
DRAFT BASIC ASSESSMENT REPORT

THE PROPOSED DEVELOPMENT OF THE SPRINGHAAS SOLAR PV FACILITIES CONSISTING OF SEVEN (7) NEW SOLAR PHOTOVOLTAIC FACILITIES WITH ASSOCIATED INFRASTRUCTURE NEAR DEALESVILLE, BLOEMFONTEIN, FREE STATE

Part 2

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Springhaas Solar Facility 1: 14/12/16/3/3/1/2523

Springhaas Solar Facility 3: 14/12/16/3/3/1/2524

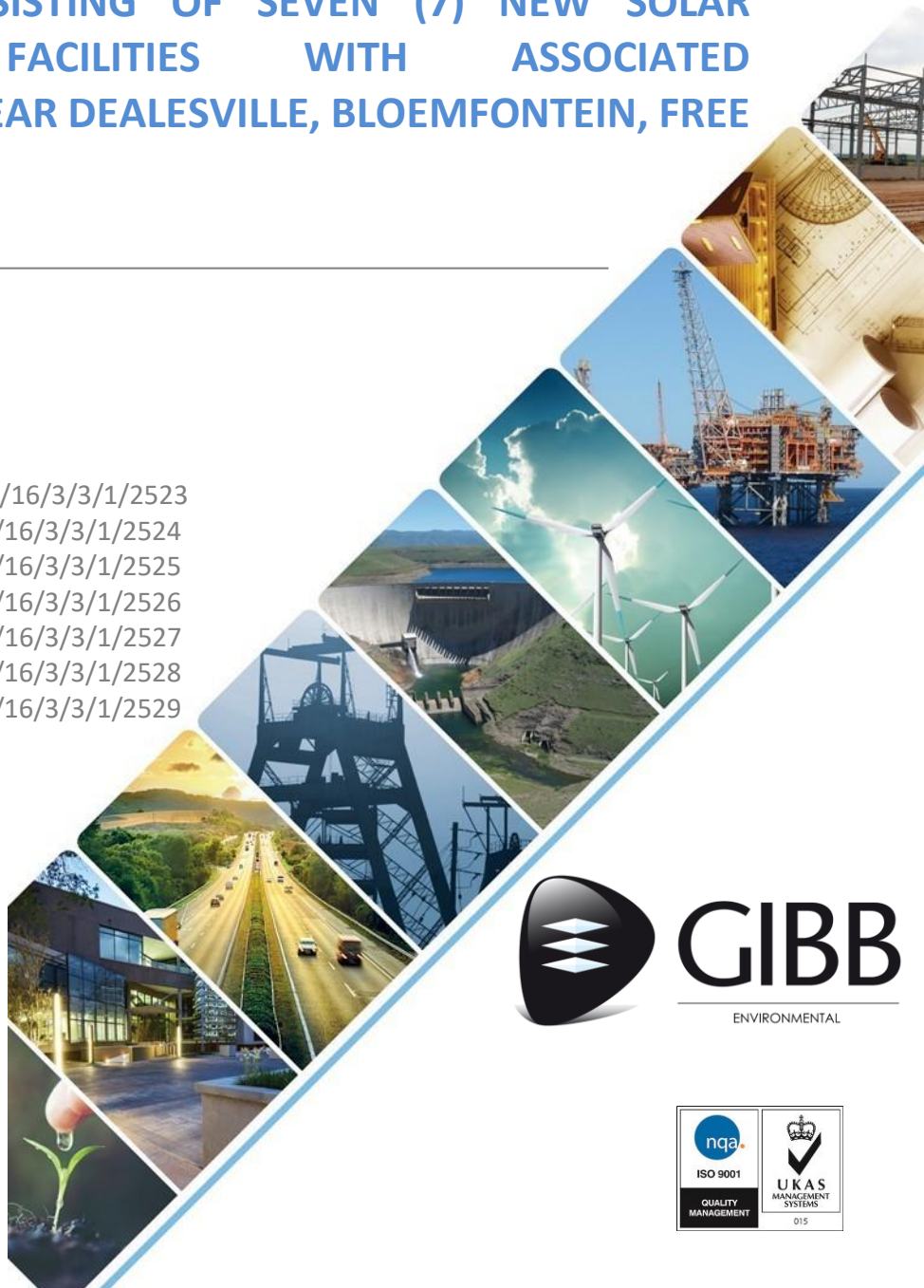
Springhaas Solar Facility 4: 14/12/16/3/3/1/2525

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Preliminary

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7 Impact Assessment

The over-arching objective of the impact assessment process in a basic assessment process is to identify, record and assess the scale of the changes that may occur within a specific receiving environment, in response to the introduction of the proposed solar PV facilities within that receiving environment. In terms of Environmental Impact Assessment as provided for as an Integrated Environmental Management (IEM) tool for assessment in terms of the National Environmental Management Act and its associated Regulations, this refers to a specific site.

This approach enables the EAP to provide the team of specialist with a clearly defined Scope of Work and allows the specialists to focus and highlight pertinent changes as an independent assessor of the changes to the receiving environment in the context of their field of speciality.

The approach therefore provides a framework for the assessment of the impacts that the proposed project will have on the environment, and of the impacts the environment will have on the proposed project. Based on inputs from the project team, stakeholders, I&APs and specialists, the potential environmental (biophysical, social and cultural) impacts were identified and accordingly assessed and their significance summarised as an 'Environmental Impact Statement'.

7.1 Impact Assessment Methodology

GIBB, subsequent to the assessments conducted by the specialist team, reviewed the impacts identified and assessed the inherent and residual risks posed to the receiving environment pre and post the application of mitigation measures. For each of the main project phases the existing and potential future impacts and benefits (associated only with the proposed development) were described using the criteria listed in **Table 7-1** below. This was done in accordance with Government Notice R.326, promulgated in terms of Section 24 of the NEMA, and the criteria drawn from the IEM Guidelines Series, Guideline 5: Assessment of Alternatives and Impacts, published by the DEAT (April 1998) and the DEAT 2006 Guideline 5: Assessment of Alternatives and Impacts (June 2006).

The assignment of ratings has been undertaken based on past experience of the project technical team, as well as through research. Mitigation measures were subsequently identified and considered for each impact and the assessment repeated in order to determine the significance of the residual impacts (the impact remaining after the mitigation measure has been implemented).

Table 7-1: Impact Assessment Criteria

Criteria	Rating Scales	Notes
Nature	Positive	An evaluation of the effect of the impact related to the proposed development
	Negative	

Criteria	Rating Scales	Notes
Extent	Footprint	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur
	Site	The extent of the impact is rated as site as it will affect only the development area
	Local	The extent of the impact is rated as Local as it affects the development area and adjacent properties
	Regional	The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries
	National	The extent of the impact is rated as National as the effects of the impact extends beyond more than 2 regional/ provincial boundaries
	International	The extent of the impact is rated as International as the effect of the impact extends beyond country borders
Duration	Temporary	The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary
	Short term	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term
	Medium term	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term
	Long term	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term
Severity	High negative	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.
	Moderate negative	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected
	Low negative	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected
	Low positive	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved
	Moderate positive	The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected
	High positive	The severity of the impact is rated as High positive as the natural, cultural or social functions and processes are altered to the extent that valued, important, sensitive or vulnerable systems or communities are substantially positively affected.
Potential for impact on irreplaceable resources	No	No irreplaceable resources will be impacted.
	Yes	Irreplaceable resources will be impacted.
Consequence	Extremely detrimental	A combination of extent, duration, intensity and the potential for impact on irreplaceable resources
	Highly detrimental	
	Moderately detrimental	
	Slightly detrimental	
	Negligible	
	Slightly beneficial	

Criteria	Rating Scales	Notes
	Moderately beneficial	
	Highly beneficial	
	Extremely beneficial	
Likelihood of the impact occurring	Unlikely	It is highly unlikely or less than 50 % likely that an impact will occur
	Likely	It is between 50 and 75 % certain that the impact will occur
	Definite	It is more than 75 % certain that the impact will occur or it is definite that the impact will occur
Significance	Very high - negative	A function of Consequence and Likelihood
	High - negative	
	Moderate - negative	
	Low - negative	
	Very low	
	Low - positive	
	Moderate - positive	
	High - positive	
	Very high - positive	

Table 7-2: Explanation of Assessment Criteria

Criteria	Explanation
Nature	This is an evaluation of the type of effect the construction, operation and management of the proposed development would have on the affected environment. Will the impact change in the environment be positive or negative?
Extent or Scale	This refers to the spatial scale at which the impact will occur. Extent of the impact is described as: footprint (affecting only the footprint of the development), site (limited to the site) and regional (limited to the immediate surroundings and closest towns to the site). Extent or scale refers to the actual physical footprint of the impact, not to the spatial significance. It is acknowledged that some impacts, even though they may be of small extent, are of very high importance, e.g. impacts on species of very restricted range. In order to avoid “double counting, specialists have been requested to indicate spatial significance under “intensity” or “impact on irreplaceable resources” but not under “extent” as well.
Duration	The lifespan of the impact is indicated as temporary, short, medium and long term.
Severity	This is a relative evaluation within the context of all the activities and the other impacts within the framework of the project. Does the activity destroy the impacted environment, alter its functioning, or render it slightly altered?
Impact on irreplaceable resources	This refers to the potential for an environmental resource to be replaced, should it be impacted. A resource could possibly be replaced by natural processes (e.g. by natural colonisation from surrounding areas), through artificial means (e.g. by reseeding disturbed areas or replanting rescued species) or by providing a substitute resource, in certain cases. In natural systems, providing substitute resources is usually not possible, but in social systems substitutes are often possible (e.g. by constructing new social facilities for those that are lost). Should it not be possible to replace a resource, the resource is essentially irreplaceable e.g. red data species that are restricted to a particular site or habitat of very limited extent.

Criteria	Explanation
Consequence	The consequence of the potential impacts is a summation of above criteria, namely the extent, duration, severity and impact on irreplaceable resources.
Probability of occurrence	The probability of the impact actually occurring based on professional experience of the specialist with environments of a similar nature to the site and/or with similar projects. It is important to distinguish between probability of the impact occurring and probability that the activity causing a potential impact will occur. Probability is defined as the probability of the impact occurring, not as the probability of the activities that may result in the impact.
Significance	<p>Impact significance is defined to be a combination of the consequence (as described below) and probability of the impact occurring. The relationship between consequence and probability highlights that the risk (or impact significance) must be evaluated in terms of the seriousness (consequence) of the impact, weighted by the probability of the impact actually occurring.</p> <p>In simple terms, if the consequence and probability of an impact is high, then the impact will have a high significance. The significance defines the level to which the impact will influence the proposed development and/or environment. It determines whether mitigation measures need to be identified and implemented and whether the impact is important for decision-making.</p>
Degree of confidence in predictions	Specialists and the EIR team were required to provide an indication of the degree of confidence (low, medium or high) that there is in the predictions made for each impact, based on the available information and their level of knowledge and expertise. Degree of confidence is not taken into account in the determination of consequence or probability.
Mitigation measures	Mitigation measures are designed to reduce the consequence or probability of an impact, or to reduce both consequence and probability. The significance of impacts has been assessed both with mitigation and without mitigation.

