreversibility	Very low cost to mitigate/ High potential to mitigate impacts to level of insignificance / Easily reversible	Low cost to mitigate	Substantial cost to mitigate / Potential to mitigate impacts / Potential to reverse impact	High cost to mitigate	Prohibitive cost to mitigate / Little or no mechanism to mitigate impact / Irreversible
Biophysical (Air quality, water quantity and quality, waste production, fauna and flora)	Insignificant change / deterioration or disturbance	Medium change / deterioration or disturbance	Significant change / deterioration or disturbance	Very significant change / deterioration or disturbance	Disastrous change / deterioration or disturbance

2.1.2. Determination of duration:

Duration refers to the amount of time the receiving environment will be exposed to a given aspect, risk or impact, given the absence of intervention/mitigation.

Table 2: Rating criteria for determination of duration

Rating	Description
1: Low	1 Month
2: Low-Medium	1 – 3 Months
3: Medium	More than 3 Months
4: Medium-High	5 – 10 Years
5: High	More than 10 Years

2.1.3. Determination of extent/spatial scale:

Extent refers to the spatial influence of an impact, be it contained to the immediate surroundings (site), extending to the surrounding area, regional (will have an impact on the region), national (will have an impact on a national scale) or international (impact across international borders).

Table 3: Rating criteria for the determination of extent/spatial scale

Rating	Description
1: Low	Immediate, fully contained area (site)
2: Low-Medium	Surrounding area
3: Medium	Regional
4: Medium-High	National
5: High	International

2.1.4. Determination of overall consequence:

The overall consequence is determined by calculating the sum of all impact factors described above and those summarised below, divided by the total number of impact factors (three) (Equation 2).

I = Intensity

D = Duration

E = Extent

n = number of factors

Equation 2: Calculation of overall consequence.

$$\text{Overall Consequence} = \frac{\sum(I+D+E)}{n}$$

2.1.5. Determination of likelihood:

Likelihood refers to the probability of a given aspect/impact to occur given that no mitigation measures are implemented.

Table 4: Rating Criteria for the determination of likelihood.

Rating	Description
1: Low	< 30% chance of occurrence
2: Low-Medium	30% - 50% chance of occurrence
3: Medium	50% - 70% chance of occurrence
4: Medium-High	70 – 90% chance of occurrence
5: High	>90% of occurrence

2.2. Determination of overall environmental significance:

2.2.1. Quantitative analysis of the overall environmental significance:

The overall environmental significance is determined by multiplying the overall consequence (**C**) by the likelihood of occurrence (**L**) (Equation 1). The rationale of the overall environmental significance relates to identifying and quantifying the sum of environmental impacts arising from the proposed development and the recommendation of appropriate mitigation measures.

Table 5: Environmental significance evaluation score sheet.

Aspect	Specific	Low	Low-Medium	Medium	Medium-High	High
Overall Environmental significance	Consequence x Overall Likelihood (<i>Equation 1</i>)	1-5	6-10	11-15	16-20	21-25

2.2.2. Qualitative description or magnitude of the environmental significance:

The qualitative description of environmental significance attempts to provide an indication of the nature and or magnitude associated with the proposed development. It also guides the prioritisation and decision-making process related to this event, aspect or impact.

Table 6: Rating criteria for impact significance.

Significance	Low	Low-Medium	Medium	Medium-High	High
Impact Magnitude	Impact is of very low order and therefore likely to have very little real effect. Acceptable.	Impact is of low order and therefore likely to have little real effect. Acceptable.	Impact is real, and potentially substantial in relation to other impacts. Can pose a risk to the company	Impact is real and substantial in relation to other impacts. Pose a risk to the company and environment. Unacceptable	Impact is of the highest order possible. Unacceptable . Fatal flaw.
Action Required	Maintain current management measures. Where possible improve.	Maintain current management measures. Implement monitoring and evaluate to determine potential increase in risk. Where possible improve	Implement monitoring. Investigate mitigation measures and improve management measures to reduce risk, where possible.	Improve management measures to reduce risk.	Implement significant mitigation measures or implement alternatives.

3. Impact assessment for the preferred alternative:

3.1. Ecological impacts:

The ecological impact assessment takes into consideration the site's natural condition and any sensitivities, in terms of habitat diversity, species diversity and ecological diversity. The flora impact assessment refers to the vegetative component of the assessed area and focuses on the degree of infestation by exotics, vegetation structure, endemics, and protected species. The fauna impact assessment refers to the animal component and focuses on the available habitats, resources and protected species.

Habitat loss							
Impact	Loss of habitat and species diversity as a result of construction and the removal of natural elements.						
Activities (Not an all-inclusive list)	<ul style="list-style-type: none"> Physical clearance. Construction of new service roads. Trampling Off roading 		<ul style="list-style-type: none"> Habitat fragmentation leading to edge effects. Illegal harvesting of plant material. Habitat degradation. 				
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	5	2	3	5	15
Mitigation	<ul style="list-style-type: none"> Removal of indigenous vegetation should be kept to a minimum. Disturbance related activities must be restricted to the authorised development site. Prioritise the use of existing service roads. No off roading or reckless driving should be allowed. Post-construction open areas should be rehabilitated and revegetated with indigenous vegetation. No harvesting of plant material should be allowed. No illicit fires may be allowed during construction. A fire management plan should be drafted and kept on site for all phases of the development. Littering should be prohibited. No burning of any material is allowed on site. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	5	1	2	3	6
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	The operational phase of the powerline development is not anticipated to generate any impacts which may lead to habitat loss greater than what was already lost during the construction phase. There will be no movement of vehicles and / or people during the operational phase apart from routine maintenance.						
Mitigation	N/A						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						

The environmental impact on habitat loss during constructional phase will be **Medium-high** without mitigation and **Low-Medium** when mitigation measures are applied. The operational phase of the powerline development is not anticipated to generate any impacts which may lead to habitat loss greater than what was already lost during the construction phase. However, it remains important for the applicant to be cognisant of activities which may cause damage to the natural environment which exceed the development area. Aspects which may cause damage outside the authorised development area include but are not limited to veld fire's, water pollution, plastic pollution etc. The applicant is to take steps which greatly limit the potential of such adverse impacts to occur. It is necessary to implement monitoring and evaluation procedures to determine the potential of increased risk throughout the phases of this development.

Invasive plant species							
Impact	Proliferation of exotic plant species due to environmental disturbance.						
Activities (Not an all-inclusive list)	<ul style="list-style-type: none"> Improper eradication methods on existing exotics. Physical clearance providing opportunity for opportunistic exotics to proliferate. Accidental spread. 		<ul style="list-style-type: none"> Disruption of ecological balance due to habitat disturbance. Slow response to infestation eradication. Landscaping with exotics. 				
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	3	2	2	3	6
Mitigation	<ul style="list-style-type: none"> Stockpiles need to be eradicated from all vegetation on a three-monthly basis. Disturbance related activities may not exceed the authorised development boundary. The appointed ECO should liaise with the contractor and developer and compile an alien invasive species management plan if required. Exotics may not be allowed to proliferate within the development area. All invasive species within 30 m of the development area need to be managed in accordance to sustainable management practices. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	2	1
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	3	2	2	2	4
Mitigation	<ul style="list-style-type: none"> All open spaces post-construction needs to be rehabilitated with indigenous species. An alien invasive species management plan needs to be drafted and implemented. The need for an alien invasive species management plan needs to be proposed by an appointed ECO if required. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	1	1
Additional Notes:							

The impact regarding the invasion of plant species during constructional phase will be **Low-Medium** without mitigation and **Low** when mitigation measures are applied. This risk assessment for the operational phase will be **Low-Medium** prior to mitigation, and **low** after mitigation and is described as having a low order impact. It is necessary to implement monitoring and evaluation procedures to determine the potential of increase in risk.