Table 7-3: Impact Assessment Criteria and Rating Scales

Duration		Extent		Irreplaceable Resources		Severity		Consequence = (Duration + Extent + Irr) x Severity		Likelihood		Significance		Confidence
1	Temporary	1	Footprint	1	Yes	-3	High - negative	-25 to -33	Extremely detrimental	1	Unlikely	-73 to -99	Very high - negative	Low
2	Short term	2	Site	0	No	-2	Moderate - negative	-19 to -24	Highly detrimental	2	Likely	-55 to -72	High - negative	Medium
3	Medium term	3	Local			-1	Low -negative	-13 to -18	Moderately detrimental	3	Definite	-37 to -54	Moderate - negative	High
4	Long term	4	Regional					-7 to -12	Slightly detrimental			-19 to -36	Low - negative	
		5	National			1	Low -positive	0 to -6	Negligible			0 to -18	Very low - negative	
		6	International			2	Moderate - positive							
						3	High - positive	0 to 6	Negligible			0 to 18	Very Low - positive	
								7 to 12	Slightly beneficial			19 to 36	Low - positive	
								13 to 18	Moderately beneficial			37 to 54	Moderate - positive	
								19 to 24	Highly beneficial			55 to 72	High - positive	
								25 to 33	Extremely beneficial			73 to 99	Very high - positive	

7.1.1 Ascribing Significance for Decision-Making

The best way of expressing the impact assessment cost benefit implications for decision-making, is to present them as risks. Risk is defined as the consequence (implication) of an event multiplied by the probability (likelihood)¹ of that event. Many risks are accepted or tolerated on a daily basis because even if the consequence of the event is serious, the likelihood that the event will occur is low. A practical example is the consequence of a parachute not opening, is potentially death but the likelihood of such an event happening is so low that parachutists are prepared to take that risk and hurl themselves out of an airplane. The risk is low because the likelihood of the consequence is low even if the consequence is potentially severe.

It is also necessary to distinguish between the event itself (as the cause) and the consequence. Again using the parachute example, the consequence of concern in the event that the parachute does not open is serious injury or death, but it does not necessarily follow that if a parachute does not open that the parachutist will die.

Various contingencies are provided to minimise the likelihood of the consequence (serious injury or death) in the event of the parachute not opening, such as a reserve parachute. In risk terms this means distinguishing between the inherent risk (the risk that a parachutist will die if the parachute does not open) and the residual risk (the risk that the parachutist will die if the parachute does not open but with the contingency of a reserve parachute) i.e. the risk before and after mitigation.

7.1.2 Consequence

The ascription of implications for decision-making becomes then relatively simple. It requires the consequences to be classified and likelihood to be defined of that consequence. In **Table 7-4** below, a system for ascribing consequence is shown.

Two important features should be noted in the table, namely that the scoring doubles as the risk increases and that there is no equivalent 'high' score in respect of benefits as there is for the costs. This high negative score serves to give expression to the potential for a fatal flaw where a fatal flaw would be defined as an impact that cannot be mitigated effectively and where the associated risk is accordingly untenable. Stated differently, the high score on the costs, which is not matched on the benefits side, highlights that such a fatal flaw cannot be 'traded off' by a benefit and would render the proposed project to be unacceptable.

¹ Because 'probability' has a specific mathematical/empirical connotation the term 'likelihood' is preferred in a qualitative application and is accordingly the term used in this document.

Table 7-4: Ranking of Consequence

Environmental Cost	Inherent risk
Human health – morbidity / mortality, loss of species	High
Material reductions in faunal populations, loss of livelihoods, individual economic loss	Moderate – high
Material reductions in environmental quality – air, soil, water. Loss of habitat, loss of heritage, amenity	Moderate
Nuisance	Moderate – low
Negative change – with no other consequences	Low
Environmental Benefits	Inherent benefit
Net improvement in human welfare	Moderate – high
Improved environmental quality – air, soil, water. Improved individual livelihoods	Moderate
Economic Development	Moderate – Low
Positive change – with no other consequences	Low

7.1.3 Likelihood

Although the principle is one of probability, the term ‘likelihood’ is used to give expression to a qualitative rather than quantitative assessment, because the term ‘probability’ tends to denote a mathematical/empirical expression. A set of likelihood descriptors that can be used to characterise the likelihood of the costs and benefits occurring, is presented in **Table 7-5**.

Table 7-5: Likelihood Categories and Definitions

Likelihood Descriptors	Definitions
Highly unlikely	The possibility of the consequence occurring is negligible
Unlikely but possible	The possibility of the consequence occurring is low but cannot be discounted entirely
Likely	The consequence may not occur but a balance of probability suggests it will
Highly likely	The consequence may still not occur but it is most likely that it will
Definite	The consequence will definitely occur

It is very important to recognise that the likelihood question is asked twice. **The first time the question is asked is the likelihood of the cause and the second as to the likelihood of the consequence.** In the tables that follow the likelihood is presented of the cause² and then the likelihood of the consequence is presented. A high likelihood of a cause does not necessarily translate into a high likelihood of the consequence. As such the likelihood of the consequence is not a mathematical or statistical ‘average’ of the causes but rather a qualitative estimate in its own right.

7.1.4 Residual Risk

The residual risk is then determined by the consequence and the likelihood of that consequence. The residual risk categories are shown in **Table 7-6** where consequence scoring

² Cause of the change to the receiving environment.

is shown in the rows and likelihood in the columns. The implications for decision-making of the different residual risk categories are shown in **Table 7-7**.

Table 7-6: Residual Risk Categories

		Residual risk				
		Moderate	High	High	Fatally flawed	
Consequence	High	Moderate	High	High	Fatally flawed	
	Moderate – high	Low	Moderate	High	High	High
	Moderate	Low	Moderate	Moderate	Moderate	Moderate
	Moderate – low	Low	Low	Low	Low	Moderate
	Low	Low	Low	Low	Low	Low
		Highly unlikely	Unlikely but possible	Likely	Highly likely	Definite
		Likelihood				

Table 7-7: Implications for Decision-Making of the different Residual Risk Categories

Rating	Nature of implication for Decision – Making
Very Low	Project can be authorised with very low risk of environmental degradation
Low	Project can be authorised with low risk of environmental degradation
Moderate	Project can be authorised but with conditions and routine inspections
High	Project can be authorised but with strict conditions and high levels of compliance and enforcement
Fatally Flawed	The project cannot be authorised

7.2 Development Phases

The impact assessment considers all phases of a development. These are:

1. Preconstruction phase, this is the phase where site investigations, the base assessment process, land use planning application etc. are completed.
2. Construction phase, estimated at 12 months
3. Operational phase, will be approximately 20+ years
4. Decommissioning phased, estimated to be less than 12 months.

The following alternatives were considered during the basic assessment process.

7.3 Springhaas 1 Detailed Impact Assessment

7.3.1 Alternatives Considered

(a) Location Alternatives

Two location alternatives were considered for the electrical infrastructure compound for SPH1.

(b) Technology Alternatives

Two technology alternatives namely lithium-ion and redox flow batteries were considered for the BESS.

(c) No-Go Alternative

The no-go alternative was considered for all seven of the proposed facilities. The impact of the no-go alternative was rated as the same for all seven facilities. The no-go alternative is assessed in **Section 7.8**.

7.3.2 Pre-construction phase

No significant impacts for the pre-construction phase have been identified by any specialist studies or by the EAP for SPH1.

7.3.3 Construction Phase

(a) Agricultural Impact

The most significant agricultural impacts associated with the development of SPH1 will occur during the construction phase when the site is fenced off, vegetation is removed and the soil surface is prepared for the installation of infrastructure.

The footprint of SPH1 contains one small area of medium sensitivity agricultural land and the start of the main access road crosses a small medium sensitivity land. These patches are small and isolated from other areas of viable production. The loss of these areas of moderate sensitivity land are therefore considered the same as the loss of low sensitivity areas.

SPH1 was also classified in terms of agricultural potential. The majority of the site is classified as low to very low potential. There are three patches of low- moderate potential land and two sections of moderate potential land, one of which is located at the start of the main access road. As these patches of low- moderate and moderate potential agricultural land are isolated from larger patches of moderate sensitivity land they are not viable from a production perspective.

Tables 7-8 – 7-11 cover both location alternatives for the electrical infrastructure compound and the two technology options for the BESS. There was no difference in the alternatives proposed from an agricultural perspective.

Table 7-8: SPH1: Impact of land use change from livestock farming to renewable energy generation

LAND USE CHANGE FROM LIVESTOCK FARMING TO ENERGY GENERATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Construction of boundary fence and PV infrastructure will change land use from livestock farming to renewable energy generation</i>			
INDIRECT IMPACT	<i>Intensification of agriculture in other areas or otherwise reduction of livestock produced in the area</i>			
CUMULATIVE IMPACT	<i>Increase in areas where agriculture is converted into other land uses</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5</i>	-14	3

		years and as such is rated as Long Term		
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
Springhaas Solar Facility 1 (Pty) Ltd must provide market-related compensation that will allow the current land users to have the same or better ability to sustain their livelihood.				
Ensure that the final infrastructure layout remains within the fenced off area of the development footprint.				
Prior arrangements must be made with the landowners to ensure that livestock and game animals are moved to areas where they cannot be injured by vehicles traversing the area.				
The use of main access routes by construction vehicles and equipment must do so with consideration of nearby agricultural land users who use the same access routes for farming activities.				
All left-over construction material must be removed from site once construction on a land portion is completed.				
No materials removed from development area must be allowed to be dumped in nearby livestock farming areas.				
No boundary fence must be opened without the landowners' permission.				
No open fires made by the construction teams are allowable during the construction phase.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
High				

Table 7-9: SPH1: Impact significance of soil loss through erosion during the construction phase

SOIL LOSS THROUGH EROSION	
PROJECT PHASE	Construction Phase

DIRECT IMPACT	<i>Loss of soil particles from areas where construction activities result in the removal of vegetation from the surface.</i>			
INDIRECT IMPACT	<i>Sparse to no vegetation growth in eroded areas.</i>			
CUMULATIVE IMPACT	<i>Increase in areas exposed to soil erosion</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-18	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Limit vegetation removal from the soil surface to the areas of infrastructure development such as access routes as well as around the foundations of the PV arrays and buildings.</i>				
<i>Vegetation clearance must only be undertaken immediately prior to construction activities and only within the development footprint</i>				
<i>Once construction of an area has been completed, level any remaining soil removed from excavation pits (where the PV arrays will be mounted) that remained on the surface, instead of allowing small stockpiles of soil to remain on the surface where it is exposed to rain and wind. This is applicable to all construction areas, except where topsoil stockpiles must remain for site rehabilitation of specific areas.</i>				
<i>Stormwater channels on site must be designed to minimise the soil erosion risk that results from surface water runoff.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-10: SPH1: Impact significance of impaired soil functionality caused by compaction

IMPAIRED SOIL FUNCTIONALITY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>The weight and movement of vehicles and equipment over the surface will result in soil compaction.</i>			
INDIRECT IMPACT	<i>Compacted soil have reduced pore space and water infiltration rate. Compacted soil surfaces increase the rate of surface water runoff, especially after a rainfall event.</i>			
CUMULATIVE IMPACT	<i>Increase in areas affected by soil compaction.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-18	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Only allow vehicles and equipment to travel on designated access routes and not anywhere else within the development area.</i>				
<i>Use existing main access routes and internal farm roads where possible and avoid using other areas in the site as temporary access routes.</i>				
<i>Vehicles and equipment must park in designated parking areas.</i>				
<i>Materials must be off-loaded and stored in designated laydown area.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season as wet soil compacts easily as opposed to dry soil.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-11: SPH1: Impact significance of impaired soil health as a result of soil pollution

IMPAIRED SOIL HEALTH	
PROJECT PHASE	<i>Construction Phase</i>

DIRECT IMPACT	<i>Soil pollution can be caused by oil and fuel spills from vehicles and equipment as well as domestic and material waste on site. Should the vanadium redox flow batteries be used for the BESS, spillage of corrosive and environmentally toxic electrolyte is possible. In the case that lithium solid state containerised batteries are used, there is a possibility of thermal runaway that will result in the release of toxic and flammable gasses.</i>			
INDIRECT IMPACT	<i>Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health.</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil pollution.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-21	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>Maintenance must be undertaken regularly on all vehicles and construction equipment to prevent hydrocarbon spills.</i>				
<i>Any waste generated during construction must be stored into designated containers and removed from the site by the construction teams.</i>				
<i>Any left-over construction materials must be removed from the development area.</i>				
<i>The development area must be monitored by the Environmental Control Officer (ECO) to detect any early signs of fuel and oil spills and waste dumping. The ECO must also report any spills from batteries.</i>				
<i>Ensure battery transport and installation is undertaken by accredited staff and contractors.</i>				
<i>Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(b) Aquatic Impact

Construction phase activities would result in disturbance of soil and clearing of vegetation.