Loss of floral and faunal SCC							
Impact	The loss of floral and faunal species of conservation concern as a result of the proposed development.						
Activities (Not an all-inclusive list)	<ul style="list-style-type: none"> • Physical clearance • Poaching • Reckless / off road driving • Isolation of sub-populations • Behavioural pattern disruption • Construction of internal roads • Habitat disturbance, fragmentation. • Road collisions • Electrification 						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	4	5	2	3	4	16
Mitigation	<ul style="list-style-type: none"> • A proper pre-construction walkthrough needs to be conducted to establish the possible occurrence of floral SCC. • No protected species may be removed/ damaged/ transported/ collected/ relocated without the relevant permits. • <i>Vachellia erioloba</i> and <i>Boscia albitrunca</i> are not to be removed, cut or damaged. Any roads to be built, should be constructed around the protected trees. • Removal permits need to be obtained for all <i>Vachellia erioloba</i> and <i>Boscia albitrunca</i> individuals prior to construction if no alternative construction could occur in which the trees will not have to be removed. • Notice boards depicting information on floral SCC need to be placed across the site. • All construction personal need to be informed on floral and faunal SCC. • All protected flora needs to be demarcated and barricaded. • Demarcation netting around protected flora need to be maintained until the relevant permits for removal/ relocation are obtained. • Staff should immediately inform the on-site environmental representative and a relevant specialist if any floral SCC are observed. • Development may only occur within the authorised development boundary. • Monitoring for the emergence of exotic species should be conducted on a three-monthly basis. • No unnecessary destruction or removal of vegetation may be allowed. • Small movement corridors within fencing should be considered. • Wildlife elements such as nests and burrows should carefully be inspected prior to construction. Such elements may only be responsibly removed by a relevant specialist. • No hunting, trapping, or killing of fauna is allowed. • Animals that get trapped in trenches need to be removed by the on-site environmental officer. • The on-site environmental officer should be in possession of the relevant animal handling certificates. • Vehicle movement should strictly be contained on designated roads. No off roading must be allowed. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	20	5	1	3	3	9
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Mitigation	The operational phase of the powerline development is not anticipated to generate any impacts which may lead to floral and faunal SCC loss greater than what was						

	already lost during the construction phase. There will be no movement of vehicles and / or people during the operational phase apart from routine maintenance.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Additional Notes:	Even though construction is not anticipated to exceed more than 1 year, the loss of any floral or faunal SCC within that period will be permanent. Duration is thus calculated at the maximum threshold. The impact on faunal SCC during the construction phase is considered less significant compared to the floral component as the animals will likely migrate to other open spaces. However, the operational phase will likely have a lower impact on faunal elements compared to floral elements. It is therefore crucial that mitigation measures be strictly implemented and supervised.						
	Floral SCC on site: <ul style="list-style-type: none"> - <i>Boscia albitrunca</i> - <i>Vachellia erioloba</i> - <i>Aloe claviflora</i> - <i>Aloe hereroensis</i> - <i>Haworthiopsis tessellata</i> - <i>Euphorbia braunsii</i> - <i>Euphorbia gariiepina</i> - <i>Euphorbia gregaria</i> - <i>Euphorbia spinea</i> - <i>Gladiolus permeabilis</i> - <i>Nymannia capensis</i> - <i>Lessertia Pauciflora</i>. See the EMPr for more details concerning floral SCC.						

The impact assessment related to the loss of floral and faunal species of conservation concern during the construction phase prior to mitigation is considered to be of **Medium-high** significance and **Low-medium** significance post-mitigation. The operational phase will result in a **No**-impact significance as there will be no movement of vehicles and / or people during this phase, apart from routine maintenance when faulty equipment is identified.

The loss of floral and faunal SCC is a serious ecological theme, and mitigation measures must be strictly implemented and supervised throughout all phases of the development.