Water quality impacts may occur from batching of concrete on site, hydrocarbon spills and other construction activities.

Two location alternatives are proposed for the electrical infrastructure compound for SPH1. As both are located beyond aquatic habitats there is no difference between the two options in terms of impacts on aquatic biodiversity.

Two technology options are proposed for the BESS. As the electrical infrastructure compound which contains the BESS in SPH1 is located beyond any aquatic environments there is no difference in the two options in terms of impacts on aquatic biodiversity.

Table 7-12: SPH1: Impact of aquatic ecosystems during the construction phase

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>	Negligible	Unlikely
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	Very low negative		
PROPOSED MITIGATION MEASURES				
<i>A buffer of at least 250 m between the significant aquatic ecosystems (larger pans) and all the proposed project activities should be maintained (noting that this is already honoured in the proposed layout for all facilities).</i>				
<i>Clearing of indigenous vegetation should not take place within the aquatic features and the recommended buffers, while retaining the topography and cover vegetation within the wider drainage areas through the site is preferred to reduce the potential modification to the way in which water drains through these areas.</i>				
<i>The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance.</i>				
<i>During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills. The solar panels will be washed with water and a biodegradable/ greendetergent.</i>				
<i>Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.</i>				
<i>Development within the drainage areas, where located within a proposed facility, will however need to consider stormwater management measures and should avoid impacting on the movement of water through the more seasonally wet areas. Minimal disturbance to the topography and cover vegetation in these areas is recommended.</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the</i>		

		<i>proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-2 very low negative			
CONFIDENCE LEVEL				
<i>High</i>				

(c) Avifaunal Impact

(i) Habitat destruction associated with the construction of the facility

Habitat destruction and alteration will occur during the construction phase of SPH1. The majority of the development footprint would be transformed from its current state to a renewable energy facility. SPH1 will transform approximately 209ha of habitat. Most of this is in a fairly natural state currently, or in the case of arable lands is still accessible and useable for birds foraging.

Table 7-13: SPH1: Formal rating of destruction of bird habitat during construction.

DESTRUCTION OF BIRD HABITAT DURING CONSTRUCTION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Transformation of natural habitat into PV facility</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Yes - Larger area transformed from natural habitat</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-18	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural and social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required. Impact avoidance has already been implemented in the design phase through the adherence to no-go buffers around pans.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	3

EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Disturbance of birds & displacement effects

Disturbance of avifauna during the construction (and thereafter during maintenance and operational and decommissioning) of the facility and all development alternatives and associated infrastructure is likely to occur. Disturbance of breeding birds is typically of greatest concern. In this regard any breeding sites of sensitive bird species would be the most important. It is noted that no breeding sites have been identified on site at this stage.

There is no difference between the location and technology options in terms of disturbance and displacement of birds.

Table 7-14: Formal rating of disturbance of birds during construction.

PROJECT PHASE	<i>Construction phase & operations phase to lesser extent</i>			
DIRECT IMPACT	<i>Birds disturbed from their normal activities through the increased noise and activity levels associated with construction</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>More projects will result in overall higher disturbance levels</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required as there are no particularly sensitive features identified (such as breeding sites). General good environmental practice should be implemented during construction in terms of control of vehicles, staff, minimising the impact on the receiving environment as much as possible.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1

EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

SPH1 overlaps an area of medium bat sensitivity. During the construction of SPH1 habitat modification would occur, disturbance and displacement of bats may occur and bat roosts may be disturbed or destroyed. SPH1 overlaps an area of medium bat sensitivity.

Two location alternatives for the electrical infrastructure compound are under consideration for SPH1. The alternatives are both located similar habitats and do not overlap any sensitive features for bats. As such, both alternatives are equally acceptable. Two technology options are under consideration for the BESS. For bat impacts the type of technology used for the BESS is not considered relevant. Both technology options are considered equally acceptable.

Table 7-15: SPH1: Bat habitat modification

IMPACT ON POSSIBLE HABITAT MODIFICATION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Modification of habitat through the removal of vegetation cover and water sources</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Loss of foraging resources for local bat population</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
PROPOSED MITIGATION MEASURES				
<i>This impact may be reduced by limiting the removal of vegetation and available water sources, as far as possible.</i>				
<i>Avoid all high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should the currently assessed layout change, a bat specialist must confirm, that these high sensitive areas have been adequately avoided.</i>				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential additional sensitive habitats, to confirm the baseline environment, if construction does not take place within 5 years of the initial bat study.</i>				

Following construction, rehabilitation of all disturbed areas, inclusive of that beyond permanent infrastructure footprints, (e.g. temporary access tracks and laydown areas) must be undertaken.

POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-4	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
Medium				

Table 7-16: SPH1: Disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS				
PROJECT PHASE	Construction phase			
DIRECT IMPACT	Disturbance of bats during construction activities			
INDIRECT IMPACT	Displacement			
CUMULATIVE IMPACT	Unavailability of suitable foraging resources in the broader environment for displaced individuals			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
Limit construction activities to daylight hours only and minimise lighting at night, as far as possible.				
Avoid high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should the currently assessed layout change, a bat specialist must confirm, that these high sensitive areas have been adequately avoided.				
Avoid construction in medium sensitive areas, as far as possible. Where unavoidable, limit and restrict all movement and noise in these areas, as a result of construction activities, to daylight hours only.				
All construction activities should be limited to the assessed project footprint only.				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	1	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely

IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-17: SPH1: Bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during construction activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-10	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Likely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-20	low negative		
PROPOSED MITIGATION MEASURES				
<i>Avoid construction in medium sensitive areas, as far as possible. Where unavoidable, limit and restrict all movement and noise in these areas, as a result of construction activities, to daylight hours only.</i>				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.</i>				
<i>If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-18: SPH1: Bat Roost destruction

IMPACT OF POSSIBLE ROOST DESTRUCTION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Destruction of potential bat roosting features</i>			
INDIRECT IMPACT	<i>Reduction of available roosting sites and/or Mortality</i>			
CUMULATIVE IMPACT	<i>Insufficient roosting resources to support the local population and potential increased bat mortality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-10	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-20	low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMP				
<i>Avoid the destruction or removal of existing farmsteads and trees, as far as possible.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.</i>				
<i>If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.</i>				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(e) Botanical Impacts

The development of SPH1 would result in extensive but localized loss of relatively undisturbed (unploughed but grazed) Western Free State Clay Grasslands.

The shade effect of the panels on the grassland vegetation is not known and it not easily predicted. There will be space under the panels for grass and other plants to grow. However, the microclimate is likely to be different to that of open grassland, so a different suite of plant species is likely to colonize the space under the solar panels.

Two location alternatives for the electrical infrastructure compound are proposed for SPH1 and two technology options for the BESS. The location and technology alternatives will make no difference on the botanical impact assessment and as such these alternatives are covered in the **Table 7-19**.

Table 7-19: SPH1: Impact of loss of Western Free State Clay Grassland

LOSS OF VEGETATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Removal of natural vegetation: Western Free State Clay Grasslands</i>			
INDIRECT IMPACT	<i>None determined</i>			
CUMULATIVE IMPACT	<i>Loss of Western Free State Clay Grasslands</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term.</i>	-15	3
EXTENT	3	<i>The impacts will be localized to the designated target areas.</i>	Moderately Detrimental	Definite
SEVERITY	-2	<i>The severity of the potential impact will be moderate negative.</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-45	medium - negative		
PROPOSED MITIGATION MEASURES				
<i>The first mitigation measures necessary would be the relocation of Ammocharis coronica bulbs if they cannot be avoided. Ideally the bulb should be lifted when they are dormant (winter) but that would mean traversing the entire area of the SPH sites in the preceding summer and marking every occurrence of these plants. A more practical approach would be to unearth the bulbs during the construction phase and relocating and planting them soon after removal.</i>				
<i>Secondly, all areas that are disturbed during construction and that are not needed during the operational phase should be rehabilitated, using natural grasses that occur in the area. It would be possible for some grasses and forbs to survive under the panels, but it is difficult to predict the extent of such growth, nor which plant species would grow effectively under the panels.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last at least 5 years and therefore it is considered to be Long Term.</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>	Slightly Detrimental	Definite
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(f) Groundwater Impact

The water required during the construction phase of SPH1 is approximately 18,000m³ per year. The water requirement lies well within the yield potential of the underlying fractured rock aquifer (i.e. 0.5 – 2.0 L/s). It must be noted that at present the use of groundwater is not proposed however if this changes the potential impacts of groundwater abstraction are shown in **Table 7-20**.

Earthmoving plant and/or construction vehicles will be used on site during the construction phase. Use of vehicles presents a risk of groundwater contamination by fuel and oil leakage.

Two location alternatives for the electrical infrastructure compound and two technology options (lithium-ion vs redox flow batteries) were considered for SPH1. The alternatives considered are equally preferred.

Table 7-20: SPH1: Impact table for the lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place).

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Lowering of groundwater level due to over abstraction</i>			
INDIRECT IMPACT	<i>Drying of springs in the area</i>			
CUMULATIVE IMPACT	<i>Permanent damage to the aquifer system in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-14	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-28	low - negative		
PROPOSED MITIGATION MEASURES				
<i>If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring. Adhere to the borehole’s safe yield and to monitor water levels and flow.</i>				
<i>Groundwater abstraction volumes must be monitored.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated</i>		

		<i>as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	Negligible	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
Medium				

The main risk associated with the construction phase is groundwater contamination from the use of construction vehicles and heavy machinery on-site.

Table 7-21: SPH1: Impact of contamination of groundwater as a result of accidental oil spillages or fuel leakages during the construction and decommissioning phases.

Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages				
PROJECT PHASE	<i>Construction and Decommissioning Phase</i>			
DIRECT IMPACT	<i>Groundwater contamination</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem it the area</i>			
CUMULATIVE IMPACT	<i>Long term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Likely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-10	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Vehicles must be maintained regularly and kept in a good working order. Dirty water should be captured, to be re-used where possible. No dirty water is allowed to be discharged into the surrounding environment.</i>				
<i>No heavy equipment or vehicles to be left in excavation area when not in use. Drip trays to be used under stationary vehicles and machinery where possible.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON	0	<i>No irreplaceable resources will be</i>		

IRREPLACEABLE RESOURCES		<i>impacted.</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to archaeological resources

Impacts to archaeological resources at SPH1 are limited to one site of low significance (Grade GPB, but which might not even be 100 years old) and the associated remnants of a small dam (Grade GPC). Impacts will be direct and permanent but because of the low cultural significance the severity is low.