Loss of ecological support areas (ESA)							
Impact	The loss of ESA areas due to the proposed development						
Activities (Not an all-inclusive list)	<ul style="list-style-type: none"> Physical clearance Construction of internal roads 		<ul style="list-style-type: none"> Habitat fragmentation Habitat disturbance 				
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	3	3	2	3	4	12
Mitigation	<ul style="list-style-type: none"> Removal of indigenous vegetation should be kept to a minimum. Disturbance related activities must be restricted to the authorised development site. Vehicle movement should strictly be kept on designated dirt roads. No off roading or reckless driving should be allowed. Post-construction open areas should be rehabilitated and revegetated with indigenous vegetation. No harvesting of plant material should be allowed. No illicit fires may be allowed during construction. A fire management plan should be drafted and kept on site for all phases of the development. No disturbance related activity may encroach near the wetland / watercourse situated on the site's western boundary. Littering should be prohibited. No burning of any material is allowed on site. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	2	1	2	4	8
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	No anticipated activities restricted to the operational phase are considered to have a notable adverse impact on the loss of CBA/ESA areas greater than what was already lost during the construction phase.						
Mitigation	N/A						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Additional Notes:	The applicant and operational team is to remain cognisant of operational activities which may cause accidental events such as veld fire. The lack of dense vegetation lowers the overall probability of runaway veldfires; however, this should not discourage responsible operational procedures.						

According to the CBA technical guidelines¹ “An ESA is an area that must remain in at least fair ecological condition in order to: meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; meet biodiversity targets for representation of ecosystem types or species of special concern when it is not possible to meet them in CBAs; support ecological functioning of a protected area or CBA (e.g. protected area buffers); or a combination of these. ESAs can meet biodiversity targets for terrestrial or aquatic features, or both. All ecological processes important for the long-term persistence of ecosystems and species should be adequately included in the portfolio of protected areas, CBAs and ESAs.” The proposed site’ alignment within an ESA is likely attributed to the vast open, natural landscape and due to the undulating terrain possessing a fairly rich surface drainage theme.

To some extent, the site's alignment within an ESA zone promotes a conservative approach to land use change; however, considering the landscape is not unique, other open areas with a similar composition and vegetation structure in the immediate area may provide the same supporting role. The estimate physical clearance is to some extent difficult to accurately determine considering the development’s low intensive and linear nature. Physical clearance will be restricted to pylon placement, trampling of vegetation via vehicle movement, and the circumstantial instalment of service roads. Based on the information provided to the EAP, the pylon footprint / laydown structures ranges from 0.6 x 0.6m to 1.5m x 1.5m with the larger footprint associated with the guyed suspension and angle strain pole as bend/ strain structures. It’s important to note that the design specifications of the proposed powerline’s pylons will be similar to the existing 132 kV transmission line. The operational requirements of powerlines necessitate the instalment of service roads. These roads are typically less than 8 m wide and is used for maintenance purposes. The proposed powerline development’s proximity to the existing powerline allows for the sharing of service roads. By sharing the existing powerline’s service road, the actual clearance will be limited. In some areas of limited access, a new service road will be developed by clearing an approximate 8 m wide stretch of vegetation. If assumed service roads will be laid down along the whole powerline’s layout, the total clearance will be less than 3 ha. It’s important to note that the clearance of 3 ha is highly unlikely as existing service roads will be utilised and clearance near the Orange River’s riparian vegetation will be greatly limited.

Therefore, the impact assessment concluded the loss of an ESA due to the proposed development be of **Medium** significance (Construction phase, pre mitigation). The implementation of adequate mitigation measures during the construction phase will result in a **Low-medium** impact significance score.

¹ Technical Guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning (2017) published by SANBI.

Loss of avifaunal priority species							
Impact	The displacement, or loss of priority avifaunal species due to the proposed development.						
Activities (Not an all-inclusive list)	<ul style="list-style-type: none"> Road mortalities Entrapment Habitat loss and fragmentation due to clearing 		<ul style="list-style-type: none"> Collisions with infrastructure Electrocution 				
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	4	3	2	3	4	12
Mitigation	<ul style="list-style-type: none"> Development should be restricted to the authorised footprint. The use of existing roads should be prioritised. Conduct a pre-construction inspection (avifaunal walk-through) to record the status of nests of SCC on the existing powerline which will run parallel to the proposed 132 kV powerline. If a nest is occupied, the avifaunal specialist must consult with the contractor to find ways of minimising the potential disturbance to the breeding pair of birds during the construction period. Disturbance should be restricted to an absolute minimum. Construction of the power line using an approved bird friendly pole/tower design in accordance with the Eskom Distribution Technical Bulletin relating to bird friendly structures. The avifaunal specialist must sign off on the final design. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	2	1	2	3	6
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	4	2	3	3	9
Mitigation	<ul style="list-style-type: none"> Mortality monitoring should be conducted on a monthly basis. These mortalities need to be recorded and reported to the environmental officer. Reactive mitigations need to be implemented when above than normal mortalities are recorded. All open electrical wires need to be insulated to prevent electrocution. Eskom approved bird flight diverters should be installed on the proposed 132kV line according to the applicable Eskom Engineering Instruction. These devices must be installed as soon as the conductors are strung 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	4	1	2	2	4
Additional Notes:	See the specialist's report for a detailed breakdown of all impacts and mitigations relevant to the avifaunal theme.						