Two location alternatives were considered for the electrical infrastructure compound, neither of the footprints contain heritage resources. As such, both are equally preferred.

Two technology alternatives were considered for the battery technology for the BESS. Both technology options are equally preferred.

Table 7-22: SPH1: Assessment of construction phase impacts to archaeological sites.

Archaeological impacts				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Destruction of a ruined historical cottage (already in very poor condition)</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Increased loss of vernacular architecture</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>None required as the ruin is in poor condition and does not have any special architectural qualities that need to be further recorded.</i>				
<i>No materials to be removed from any other ruins in the wider project area.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		

SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Impacts to graves

Impacts to graves for SPH1 are not expected because all identified graves have been avoided by the facility layout. There is still the chance of an unmarked grave being present, or even a marked grave that was not found during the survey. The chances are considered low, however.

Table 7-23: SPH1: Assessment of construction phase impacts to graves

IMPACTS TO GRAVES				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Destruction of graves, including their coverings and possibly human remains</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Destruction of graves, including their coverings and possibly human remains</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-18	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Farm-style wire fences should be erected around all known and unfenced graves (i.e. waypoints 362 & 404) within the farm portion affected by construction. Pedestrian access gates must be provided and the fences must be located a minimum of 5 m away from all graves.</i>				
<i>All graves to be treated as no-go areas with temporary signage as required.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-18	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		

SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Impacts to the cultural landscape SPH 1

No landscape features such as hills and pans will be impacted by SPH1. The impact on cultural landscape is due to the construction activities (construction vehicles and equipment) on site which is a rural landscape.

Table 7-24: SPH1 Assessment of construction phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the introduction of construction equipment and vehicles and all the associated activities on site</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being constructed at once</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Keep construction period as short as possible.</i>				
<i>Rehabilitate any areas not needed during operation as soon as possible.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3

EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-30	low - negative		
CONFIDENCE LEVEL				
High				

(h) Palaeontological Impact

Palaeontological impacts would be the destruction of fossils from construction activities. The site as a whole is considered as low sensitivity in terms of palaeontology.

Table 7-25: SPH1: Assessment of the potential impacts to possible palaeontological resources considers the criteria below

PALAEOLOGY IMPACTS				
PROJECT PHASE	Construction, Operational and de commissioning Phases			
DIRECT IMPACT	Destruction of fossils in the footprint			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Loss of fossil heritage and scientific knowledge			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	1	The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary	-2	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-6	Very Low Negative		
PROPOSED MITIGATION MEASURES				
If fossils are found once excavations for foundations and amenities have commenced then they should be photographed, removed and put in a safe place. Photographs should be sent to a palaeontologist to assess their scientific value. If the fossils are important the palaeontologist must obtain a permit from SAHRA, visit the site and remove the fossils for curation and storage in a recognised facility such as a museum or palaeontology department in a university				
If no fossils are found, no action will be required				
POST-MITIGATION				
DURATION	1	The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary	2	3

EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	6	Very Low Positive		
CONFIDENCE LEVEL				
High				

(i) Socio-Economic Impact

(i) Stimulation of the Economy during construction

The size of the Tokologo LM's economy was estimated at R2,170 million at current prices (2022) and primarily comprises of the agricultural and tertiary services sectors. Considering the small economic base of the municipality, the opportunities for the procurement of goods and services within the local economy will be very limited. That being said, it is likely that some of the local businesses will benefit from sub-contracting opportunities, consumer expenditure of the construction crew, and an increase in income of locals who are directly employed in the construction activities, or who benefit from the development of SPH1 through local procurement.

The stimulation of the economy will not be dependent on the layout or technology options of the SPH1 solar facility; thus, alternatives are equally preferred.

Table 7-26: Impact of Economic Stimulation during construction

IMPACT ON ECONOMY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Temporary increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite

IMPACT IRREPLACEABLE RESOURCES	ON	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE		30	low positive		
PROPOSED MITIGATION MEASURES					
<i>To optimise the stimulation of the local economy through direct, indirect and induced effects, the following should be applied where possible:</i>					
<i>Procure construction materials, goods, and products from local and domestic suppliers if feasible</i>					
<i>Employ local contractors where possible</i>					
<i>Note: The proposed mitigation measures will possibly increase the positive impact on the local economy; however, this will not affect the weighting thereof.</i>					
POST-MITIGATION					
DURATION		2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term	10	3
EXTENT		3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY		2	The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural, and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected	Slightly Beneficial	Definite
IMPACT IRREPLACEABLE RESOURCES	ON	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE		30	low positive		
CONFIDENCE LEVEL					
<i>High</i>					

(ii) Creation of Employment during construction

The construction of SPH1 will require temporary employment of construction workers, foremen, and engineers On-site. Construction is expected to last twelve months where at the peak of construction about 150 people will be working on-site. The creation of between 100 and 150 temporary employment opportunities for SPH1 throughout the duration of construction which equates to about 50 FTE.

In addition to those benefitting from direct employment created at the project, various multiplier effects will assist in temporarily supporting existing jobs in the businesses offering services and goods that will be procured during construction activities. The increased temporary income earned by these businesses will in turn stimulate consumption spending, creating another round of multiplier effects.

SPH1 will create the same number of employment opportunities, regardless of its layout on the site; thus, layout alternatives are equally preferred.

Table 7-27: SPH1: Assessment of Employment during construction

IMPACT ON EMPLOYMENT	
PROJECT PHASE	<i>Construction Phase</i>
DIRECT IMPACT	<i>Creation of temporary employment opportunities On-site</i>

INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of temporary employment opportunities in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
PROPOSED MITIGATION MEASURES				
<i>The following is recommended to increase the employment opportunities created in the local communities, where feasible:</i>				
<i>Employ labour intensive methods in construction, where feasible</i>				
<i>Employ local residents and communities, where possible</i>				
<i>Utilise local suppliers, where possible</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Reduction of Land Area available for productive farming

The proposed site of SPH1 and surrounding land is currently used for small-scale livestock. The agricultural assessment classified the majority of SPH1 as being of low to very low agricultural potential with small isolated patches of low – moderate and moderate potential land on the edges of the facility. The farmers with livestock on the land proposed for the facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH1 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on

the site that will be affected by the plant's footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project's construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH1.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant differentiation among site layout alternatives can be made. The footprint of the BESS will be the same regardless of which battery technology is used. There is therefore no difference in the impact between the two technology alternatives.

Table 7-28: SPH1: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Construction and Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	<i>very low negative</i>		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite

IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iv) Loss of Property

An influx of job seekers to the area during the construction phase may result in stock theft and burglaries. The number of workers and duration of construction will not be affected by the layout alternatives or technology alternatives; thus, all alternatives are equally preferred.

Table 7-29: SPH1: Assessment of loss of property

IMPACT ON CRIME LEVELS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in crime associated with the influx of people</i>			
INDIRECT IMPACT	<i>Reduced level of security in and around the proposed facility</i>			
CUMULATIVE IMPACT	<i>No to negligible cumulative impact</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
<i>The following mitigations are advised to be instituted to minimise and possible eliminate the impact altogether:</i>				
<i>Ensure proper fencing and monitoring of the fencing is in place</i>				
<i>Maximise job creation and allocation to locals as far as practically possible. Recruitment of workers should be planned in advance and should not take place on-site. This will reduce the probability of work seekers loitering in the area surrounding the project sites</i>				
<i>Hire additional security personnel during the construction period</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(j) Terrestrial Biodiversity & Faunal Impact

(i) Direct Impact - Destruction of faunal habitat

Clearing or disturbance to natural vegetation for the construction of SPH1 will remove up to 209ha of natural grassland habitat. This includes the burrows of many fossorial species as well as termite mounds which provide a source of food for species such as aardvark and mongoose.

There are two location alternatives for the electrical infrastructure compound for SPH1. Noting that if both are not approved, the area of the second one would likely comprise solar PV panels, therefore the difference in terms of the impact of clearance of natural habitat is negligible. Two technology alternatives for the battery to be used in the BESS have been proposed. As the type of battery used will not alter the footprint of the BESS the alternatives are rated as equal for the impact of clearance of natural habitat.

Table 7-30: SPH1: Destruction of faunal habitat

DESTRUCTION OF FAUNAL HABITAT				
PROJECT PHASE	Construction phase			
DIRECT IMPACT	Destruction of faunal habitat			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	Loss of habitat and habitat connectivity			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-21	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-3	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays. Only indigenous grasses found in the area must be used for rehabilitation				
Undertake vegetation clearing during the dry season, and outside of the breeding season of burrowing fauna				
If possible, the movement of animals through the sites must be permitted during operations. The use of fencing that will allow the movement of small to medium fauna through would help mitigate the effect of fences acting as barriers. This can				

<i>be achieved by constructing a fence that has places for animals to crawl through and is not difficult for fleeing animals and birds to see. For example, black mesh panel fencing can be used where gaps of approximately 30 cm high and 50 cm wide and spaced at regular intervals are cut/installed. The tops of these gaps must be smoothed off to limit the chance of wildlife being injured when passing through. The use of barbed wire must be avoided</i>				
<i>The proposed activities must remain within the project footprint</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-10	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-30	low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(ii) Direct Impact - Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death. The clearing of ground for the foundations of the PV arrays will destroy burrows, potentially causing injury or death to burrowing animals. Furthermore, the presence of the construction site and personnel may result in negative interactions with fauna, such as hunting or killing animals perceived to be pests.

Regarding the technology alternative for the type of battery used in the BESS for all facilities, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place.

The alternative locations for the electrical infrastructure compound will not change the ratings for this impact.

Table 7-31: SPH1: Injury or death to fauna

INJURY OR DEATH TO FAUNA				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Injury or death to fauna</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-18	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-54	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by construction workers</i>				
<i>To prevent possible collisions with animals, drivers of construction vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				
<i>Ideally construction should not continue at night so as to avoid potential collisions with nocturnal fauna</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>No wild animal may under any circumstance be hunted, snared, captured, injured or killed. This includes animals perceived to be vermin. Checks of the surrounding natural vegetation must be regularly undertaken to ensure no traps have been set. Any snares or traps found on or adjacent to the site must be removed and disposed of</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts - Pollution and contamination of natural areas

During construction, dust from exposed areas and roads, and litter from construction workers have the potential to pollute the surrounding natural vegetation. The use of dust suppressants, as well as hydrocarbons from vehicles and machinery, have the potential to contaminate soils and ground water, and be washed into the nearby natural pans during high rainfall events. This is relevant to all facilities equally for the construction phase.

Table 7-32: SPH1 pollution and contamination of natural areas

POLLUTION AND CONTAMINATION OF NATURAL AREAS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-15	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-45	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities</i>				
<i>All vehicles and machinery must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>During construction, dust on construction roads must be suppressed using a water tanker</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by construction workers must be prohibited</i>				
<i>Appropriate solid waste disposal facilities must be provided for workers during construction</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iv) Indirect Impacts – Disturbance and displacement of fauna

Construction activities have the potential to cause disturbance to fauna inhabiting the natural grassland through noise, vibrations, and light (if construction continues after dark). Security lights for the solar facilities during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The location alternatives for the electrical infrastructure compound for SPH1 and the technology alternatives for the BESS will not change the ratings for this impact.

Table 7-33: SPH1: Disturbance and displacement of fauna

DISTURBANCE AND DISPLACEMENT OF FAUNA				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Disturbance to and displacement of fauna – natural grassland</i>			
CUMULATIVE IMPACT	<i>Displacement of fauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-18	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-36	low negative		
PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>Ideally construction activities should cease at night to minimise the need for artificial lighting and to reduce the impact of noise and vibrations on nocturnal animals</i>				
<i>Lighting during construction should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects, such as low-pressure sodium lamps, is preferred</i>				
<i>Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	2

EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-10	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(v) Indirect Impacts – Increased potential of invasion by alien vegetation

During construction, the removal of natural vegetation and disturbance to the soil will increase the likelihood of invasion by alien plant species. Alien species establish easily and quickly on bare soil by colonisation or from seeds existing in the seed bank of the soil. Infestation by alien and invasive species will lead to degradation of the surrounding natural habitat and will increase the potential of spread into the greater landscape. In addition, the vehicles and equipment were likely used on various other sites and could introduce alien invasive plant seeds. This impact is relevant to all the proposed arrays equally and has therefore been assessed in one table for the construction phase.

The location alternative for the electrical infrastructure compound and the technology alternatives for the BESS will not change the ratings for this impact.

Table 7-34: SPH1: Increased potential of invasion by alien vegetation

INCREASED POTENTIAL OF INVASION BY ALIEN VEGETATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Increased potential of invasion by alien vegetation</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities monthly</i>				

<i>All areas cleared of natural vegetation must be rehabilitated. Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays and other cleared areas. Only indigenous grasses found in the area must be used for rehabilitation. This must be advised by the botanist</i>				
<i>An invasive alien plant species management and monitoring plan must be implemented during the construction phase. Monitoring should continue into the operational phase and through and for a period after decommissioning. This should be advised by the botanist</i>				
<i>All alien seedlings and saplings must be removed as they become evident for the duration of construction and during the operational phase. Manual / mechanical removal is preferred to chemical control</i>				
<i>All construction vehicles and equipment must be free of plant material before entering the site</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
High				

(k) Transport Impact

Traffic impacts anticipated to occur during the construction phase of the project are construction related traffic and noise and dust pollution.

Two location alternatives for the electrical infrastructure compound and two technology alternative for the BESS have been proposed. There is no difference in the impacts from a traffic perspective between the alternatives.

Table 7-35: SPH1: Traffic Impacts – Construction Phase

TRAFFIC IMPACT				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site</i>			
INDIRECT IMPACT	<i>Construction traffic on roads might generate dust and noise.</i>			
CUMULATIVE IMPACT	<i>Traffic delays on the surrounding road network.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue</i>	Slightly Detrimental	Definite

		<i>albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES		<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low negative		
PROPOSED MITIGATION MEASURES				
<i>Stagger component delivery to site;</i>				
<i>Reduce the construction period (if possible);</i>				
<i>Dust suppression of gravel roads (internal roads and the access road to the site) during the construction phase, as required.</i>				
<i>Regular maintenance of gravel roads (internal roads and the access road to the site) by the Contractor during the construction phase.</i>				
<i>The use of mobile batching plants and quarries in close proximity to the site (if available and feasible); and</i>				
<i>Staff and general trips should occur outside of peak traffic periods.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(I) Landscape and Visual Impact

Four visual impacts were identified for SPH1 during the construction, operational phase and decommissioning phase

- Landscape change
- Impact on Protected Areas
- Impact on local roads
- Impact on homesteads
- Light pollution

These impacts would all occur during the construction, operation and decommissioning phase. Impacts would peak once the facility is constructed, remain relatively constant during the operational phase and then decrease during the decommissioning phase.

For certain impacts the location alternatives for the electrical infrastructure compound are assessed separately in the tables below. The type of battery technology used in the BESS would not impact on the assessment of visual impacts and so the tables below cover both technology options.

Table 7-36: SPH1 Landscape change, both location alternatives for electrical infrastructure compound

LANDSCAPE CHANGE				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Change of character due to industrialisation of a Natural Landscape</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of landscape industrialisation due to other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Plan to maintain the height of structures as low as possible relative to existing ground levels;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
<i>Monitor areas for vegetation cover post-decommissioning and implement remedial actions.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				

High
NOTES
<ol style="list-style-type: none"> The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.

Table 7-37 Industrialization of the landscape as seen from Nielsview NR, with alternative electrical substation compound (alternative 1)

SPH1 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM NIELSVIEW NR, WITH PROPOSED ELECTRICAL INFRASTRUCTURE COMPOUND (ALTERNATIVE 1)				
PROJECT PHASE	Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.			
DIRECT IMPACT	Industrialisation of the view from Nielsview NR due to this project.			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Extension of industrialisation of views from Protected Areas due to this and other electrical infrastructure projects			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
Plan to maintain the height of structures as low as possible relative to existing ground levels;				
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;				
Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;				
Reinstate any areas of vegetation that have been disturbed during construction;				
Remove all temporary works;				
Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;				
Remove infrastructure not required for the post-decommissioning use of the site;				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	0	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
High				
NOTES				

1. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.
2. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.

Table 7-38 Industrialization of the landscape as seen from Nielsview NR, with alternative electrical substation compound (alternative 2)

SPH 1 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM NIELSVIEW NR, WITH ALTERNATIVE ELECTRICAL SUBSTATION COMPOUND (ALTERNATIVE 2)				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases</i>			
DIRECT IMPACT	<i>Industrialisation of the view from Nielsview NR due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from Protected Areas due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	0	<i>Negligible</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>	Negligible	Unlikely
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Plan to maintain the height of structures as low as possible relative to existing ground levels;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	0	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	0	<i>Negligible</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>	Negligible	Unlikely
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				
NOTES				
<ol style="list-style-type: none"> 1. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures. 2. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact. 				

Table 7-39 Industrialization of the landscape as seen from local roads, SPH1 with alternative electrical infrastructure compound (alternative 1)

INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL ROADS, SPH1 WITH ALTERNATIVE ELECTRICAL INFRASTRUCTURE COMPOUND (ALTERNATIVE 1)				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases</i>			
DIRECT IMPACT	<i>Industrialisation of the view from local roads due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from local roads due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Plan site levels to minimise earthworks to ensure that levels are not elevated;</i>				
<i>Plan to maintain the height of structures as low as possible;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Plan to protect existing natural site features such as drainage pans;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>Negligible</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
<ol style="list-style-type: none"> <i>The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i> <i>The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i> 				

Table 7-40 Industrialization of the landscape as seen from local roads, SPH1 with alternative electrical infrastructure compound (alternative 2)

INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL ROADS, SPH1 WITH ALTERNATIVE ELECTRICAL INFRASTRUCTURE COMPOUND (ALTERNATIVE 2)				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases</i>			
DIRECT IMPACT	<i>Industrialisation of the view from local roads due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from local roads due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-7	very low negative		
PROPOSED MITIGATION MEASURES				
<i>As Alternative 1</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	0	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
<p>3. <i>The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i></p> <p>4. <i>The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i></p>				

Table 7-41 Industrialization of the landscape as seen from local homesteads, with proposed electrical infrastructure compound (alternative 1)

SPH1 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL HOMESTEADS, WITH PROPOSED ELECTRICAL INFRASTRUCTURE COMPOUND (ALTERNATIVE 1)				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Industrialisation of the view from local homesteads due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from local homesteads due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Plan to maintain the height of structures as low as possible;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Construct / grow 2m high screen along SW and E edges of solar cluster closest to affected homesteads;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				

High
NOTES
<ol style="list-style-type: none"> 1. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures. 2. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.

Table 7-42 SPH 1 Industrialization of the landscape as seen from local homesteads, with alternative electrical infrastructure compound (alternative 2)

SPH1 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL HOMESTEADS, WITH ALTERNATE ELECTRICAL INFRASTRUCTURE COMPOUND (ALTERNATIVE 2)				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Industrialisation of the view from local homesteads due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from local homesteads due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Plan site levels to minimise earthworks to ensure that levels are not elevated;</i>				
<i>Plan to maintain the height of structures as low as possible;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Construct and/or plant 2m high screen along SW and E edges of solar cluster closest to affected homesteads;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	0	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		

SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
High				
NOTES				
<p>1. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</p> <p>2. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</p>				

Table 7-43 SPH 1 Light pollution, with proposed / alternative electrical infrastructure compound (alternatives 1 & 2)

SPH1 LIGHT POLLUTION , WITH PROPOSED / ALTERNATIVE ELECTRICAL INFRASTRUCTURE COMPOUND (ALTERNATIVES 1 & 2)				
PROJECT PHASE	Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.			
DIRECT IMPACT	Light pollution from the project spoiling the night time environment and nuisance to neighbors.			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Extension of light pollution due to this and other electrical infrastructure projects			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
Use low key lighting around buildings and operational areas that is triggered only when people are present;				
Utilise infra-red security systems or motion sensor triggered security lighting;				
Ensure that lighting is focused on the development with no light spillage outside the site;				
No tall mast lighting should be used;				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	0	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	0	Negligible	Negligible	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
<ol style="list-style-type: none"> The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact. 				

7.3.4 Operational Phase

(a) Agricultural Impact

During the operational phase, areas that where vegetation will remain cleared such as access routes, will remain at risk of soil loss through erosion. During the operation phase, staff and maintenance personnel will access the development area to maintain the infrastructure and make repairs, where required. Biodegradable detergents and water will be used to clean the panels, however this is not expected to result in impacts from an agricultural perspective. The assessment of these impacts are summarised in **Table 7-44** and **Table 7-45**.

Table 7-44 Impact significance of soil loss through erosion during the operation phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	<i>Operation Phase</i>			
DIRECT IMPACT	<i>Areas where soil surfaces will remain bare such as access routes and between PV arrays, will remain at risk of soil erosion.</i>			
INDIRECT IMPACT	<i>Eroded areas can expand into nearby areas and result in land degradation.</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil erosion.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>The development area, including internal access routes, as well as areas bordering on the development area, must regularly be monitored to detect early signs of soil erosion on-set.</i>				
<i>If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.</i>				
POST-MITIGATION				

DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-6	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
High				

Table 7-45 Impact significance of soil pollution during the operation phase

SOIL POLLUTION				
PROJECT PHASE	Operational phase			
DIRECT IMPACT	Soil pollution caused by oil and fuel spills or maintenance materials and domestic waste left on site. The replacement of electrolyte of the redox flow batteries, also pose soil pollution risk.			
INDIRECT IMPACT	Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health			
CUMULATIVE IMPACT	Increase in areas at risk of soil pollution			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-14	very low negative		
PROPOSED MITIGATION MEASURES				
Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills.				
No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area.				
Regularly monitor the BESS area for any signs of oil, grease and fuel spillage or the presence of waste.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-6	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the	Negligible	Unlikely

		<i>environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>	
SIGNIFICANCE	-6	very low negative	
CONFIDENCE LEVEL			
<i>High</i>			

(b) Aquatic Impact

During the operation phase, the solar arrays will operate largely unattended and with low maintenance required for more than 20 years. The hard surfaces created by the development may lead to increased runoff. This may lead to increased erosion and sedimentation of the downslope areas. A localised long-term impact (more than 20 years) of low intensity (depending on the distance between the solar arrays and the freshwater features) could be expected that would have a very low overall significance post-mitigation in terms of its impact on the identified aquatic ecosystems in the area.

The only potentially toxic or hazardous materials which would be present in relatively small amounts would be of lubricating oils and hydraulic and insulating fluids. Therefore, contamination of surface or groundwater or soils is highly unlikely.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low. The impacts are also rated the same for the location alternatives for the electrical infrastructure compound the battery technology options for the BESS.