The construction of additional infrastructure especially those associated with sub-transmission line developments present a significant risk to avifaunal elements. Birds may get entrapped, electrocuted, or collide with infrastructure. To prevent or at least minimise the impacts generated by similar developments, the proponent and its appointed contractor need to apply the relevant mitigation measures. The construction phase is anticipated to generate a **Medium** impact prior to the implementation of mitigation measures. Impact significance lowers to a **Low-medium** order after the implementation of mitigation measures. The operational phase is anticipated to generate a **Low-medium** impact pre-mitigation and a **Low** order impact after the implementation of mitigation measures. See the specialist's report for a detailed breakdown of all impacts and mitigations relevant to the avifaunal theme.

Cumulative impact							
Impact	The cumulative impact on the receiving environment's ecology regarding the proposed development total footprint assessed in conjunction with other renewable developments in a 30 km radius.						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	3	2	2	5	10
Mitigation	<ul style="list-style-type: none"> Development should be restricted to the authorised development boundary. Vegetation clearance should be kept to an absolute minimum. Revegetation and rehabilitation of open areas post construction. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	3	1	2	4	8
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Mitigation	The cumulative impact during the operational phase is considered insignificant as no notable additional impacts is anticipated within the area's ecology with respects to the proposed development measured against other renewable developments.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Additional Notes:							

The cumulative impacts of renewable energy developments should always be compared to similar developments in the region. This is especially important considering the nature of solar developments typically results in large-scale clearings of the environment.

The cumulative impact of habitat loss generated by renewable energy production is considered to be **Low-medium** before mitigation and **Low-medium** after mitigation.

3.2. Heritage:

The heritage theme involves culturally significant finds including, but not limited to fossils, artefacts and certain culturally relevant infrastructure. Details concerning the heritage theme is discussed in detail within the Phase 1 Heritage Impact Assessment.

Artefacts and Fossils							
Impact	Destruction of any archaeological artefacts or fossils						
Activities (Not an all-inclusive list)	<ul style="list-style-type: none"> Excavation within lower geological strata. Illegal collecting of loose chance finds (e.g. Stone age artefacts) 						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	3	1	2	2	4
Mitigation	<ul style="list-style-type: none"> SAHRA and a qualified archaeologist be consulted immediately in the event of accidental archaeological exposure. In the unlikely event of accidental archaeological exposure, all excavations should stop immediately. No loose chance finds such as stone age artefacts (arrow heads, stone flake blades etc.) may be collected. The on-site environmental representative should consult the appointed ECO regarding any such discoveries. All construction debris/ waste should be removed from site and may not be deposited in on-site excavated waste pits. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	1	1
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	2	2	2	2	4
Mitigation	<ul style="list-style-type: none"> No loose chance finds such as stone age artefacts (arrow heads, stone flake blades etc.) may be collected. The on-site environmental representative should consult the appointed ECO regarding any such discoveries. No unauthorised excavations, post construction may be allowed. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	1	1
Additional Notes:	According to the Phase 1 HIA report: The applicant and contractor should remain cognisant of this statement. Responsible excavation and other construction related activities which reduces the likelihood of impacting heritage resources should always be implemented.						

The proposed development's impact on subsurface heritage resources and surface artefacts during the construction phase is calculated to be of **Low** significance (pre-mitigation). The post mitigation impact significance remains **Low** for the construction phase. It's not anticipated that any post-construction excavations taking place, and as such the likelihood of further impact subsurface heritage resources remains **Low**.

The odd chance of finding loose surface scatters such as stone age arrow heads and stone flake knives were regarded by the HIA specialist as being of **Low significance**. Nonetheless, a conservative approach needs to be retained as this prevents heritage resources from being viewed in a casual light.

The overall impacts on archaeological components will be of **Low** order prior to any mitigation and **Low** after mitigation. These low scores are attributed to the low likelihood of finding fossils and artefacts of historical significance and the absence of above ground evidence of historically significant structures. Mitigation measures as indicated should be implemented.

3.3. Water resources:

The water resource theme includes all aspects of freshwater including surface and groundwater resources. Water quality and quantity are two crucial components that are evaluated.

Surface and ground water quality							
Impact	The pollution of surface and groundwater resources due to the proposed development.						
Activities (Not an all-inclusive list)	<ul style="list-style-type: none"> • Removal of riparian vegetation • Soil erosion • Disturbance of stream banks • Accidental oil spills and other forms of water pollution 						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	4	3	2	3	4	12
Mitigation	<ul style="list-style-type: none"> • This Orange River system should be regarded as a no-go area. • A stormwater management plan should be implemented to avoid the increased runoff from eroding soils. • Soil erosion prevention should be implemented. • Power line pylons may not be placed within watercourses. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	3	2	1	2	3	6
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	2	2	3	2	4
Mitigation	<ul style="list-style-type: none"> • A monitoring programme should be drafted and maintained by the operational team in liaison with the appointed ECO. This monitoring programme should monitor changes in the various watercourses which'll be affected by the development. • Any observable impact on watercourses needs to be attended too immediately. The onsite environmental representative in liaison with the ECO should recommend appropriate management options. • No pollution causing activity may occur near streams/rivers. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	2	2	2
Additional Notes: The original powerline layout was in such a matter to limit the number of river crossings and where applicable cross river perpendicular to its flow direction.							

It's not foreseen that any significant adverse groundwater impacts arise due to the proposed development. Such impacts cannot be entirely excluded as accidental events such as oil spillages may still occur. Depending on the size of hazardous spill impacts on groundwater resources might range from low to severe. It is therefore crucial that the developer exercise avoidance mitigation to avoid serious environmental risks.

The proposed development's impacts on water resources are anticipated to have a higher probability of adversely affecting surface water resources. Layout alterations have already been implemented which ultimately lowered the anticipated risk. During the construction phase, it is estimated the impact on surface water quality is of **Medium** significance (no mitigation). By implementing adequate mitigation measures this impact gets reduced to a **Low-medium** order. The development's operational phase is anticipated to generate a **Low-medium** impact without mitigation and a **Low** impact significance with mitigation measures applied. Mitigation measures will significantly reduce the overall impact on water resources and should therefore be implemented. Continual monitoring as advised throughout the development's operation remains important.

The overall impact generated by the proposed development on water resources prior to implementing mitigation measures is calculated to be of **Low-medium** order significance. Adequate mitigation measures will lower the overall environmental impact to a **Low** impact significance.

3.4. Aesthetics:

The aesthetic theme is focused on the alteration of the visual characteristics of the area and overall impact on landscape appreciation. Landscape appreciation is inherently subjective with few metrics allowing for an objective impact assessment. However, several aspects concerning visual impacts associated with solar developments may be objectively assessed. These include, glare, development size, topographic alteration, aesthetic deterioration due to construction, and line of sight distance.

Construction of Infrastructure							
Impact	The alteration of landscape appreciation, visual deterioration and visual impacts from the solar array.						
Activities (Not an all-inclusive list)	<ul style="list-style-type: none"> • Construction • Generation of construction debris / waste • Temporary waste dump areas • Visual impairments from powerline and pylons • Removal of vegetation • Alteration of the overall landscape perspective 						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	3	3	1	2	4	8
Mitigation	<ul style="list-style-type: none"> • Construction debris should be removed regularly and not allowed to pile up. • A designated construction waste area should be placed. • All domestic waste and construction debris should be removed to a designated waste landfill site. • Construction should finish as quickly as possible. • Pylon height needs to be restricted to the lowest minimum thresholds. • All open spaces after construction need to be revegetated. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	2	1	2	3	6
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	5	2	3	4	12
Mitigation	<ul style="list-style-type: none"> • Native trees can be planted around the powerline to obscure direct visual impact. • All operational activities should strictly be concentrated on the proposed site. • Rehabilitation of all open spaces after construction. • A Complaints register needs to remain on site in which all complaints raised by the general public is to be filed. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	5	2	3	3	9
Additional Notes:							