Table 7-46: SPH1 Operational phase aquatic ecosystem impacts

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				

<i>Any disturbance during the operation phase should be limited to the approved development footprints and should avoid disturbance of the soil and natural vegetation cover.</i>				
<i>Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.</i>				
<i>Stormwater run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving developed areas.</i>				
<i>Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider. In a scenario where services are installed, these systems need to be adequately installed and maintained to prevent any potential contamination of the water resources on site.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

(c) Avifaunal Impact

(i) Bird fatality at PV facility

Bird fatalities could occur at the site through a number of mechanisms, including collision with PV panels, entanglement in perimeter fence (less likely since developer has chosen to use mesh panel fencing which has a tight weave and birds are less likely to become entangled), electrocution in substations/electrical compounds and others. The location alternatives for the electrical infrastructure compound and the battery technology options for the BESS are rated the same and are all covered in the same table.

Table 7-47: SPH1 bird fatality during operational phase

BIRD FATALITY AT PV FACILITY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Birds killed through various interaction with facility infrastructure</i>			
INDIRECT IMPACT	<i>--</i>			
CUMULATIVE IMPACT	<i>More projects will result in overall higher fatality rates in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the</i>	Slightly Detrimental	Unlikely

		<i>environment in such a way that natural, cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	<i>very low negative</i>		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any fatalities this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. Operational phase bird monitoring should be conducted for at least one year as per the best practice guidelines – see Section 8.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	<i>Slightly Detrimental</i>	<i>Unlikely</i>
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	<i>very low negative</i>		
CONFIDENCE LEVEL				
<i>Medium</i>				

(ii) Nesting & other use of facility infrastructure by birds

Certain species, in particular doves, pigeons, weavers and crows, are likely to use some of the facility infrastructure for nesting, perching and roosting. At face value this is a positive impact for birds and has been rated as VERY LOW POSITIVE significance both pre and post mitigation. However, where nesting interferes with the operation of the facility this could cause conflict and require management. Nesting on infrastructure also increases the likelihood of bird fatalities occurring through the various mechanism, particularly of young inexperienced birds. No mitigation is required for the impact of the facility on birds through nesting. For the impact of the birds nesting on the facility, the specialist recommends nest management on a case by case basis under the supervision of an avifaunal specialist, and in conformance with all relevant national and provincial legislation. The impact is rated the same for the electrical infrastructure location alternatives and the battery technology options for the BESS.

Table 7-48: SPH1 impact of bird nesting and other use of facility infrastructure by birds

BIRD NESTING, PERCHING & ROOSTING AT PV FACILITY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Birds use infrastructure to perch, roost or nest on</i>			
CUMULATIVE IMPACT	<i>More projects in the area will probably diminish the likelihood of this happening as perch availability will increase</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	7	very low positive		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any nesting which interferes with operations this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. All nest management measures should only be undertaken in compliance with national and provincial environmental legislation in this regard.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	7	very low positive		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

Day to day operation and maintenance of the facility may result in disturbance and displacement of bats. The impact is rated the same for the electrical infrastructure location alternatives and the battery technology options for the BESS.

Table 7-49: SPH1 disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	Disturbance of bats during operational activities			
INDIRECT IMPACT	Displacement			
CUMULATIVE IMPACT	Unavailability of suitable foraging resources in the broader environment for displaced individuals			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	<i>Slightly Detrimental</i>	<i>Unlikely</i>
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	very low negative		
PROPOSED MITIGATION MEASURES				
Limit operational and maintenance activities to daylight hours, as far as possible, and minimise lighting at night.				
All lighting should preferably use low pressure sodium and warm white LED lights.				
Operational and maintenance activities should be limited to the immediate project footprint only.				
Site access should be strictly controlled, to avoid unnecessary disturbance.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	<i>Slightly detrimental</i>	<i>Unlikely</i>
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-50: SPH1 bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during operational activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-28	<i>low negative</i>		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMPr				
<i>During operational & maintenance activities, avoid all movement and noise around medium sensitive areas.</i>				
<i>All lighting should preferably use low pressure sodium and warm white LED lights.</i>				
<i>Operational and maintenance activities should be limited to the immediate project area.</i>				
<i>Site access should be strictly controlled, to avoid unnecessary disturbance.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-7	<i>very low negative</i>		
CONFIDENCE LEVEL				
<i>Medium</i>				

(e) Botanical Impacts

Maintenance activities will require management of vegetation which may result in loss of natural vegetation. The impact is rated the same for the electrical infrastructure location alternatives and the battery technology options for the BESS.

Table 7-51: SPH1 loss of Western Free State Grassland during operational phase

LOSS OF VEGETATION				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Direct impact</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>Loss of Western Free State Clay Grasslands</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is the footprint as it only affects the area in which the proposed activity will occur.</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>When and where possible, vegetation clearing should be undertaken during the dry season.</i>				
<i>Only clear vegetation where absolutely necessary; and</i>				
<i>Stockpile areas for cleared vegetation will be decided and approved by the Project Manager and appointed ECO before construction commences on site and should not be located within drainage lines.</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-2	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(f) Groundwater Impact

Similar to the construction phase, the operational phase of the SPH1 will require approximately 2,000 m³/a (0.03 L/s). This does not exceed the regionally mapped yield of the underling aquifer (0.5 – 2.0 L/s). It is not currently planned to use groundwater for the operational phase of this project however if this changes a water use licence will need to be applied for and the potential impacts and mitigation measures are presented in **Table 7-52**.

The principal risks for groundwater contamination that have been identified are the use of cleaning agents for cleaning of PV panels and for dust suppression of internal roads. If required, it is encouraged that water alone is used to conduct these tasks. Alternatively, the PV cleaning agents and dust suppression mixes must be environmentally friendly and should breakdown naturally without causing ingress of harmful chemicals into the environment. The risks and status of groundwater contamination occurring during the operational phase of SPH1 is presented in **Table 7-56**.

The proposed development will require a BESS. Currently two different technologies are being considered, i.e. either Solid State Lithium Batteries (SSLB) or Vanadium Redox Flow Battery Energy Storage Systems (VRFB). Both of these two BESS systems require an electrolyte. The SSLB contain an ethylene carbonate or di-ethyl carbonate electrolyte and the VRFB system will require that an estimate of 3 000 m³ of sulfuric acid solution with vanadium ions electrolyte is stored on site for each Springhaas Facility. The BESS systems will also require cooling systems and these systems could potentially either be water based or it may be refrigerant based systems which used chemicals such as ethylene glycol- based coolants.

The containers that the BESS systems are held in are equipped with a “Clean agent” which is a fires suppression systems that can release a powder/gas into the container to snuff fires. These systems usually leave a residue on the equipment that will need to be cleaned off. With any chemical storage there is always a risk of chemical fires that will need to be put out with water or foam and the waste water from these activities could contain contaminants that should not be let to run off into the environment.

The fire safety systems, refrigerants, electrolyte solutions and the waste products produced from these systems could contaminate the soil and groundwater and all measures should be taken to prevent leaks or spills on the ground. The risks and mitigations for the BESS are presented in **Table 7-57**.

The impact on groundwater levels is rated the same for the electrical infrastructure location alternatives and the battery technology options for the BESS.

Table 7-52 SPH1: Impact of lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place)

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Lowering of groundwater level due to over abstraction</i>			
INDIRECT IMPACT	<i>Drying of springs in the area</i>			
CUMULATIVE IMPACT	<i>Permanent damage to the aquifer system in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	<i>low – negative</i>		
PROPOSED MITIGATION MEASURES				
<i>If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring.</i>				
<i>Adhere to the borehole's safe yield and to monitor water levels and flow.</i>				
<i>Groundwater abstraction volumes must be monitored.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-53: SPH1 Impact of contamination of groundwater as a result of cleaning agents used for cleaning the solar panels

Potential impact on groundwater as a result of cleaning agents used for cleaning the solar panels.				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Contamination of groundwater</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long-term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	<i>low - negative</i>		
PROPOSED MITIGATION MEASURES				
<i>Use environmentally safe cleaning agents that breakdown naturally (biodegradable detergents/green soaps) and that will not cause adverse effects.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Redox flow batteries contain electrolyte solution which needs to be replaced approximately every 15 to 20 years. During replacement of electrolyte there is a risk of leaks or spills. This impact is only applicable to the redox flow batteries as lithium-ion batteries are solid state batteries.

Table 7-54 Impact table for contamination of groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)

Potential impact on groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Contamination of groundwater</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long-term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or Communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	<i>low - negative</i>		
PROPOSED MITIGATION MEASURES				
<i>Ensure that all electrolyte or chemicals stored or used on site have secondary containments systems in place with reliable leak detection, annunciation in place. Ensure that all chemicals are handled on concrete bunded surfaces and not on bare soil.</i>				
<i>Any waste products produced from the BESS systems should be removed and disposed of appropriately. Waste water produced by fire hydrants should not be allowed to runoff into the environment.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to the cultural landscape

Because any physical impacts to the landscape would already have occurred during the construction phase, landscape impacts during operation of SPH1 relate only to the presence of the facility in what is otherwise a rural landscape. Impacts to the cultural landscape will occur during the operation phase and last as long as the lifetime of the facility. Because of the flat terrain, the impacts would not be experienced over great distances because intervening vegetation and buildings would offer partial screening. Nonetheless, the immediately surrounding area will experience a degree of change in landscape character and sense of place. The impact significance is rated to low negative before mitigation. The impacts are the same for the location alternatives for the electrical infrastructure compound and the technology options for the batteries for the BESS.

Table 7-55: SPH1: Assessment of operation phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Operation Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the presence of a solar energy facility</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being present</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Keep all maintenance work within the authorised footprint.</i>				
<i>Minimise night-time light pollution in the area (visual recommendations to be followed to achieve this).</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(h) Socio-Economic Impact

(i) Stimulation of the Local Economy during operations

The operational period of SPH1 is a minimum of 20 years. Of the money spent annually during the operations period, a significant portion will likely comprise of salaries and wages of the Springhaas employees. The operations of the facility will make some contribution towards the growth of the local economy, as it will increase the size of the local electricity sector, as well as stimulate the demand for other sectors' services and goods such as water, transportation, and trade.

No differentiation can be made between the location alternatives for the electrical infrastructure compound and battery technology for the BESS. All alternatives are considered in **Table 7-56** and **Table 7-57**.

Table 7-56: SPH1 Assessment of Economic stimulation during operations

STIMULATION OF THE LOCAL ECONOMY DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Long-term increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				
<i>Where feasible, procure goods and services required for the operation of the plant from the local economy</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	16	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue</i>	Moderately Beneficial	Definite

		<i>albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>	
SIGNIFICANCE	48	moderate positive	
CONFIDENCE LEVEL			
<i>High</i>			

(ii) Creation of Employment and increased household income during operations

The operation of SPH1 will require functional and maintenance employees. It is envisaged that about eight direct jobs per facility will be created during the operations phase, which will occur for a duration of 20 years. About 70% of these jobs are to be filled by people from the local communities as they will be low-skilled employment opportunities. Employment of the eight individuals for the entire operational period will increase their household income, improve their standard of living and benefit their families.

SPH1 will create the same number of employment opportunities, regardless of its location on the site; thus, layout alternatives are equally preferred. The type of battery used in the BESS will also not significantly affect employment alternatives, thus both technology alternatives are equally preferred.

Table 7-57: SPH1 Assessment of employment during operations

CREATION OF EMPLOYMENT AND INCREASED HOUSEHOLD INCOME DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Creation of permanent employment opportunities in the local and regional economy</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of permanent employment opportunities in the region</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				
<i>Where feasible, aim to fill all the positions by labour from the local community</i>				
POST-MITIGATION				

DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	24	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Improved municipal service delivery

SPH1 will have a capacity of up to 250MWac and will be connected to the national grid through Eskom substation and generated electricity will be sold nationwide. The proposed project, albeit relatively small, will contribute towards improving National electricity availability; thus, improving the government service delivery, and could potentially also aid in growing the local economy by increasing the overall supply of electricity in the local economy. Furthermore, due to the taxes and rates that will be paid by the project to the municipality, the revenue of the latter will be increased, thus allowing it to improve the service delivery in other areas.

The layout alternatives and BESS technology alternatives will not affect the capacity of the solar facility; thus all alternatives are equally preferred.

Table 7-58: SPH1: Assessment of service delivery improvement

IMPROVED MUNICIPAL SERVICE DELIVERY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>It will likely Improve the local electricity supply if fed to the grid</i>			
INDIRECT IMPACT	<i>Improved standard of living within the region</i>			
CUMULATIVE IMPACT	<i>Improved electricity availability</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	16	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified</i>	Moderately Beneficial	Definite

		<i>way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>	
SIGNIFICANCE	48	<i>moderate positive</i>	
PROPOSED MITIGATION MEASURES			
<i>No mitigations proposed</i>			

(i) Reduction of Land Area available for productive farming

The proposed site of SPH1 and surrounding land is currently used for small-scale livestock. The agricultural assessment classified the majority of SPH1 as being of low to very low agricultural potential with small isolated patches of low – moderate and moderate potential land on the edges of the facility. The farmers with livestock on the land proposed for the facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH1 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant’s footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project’s construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH1.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant differentiation among site layout alternatives can be made. The footprint of the BESS will be the same regardless of which battery technology is used. There is therefore no difference in the impact between the two technology alternatives.

Table 7-59: SPH1: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural,</i>	Negligible	Definite

		<i>cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(i) Terrestrial Biodiversity and Animal Species

(i) Direct Impacts – Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death.

Regarding the technology alternative for the type of battery used in the BESS for SPH1, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place. The impact ratings will be same irrespective of the layout alternatives of the electrical infrastructure compound.

Table 7-60: SPH1 Injury or death to fauna

ALL FACILITIES				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Injury or death to fauna</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-32	low negative		
PROPOSED MITIGATION MEASURES				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by maintenance staff</i>				
<i>To prevent possible collisions with animals, drivers of maintenance vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				
<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>Adequate fire prevention and safety measures must be in place. A fire emergency management plan must be in place</i>				
<i>All electrical equipment must be maintained on a regular basis to minimise the risk of fire</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Indirect Impacts – Pollution and contamination of natural areas

During operations, release of grey water into the environment can cause contamination by detergents. Grey water from cleaning of the solar panels has the potential to contaminate soils and ground water and be washed into the nearby natural pans during high rainfall events. This includes biodegradable detergents used for cleaning the panels, which can accumulate in the soil and be washed into the nearby pans before they break down. Biodegradable detergents can alter the balance of freshwater ecosystems as they promote bacterial growth and lower oxygen levels. The impacts are rated the same for both location alternatives for the electrical infrastructure compound and the battery technology alternatives for the BESS.

Table 7-61: SPH1 Pollution and contamination of natural areas

POLLUTION AND CONTAMINATION OF NATURAL AREAS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas – no nearby pans or wetlands</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-28	low negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee operational phase activities at a minimum every 6 months for the first 5 years and then yearly for the rest of the life of the facility</i>				
<i>If possible, panels should be cleaned using water that is clear of detergents only (e.g. potable water or borehole water). The use of grey water should be avoided. Should the need arise to clean the panels with detergents, then biodegradable detergents are preferred. Care must be taken not to allow the detergents to accumulate in the soil</i>				
<i>All maintenance vehicles must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by maintenance staff must be prohibited</i>				
<i>Appropriate solid waste disposal and ablution facilities must be provided for operational staff</i>				
<i>Adequate prevention and safety measures must be in place to avoid leaks to batteries. This includes regular maintenance and replacement of batteries in a timeous manner. Measures must be in place to prevent chemicals leaking into the soil, should damage to the battery occur</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1

EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
High				

(iii) Indirect Impacts – Disturbance and displacement of fauna

Security lights for SPH1 during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The impacts are rated the same for both location alternatives for the electrical infrastructure compound and the battery technology alternatives for the BESS.

Table 7-62 SPH1: Disturbance and displacement of fauna

DISTURBANCE AND DISPLACEMENT OF FAUNA				
PROJECT PHASE	Operational Phase			
DIRECT IMPACT				
INDIRECT IMPACT	Disturbance to and displacement of fauna – natural grassland			
CUMULATIVE IMPACT	Displacement of fauna			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-16	2
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-32	low negative		
PROPOSED MITIGATION MEASURES				
Operations during the night must be avoided to minimise the need for artificial lighting and to reduce the impact of light and noise on nocturnal animals				
Lighting during operations should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects, such as low-pressure sodium lamps, is preferred				

Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light

POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
High				

(j) Traffic Impact

During the operational phase there will be approximately 8 full time employees on site. Vehicles would access the site for daily operations and maintenance as and when required. The impacts are rated the same for both location alternatives for the electrical infrastructure compound and the battery technology alternatives for the BESS.

Table 7-63 SPH1: Traffic impacts during operation phase

TRAFFIC IMPACTS				
PROJECT PHASE	Operational Phase			
DIRECT IMPACT	Traffic congestion due to the trips generated by the operation of the facility			
INDIRECT IMPACT	The associated noise and dust pollution			
CUMULATIVE IMPACT	Traffic delays on the surrounding road network			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible		
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.	Negligible	Definite
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
Staff and maintenance trips should occur outside of peak traffic periods; and Client/Facility Manager is to ensure that regular maintenance of gravel roads (located within the site boundary, including the access road to the site) occurs during operation phase to minimise/mitigate dust pollution.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		

SEVERITY	0	<i>Negligible</i>	<i>Negligible</i>	<i>Definite</i>
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
<i>High</i>				

7.3.5 Decommissioning Phase

Upon completion of the operational phase of the project which will last in excess of 20 years the facilities may be decommissioned. Decommissioning activities would entail removal of infrastructure from site and return of the site to a state similar to the pre-construction condition. The decommissioning impacts would not vary significantly between facilities and so all seven facilities are covered **Section 7.7**.

7.3.6 No-Go Alternative

The no-go alternative refers to the option of not developing the facility. The impact assessment for the no-go alternative is the same for all 7 facilities and is covered in **Section 7.8**.

7.3.7 Cumulative Impacts

The cumulative impact considers the development of all seven Springhaas solar PV facilities in addition to the other projects which are proposed within 30km of the facility.

The cumulative impacts were rated the same for each of the 7 solar PV facilities. The cumulative impact assessment is available in **Section 7.9**.

7.3.8 Impact Summary

A large number of impacts have been identified through the basic assessment process. These are summarised in **Table 7-6** below for ease of reference. The impacts apply to the location alternative of the electrical infrastructure compound and the battery technology options unless stated otherwise.

Table 7-64: SPH1 impact summary

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Design/Planning/Pre-Construction Phase			
No impacts identified			
Construction Phase			
Agricultural impacts			
Land use change from livestock farming to energy generation	Negative	Moderate	Low
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance and water quality impacts	Negative	Very low	Very low
Avifaunal impacts			
Destruction of bird habitat during construction	Negative	Moderate	Low
Disturbance of birds during construction	Negative	Very low	Very low
Bat impacts			
Bat habitat modification	Negative	Very low	Very low
Disturbance and displacement of bats	Negative	Very low	Very low
Possible roost disturbance	Negative	Low	Very low
Bat roost destruction	Negative	Low	Very low
Botanical impacts			
Loss of vegetation	Negative	Medium	Low
Groundwater impacts			
Lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place)	Negative	Low	Very low
Contamination of groundwater as a result of accidental oil spillages or fuel leakages	Negative	Very low	Very low
Heritage impacts			
Impact on archaeological sites	Negative	Very low	Very low
Impact on graves	Negative	Low	Very low
Impact on cultural landscape	Negative	Low	Low
Palaeontological impacts			
Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-economic impacts			
Stimulation of the economy during construction	Positive	Low	Low
Employment opportunities	Positive	Low	Low
Reduction in land available for productive farming	Negative	Very low	Very low
Loss of property	Negative	Low	Very low
Terrestrial biodiversity and animal species (faunal) impacts			
Destruction of faunal habitat	Negative	High	Low
Injury or death to fauna	Negative	Moderate	Very low
Pollution and contamination of natural areas			
Disturbance and displacement of fauna – edge effects	Negative	Low	Very low
Spread of invasion by alien vegetation	Negative	Moderate	Very low
Traffic impacts			
Traffic congestion	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change (both electrical infrastructure compound location alternatives)	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve with proposed electrical infrastructure compound (alternative 1)	Negative	Very low	Very low

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Industrialisation of the landscape as seen from Nielsview Nature Reserve with proposed electrical infrastructure compound (alternative 2)	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads, with alternative electrical infrastructure compound (alternative 1)	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads, with alternative electrical infrastructure compound (alternative 2)	Negative	Very low	Very low
Industrialisation of the landscape as seen from local homesteads, with proposed electrical infrastructure compound (alternative 1)	Negative	Moderate	Very low
Industrialisation of the landscape as seen from local homesteads, with proposed electrical infrastructure compound (alternative 2)	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
Operational Phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Soil pollution	Negative	Very low	Very low
Aquatic impacts			
Increased run-off, pollution	Negative	Very low	Very low
Disturbance of aquatic habitat; water quality impacts	Negative	Very low	Very low
Avifauna impacts			
Bird fatality through interaction with infrastructure	Negative	Very low	Very low
Nesting and use of other infrastructure by birds	Positive	Very low	Very low
Bat impacts			
Disturbance and displacement	Negative	Very low	Very low
Roost disturbance	Negative	Low	Very low
Botanical impacts			
Loss of vegetation	Negative	Very low	Very low
Groundwater impacts			
Lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place).	Negative	Low	Very low
Contamination of groundwater from use of cleaning agents	Negative	Low	Very low
Contamination of groundwater from leaks or spills from BESS	Negative	Low	Very low
Heritage impacts			
Impact on cultural landscape	Negative	Low	Low
Socio-economic impacts			
Economic stimulation during operations	Positive	Low	Moderate
Employment opportunities	Positive	Low	Low
Improved service delivery	Positive	Moderate	Moderate
Reduction in land available for productive farming	Negative	Very low	Very low
Terrestrial biodiversity and animal species			
Injury or death of fauna	Negative	Low	Very low
Pollution and contamination of natural areas - no nearby pans or wetlands	Negative	Low	Very low
Disturbance and displacement of fauna	Negative	Low	Very low
Traffic impact			
Traffic congestion	Negative	Very low	Very low

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Palaeontological impacts			
Destruction of fossils	NA	NA	NA
Decommissioning phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance of aquatic habitat, water quality impacts	Negative	Very low	Very low
Avifaunal impacts			
Disturbance of birds	Negative	Very low	Very low
Bat impacts			
Disturbance and displacements	Negative	Very low	Very low
Botanical impacts			
Loss of vegetation	Negative	Low	Low
Groundwater			
Contamination from construction activities	Negative	Very low	Very low
Heritage impacts			
Alteration of the rural landscape character through the presence of construction equipment and vehicles and all the associated activities on site	Negative	Low	Very low
Palaeontological impacts			
Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-Economic impacts			
Impact on the economy	Positive	Very low	Very low
Creation of temporary employment opportunities in the local and regional economy	Positive	Very low	Very low
Terrestrial biodiversity and animal species			
Destruction of novel ³ faunal habitat (i.e. grassed areas under the panels where fauna may recolonise after construction)	Negative	Moderate	Very low
Injury or death to animals (due to collisions with construction vehicles or destruction of burrows that have established under the panels)	Negative	Moderate	Very low
Pollution and contamination of natural areas including pans and wetlands	Negative	Moderate	Very low
Disturbance to and displacement to fauna and edge effects – natural grassland	Negative	Low	Very Low
Increased potential of invasion by alien vegetation	Negative	Moderate	Very low
Reestablishment of movement corridors through the landscape due to removal of fences and return to open grassland	Negative	Very low	Low positive
Traffic impacts			
Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change (both electrical infrastructure compound location alternatives)	Negative	Moderate	Low