The proposed development's construction phase is likely to generate a **Low-medium** visual impact without mitigation and a **Low-medium** impact post mitigation. Impacts on aesthetics and overall landscape appreciation within the construction phase is considered less significant compared to the facility's operation phase. Operational pre mitigation aesthetic impacts were calculated to be of **Medium** significance which lowered to a **Low-medium** impact significance when applying mitigation. Several tiers of visual obscurity mitigations have been presented. Before final completion of construction, the appointed ECO should recommend the appropriate mitigation measures to be implemented during the operational phase. This approach prevents any unnecessary expenditure to be placed on the developer whilst retaining an overall low visual impact. Continual monitoring is required throughout all phases of this development.

3.5. Air quality and noise:

Noise and air quality assessments are based upon the type of equipment being used during a specific activity and the degree of disturbance that will occur. Air quality is further impacted by emissions emanating from the proposed development.

Air quality							
Impact	Additional air pollution introduced due to the mobilisation of vehicles and land clearance.						
Activities (Not an all-inclusive list)	<ul style="list-style-type: none"> Elevated dust emissions due to increased vehicle movement Vegetation clearance and the construction of internal dirt roads. 						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	3	3	2	3	3	9
Mitigation	<ul style="list-style-type: none"> Watering bare surfaces and excavations to promote dust suppression Enforce speed limit of 30km/h and optimization of working schedule to reduce vehicle mobilization. Limit the amount of vegetation clearance. The construction of new dirt roads should be restricted by prioritising existing roads. Development to remain within the authorised area. Construction needs to finish as quickly as possible. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	2	1	2	2	4
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	3	5	2	3	5	15
Mitigation	No mitigation is required as the overall impact on air quality for the powerline development is considered positive.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Additional Notes:	The Groblershoop sub-transmission line will not directly feed into the electrical grid, rather it will connect the Orange River Solar Facility 1 (PTY) LTD to Eskom's high voltage substation in Groblershoop, therefore allowing for the transmission of electricity to the national grid. The indirect benefits towards the air quality theme are derived from the avoidance of requiring electricity from the national grid to supply the chemical plant where the alternative green energy resources will be produced.						

The proposed development is not anticipated to significantly affect air quality during its operational phase. Therefore, impacts on air quality was only assessed for the construction phase. During the construction phase of the proposed development a **Low-medium** impact significance on air quality is calculated without mitigation. The adequate implementation of mitigation measures will lower the overall impact to a **Low** order impact significance.

Noise and vibrations							
Impact	Vehicles and equipment utilized						
Activities (Not an all-inclusive list)	<ul style="list-style-type: none"> Noise generated through construction related activities. Vibrations generated due to the utilisation of construction equipment. 						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	3	3	2	3	3	9
Mitigation	<ul style="list-style-type: none"> Working schedule for activities with high noise levels will be limited to 08:00 AM to 17:00 PM. Machinery should be serviced regularly during the construction stage. Equipment should be regularly serviced. Construction to remain within the authorised footprint. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	2	1	2	2	4
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	The operational activities contained around the powerline typically does not generate any significant levels of sound/ vibrations.						
Mitigation	N/A						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Additional Notes:							

The proposed development's impact on local noise levels during the construction phase is calculated to be of **Low-medium** order significance without mitigation. By implementing proper mitigation measures, the overall impact on this theme decreases to a **Low** order significance.

The anticipated impact on local noise and air quality is calculated to be of **Low** order significance without mitigation and **Low** after the implementation of mitigation measures. The direct impacts on the local community concerning noise and air quality generated by powerlines is typically considered insignificant.

3.6. Socio-economic:

Socio-economic impacts focusses on the effects the development will have on the economic drivers in the surrounding area as well as emphasising the integration of economic development concerning the needs of the people.

Job creation and the influx of job seekers							
Impact	Impacts associated with the need for locally appointed construction/ operation workers.						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	4	3	2	3	4	12
Mitigation	No mitigation is required for impacts that generally produce a positive impact.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	3	5	2	3	3	9
Mitigation	x						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Additional Notes:	The proposed Groblershoop sub-transmission line will create a great deal of jobs during both construction and operational phases. According to the !Kheis Local Municipality's IDP (2022/23), it wishes to utilise IPPP facilities to aid in growing the local socio-economic profile of the municipality. Other benefits to the local community include, skills training and local economic growth.						

The proposed Groblershoop sub-transmission line's construction and operation provides for several socio-economic benefits such as local job creation, boosting local spending, skills training, and revenue contribution towards local economic growth within the !Kheis Local Municipality. It is therefore considered that construction phase of this project will have a **Medium** positive impact on the local socio-economic sphere and the operational phase whereas the operational phase of this development will have a **Low-Medium** positive impact.

3.7. Waste:

Waste management refers to the types of waste being generated by the proposed development. This theme also investigates environmental impacts generated by the development concerning specific waste management strategies employed throughout all phases of the project.

General solid waste							
Impact	General solid waste pollution						
Activities (Not an all-inclusive list)	General construction waste such as plastic items, cement bags, construction scrap etc. Designated temporary construction waste dump area. General operational waste (plastic items, paper, broken panels / equipment etc.) Waste removal management.						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	3	3	2	3	3	9
Mitigation	<ul style="list-style-type: none"> Reduce, reuse and recycle strategy needs to be implemented. Waste receptacles must be made available, and all waste shall be adequately stored and removed. All waste management strategies employed by the contractor should comply with environmental / waste management legislation. Waste that can easily be dispersed by wind should be appropriately discarded in bins with lids. Waste should be regularly removed from the site to a registered landfill. The contractor should develop and comply to a on-site specific waste management plan. No waste may be buried in an on-site waste pit. No burning of waste material on site. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	2	1	2	2	4
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	3	4	2	3	3	9
Mitigation	<ul style="list-style-type: none"> General waste generated during routine maintenance should be transported to a designated waste storage area and may not be burned. Waste should be transported to a registered landfill site. General waste should also be removed from the site and not pile up. 						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Additional Notes:							

The proposed development's environmental impact concerning waste production will have an anticipated **Low-medium** impact significance during the construction phase (no mitigation). This impact is reduced to a **Low** order impact significance when adequate mitigation measures are applied. Operational phase environmental impacts are considered **Low-medium** as no mitigation measures are required.

3.8. No go alternative:

The no-go alternative assumes that the proposed project will not go ahead i.e. it is the option of not constructing the proposed development. This alternative would result in no environmental impacts on the site or surrounding local area. It provides the baseline against which other alternatives were compared. The following implications will occur if the "no go" alternative is implemented:

- No benefits will be derived from the implementation of an additional land-use.
- The Orange River Solar Facility 1, which's already authorised by the DAERL will not be able to provide energy to Eskom's high voltage substation due to the powerline not being constructed for the transmission of electricity.
- This will further enforce more strain on the already outdated electrical grid.
- Considering the national grid is largely supplied by non-renewable energy production facilities (90% coal based), the no go option will indirectly result in more carbon dioxide emissions.
- The authorisation refusal of this powerline will indirectly create a precedence which will deter future renewable energy developments in the area.
- Socio-economic benefits such as job creation, skills development, and local economic growth will be lost.
- Local economic benefits arising through the REIPPP will not be realised.

Besides the above mentioned, the following benefits might occur if the no go alternative is implemented:

- No vegetation will be removed and or disturbed.
- The ecology will remain largely intact.
- No change/ alteration to the existing landscape.
- No additional waste will end up in landfill sites.

While the no go alternative will not generate any negative environmental impacts, it will surely remove any socio-economic benefit the local community will receive. The no go alternative will also not aid the government in addressing climate change, reaching its greenhouse gas emission targets, and will further place more strain on the existing electrical grid. Therefore, the no go alternative is not considered the preferred alternative.