³ Novel habitats are human-built, modified, or engineered niches in places that have been altered in structure and function by human activity

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Industrialisation of the landscape as seen from Nielsview Nature Reserve with proposed electrical infrastructure compound (alternative 1)	Negative	Very low	Very low
Industrialisation of the landscape as seen from Nielsview Nature Reserve with proposed electrical infrastructure compound (alternative 2)	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads, with alternative electrical infrastructure compound (alternative 1)	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads, with alternative electrical infrastructure compound (alternative 2)	Negative	Very low	Very low
Industrialisation of the landscape as seen from local homesteads, with proposed electrical infrastructure compound (alternative 1)	Negative	Moderate	Very low
Industrialisation of the landscape as seen from local homesteads, with proposed electrical infrastructure compound (alternative 2)	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
No-Go Alternative			
Agricultural	Negative	Very low	Very low
Aquatic	Negative	-	Very low-negligible
Avifauna	Negative	Very low	Very low
Bats	Negative	Very low	Very low
Botanical	Negative	Low	Low
Heritage	Negative	Very low	Very low
Transport- Traffic congestion	Negative	Very Low	Very Low
Terrestrial biodiversity and animal species	Negative/positive	Low negative	Very low positive
Socio-economic	NA- no impact, forgone + impacts	NA	NA
Destruction of fossils	NA	NA	NA
Landscape and Visual	Negligible	No impact/NA	No impact/NA
Groundwater Impacts	Negligible	NA	NA
Cumulative impacts			
Agricultural	Negative	Very low	Very low
Aquatic	Negative	Low	Low
Avi-fauna	Negative	Moderate	Moderate
Bats	Negative	Moderate	Moderate
Botanical	Negative	Very low	Very low
Heritage	Negative	Moderate	Low
Socio-economic - Impact on the economy- construction	Positive	-	Moderate
Socio-economic -Creation of employment during construction	Positive	-	Moderate
Socio-economic -Reduction in land available for productive farming	Negative	-	Low
Socio-economic -Stimulation of the economy – operations	Positive	-	Moderate
Socio-economic -Employment - operations	Positive	-	Moderate
Socio-economic -Improved municipal service delivery	Positive	-	Moderate
Socio-economic -Loss of property	Negative	-	Low
Socio-economic - Stimulation of economy - decommissioning	Positive	-	Very low

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Terrestrial biodiversity	Negative	High	Moderate
Transport	Negative	Low	Very Low
Landscape and visual	Negative	-	Low
Destruction of fossils	NA	NA	NA
Groundwater: Aquifer system and water quality	Negative	Low- Very Low	Low – Very Low

7.4 Springhaas 3 Detailed Impact Assessment

7.4.1 Alternatives Considered

(a) Location Alternatives

Two location alternatives were considered for the temporary laydown area for SPH3.

(b) Technology Alternatives

Two technology alternatives namely lithium-ion and redox flow batteries were considered for the BESS.

(c) No-Go Alternative

The no-go alternative was considered for all seven of the proposed facilities. The impact of the no-go alternative was rated as the same for all seven facilities. The no-go alternative is assessed in **Section 7.8**.

7.4.2 Pre-construction phase

No significant impacts for the pre-construction phase have been identified by any specialist studies or by the EAP for SPH3.

7.4.3 Construction Phase

(a) Agricultural Impact

The most significant agricultural impacts associated with the development of SPH3 will occur during the construction phase when the site is fenced off, vegetation is removed and the soil surface is prepared for the installation of infrastructure.

The footprint of SPH3 contains small sections of moderate sensitivity agricultural land and the start of the main access road crosses a small medium sensitivity land. These patches are small and isolated from other areas of viable production. The loss of these areas of moderate sensitivity land are therefore considered the same as the loss of low sensitivity areas.

SPH3 was also classified in terms of agricultural potential. The majority of the site is classified as low to very low potential. There is one patch of low- moderate potential land and three areas of moderate potential land, one of which is located at the start of the main access road. As these patches of low- moderate and moderate potential agricultural land are isolated from larger patches of moderate sensitivity land they are not viable from a production perspective.

Tables 7-8 – 7-11 cover both location alternatives for the temporary laydown area and the two technology options for the BESS. There was no difference in the alternatives proposed from an agricultural perspective.

Table 7-65: SPH3: Impact of land use change from livestock farming to renewable energy generation

LAND USE CHANGE FROM LIVESTOCK FARMING TO ENERGY GENERATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Construction of boundary fence and PV infrastructure will change land use from livestock farming to renewable energy generation</i>			
INDIRECT IMPACT	<i>Intensification of agriculture in other areas or otherwise reduction of livestock produced in the area</i>			
CUMULATIVE IMPACT	<i>Increase in areas where agriculture is converted into other land uses</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Springhaas Solar Facility 3 (Pty) Ltd must provide market-related compensation that will allow the current land users to have the same or better ability to sustain their livelihood.</i>				
<i>Ensure that the final infrastructure layout remains within the fenced off area of the development footprint.</i>				
<i>Prior arrangements must be made with the landowners to ensure that livestock and game animals are moved to areas where they cannot be injured by vehicles traversing the area.</i>				
<i>The use of main access routes by construction vehicles and equipment must do so with consideration of nearby agricultural land users who use the same access routes for farming activities.</i>				
<i>All left-over construction material must be removed from site once construction on a land portion is completed.</i>				
<i>No materials removed from development area must be allowed to be dumped in nearby livestock farming areas.</i>				
<i>No boundary fence must be opened without the landowners' permission.</i>				
<i>No open fires made by the construction teams are allowable during the construction phase.</i>				

POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-66: SPH3: Impact significance of soil loss through erosion during the construction phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Loss of soil particles from areas where construction activities result in the removal of vegetation from the surface.</i>			
INDIRECT IMPACT	<i>Sparse to no vegetation growth in eroded areas.</i>			
CUMULATIVE IMPACT	<i>Increase in areas exposed to soil erosion</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-18	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-3	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Limit vegetation removal from the soil surface to the areas of infrastructure development such as access routes as well as around the foundations of the PV arrays and buildings.</i>				
<i>Vegetation clearance must only be undertaken immediately prior to construction activities and only within the development footprint</i>				

<i>Once construction of an area has been completed, level any remaining soil removed from excavation pits (where the PV arrays will be mounted) that remained on the surface, instead of allowing small stockpiles of soil to remain on the surface where it is exposed to rain and wind. This is applicable to all construction areas, except where topsoil stockpiles must remain for site rehabilitation of specific areas.</i>				
<i>Stormwater channels on site must be designed to minimise the soil erosion risk that results from surface water runoff.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-67: SPH3: Impact significance of impaired soil functionality caused by compaction

IMPAIRED SOIL FUNCTIONALITY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>The weight and movement of vehicles and equipment over the surface will result in soil compaction.</i>			
INDIRECT IMPACT	<i>Compacted soil have reduced pore space and water infiltration rate. Compacted soil surfaces increase the rate of surface water runoff, especially after a rainfall event.</i>			
CUMULATIVE IMPACT	<i>Increase in areas affected by soil compaction.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-18	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Only allow vehicles and equipment to travel on designated access routes and not anywhere else within the development area.</i>				
<i>Use existing main access routes and internal farm roads where possible and avoid using other areas in the site as temporary access routes.</i>				

<i>Vehicles and equipment must park in designated parking areas.</i>				
<i>Materials must be off-loaded and stored in designated laydown area.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season as wet soil compacts easily as opposed to dry soil.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-68: SPH3: Impact significance of impaired soil health as a result of soil pollution

IMPAIRED SOIL HEALTH				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Soil pollution can be caused by oil and fuel spills from vehicles and equipment as well as domestic and material waste on site. Should the vanadium redox flow batteries be used for the BESS, spillage of corrosive and environmentally toxic electrolyte is possible. In the case that lithium solid state containerised batteries are used, there is a possibility of thermal runaway that will result in the release of toxic and flammable gasses.</i>			
INDIRECT IMPACT	<i>Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health.</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil pollution.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-21	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>Maintenance must be undertaken regularly on all vehicles and construction equipment to prevent hydrocarbon spills.</i>				
<i>Any waste generated during construction must be stored into designated containers and removed from the site by the construction teams.</i>				
<i>Any left-over construction materials must be removed from the development area.</i>				

<i>The development area must be monitored by the Environmental Control Officer (ECO) to detect any early signs of fuel and oil spills and waste dumping. The ECO must also report any spills from batteries.</i>				
<i>Ensure battery transport and installation is undertaken by accredited staff and contractors.</i>				
<i>Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(b) Aquatic Impact

Construction phase activities would result in disturbance of soil and clearing of vegetation. Water quality impacts may occur from batching of concrete on site, hydrocarbon spills and other construction activities.

Two location alternatives are proposed for the temporary laydown area for SPH3. As both are located beyond aquatic habitats there is no difference between the two options in terms of impacts on aquatic biodiversity.

Two technology options are proposed for the BESS. As the electrical infrastructure compound which contains the BESS in SPH3 is located beyond any aquatic environments there is no difference in the two options in terms of impacts on aquatic biodiversity.

Table 7-69: SPH3: Impact of aquatic ecosystems during the construction phase

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON	0	<i>No irreplaceable resources will be impacted.</i>		

IRREPLACEBLE RESOURCES				
SIGNIFICANCE	-4	Very low negative		
PROPOSED MITIGATION MEASURES				
<i>A buffer of at least 250 m between the significant aquatic ecosystems (larger pans) and all the proposed project activities should be maintained (noting that this is already honoured in the proposed layout for all facilities).</i>				
<i>Clearing of indigenous vegetation should not take place within the aquatic features and the recommended buffers, while retaining the topography and cover vegetation within the wider drainage areas through the site is preferred to reduce the potential modification to the way in which water drains through these areas.</i>				
<i>The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance.</i>				
<i>During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills. The solar panels will be washed with water and a biodegradable/ greendetergent.</i>				
<i>Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.</i>				
<i>Development within the drainage areas, where located within a proposed facility, will however need to consider stormwater management measures and should avoid impacting on the movement of water through the more seasonally wet areas. Minimal disturbance to the topography and cover vegetation in these areas is recommended.</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-2 very low negative			
CONFIDENCE LEVEL				
<i>High</i>				

(c) Avifaunal Impact

(i) Habitat destruction associated with the construction of the facility

Habitat destruction and alteration will occur during the construction phase of SPH1. The majority of the development footprint would be transformed from its current state to a renewable energy facility. SPH3 will transform approximately 225ha of habitat. Most of this is in a fairly natural state currently, or in the case of arable lands is still accessible and useable for birds foraging.

Table 7-70: SPH3: Formal rating of destruction of bird habitat during construction

DESTRUCTION OF BIRD HABITAT DURING CONSTRUCTION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Transformation of natural habitat into PV facility</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Yes - Larger area transformed from natural habitat</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low – negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required. Impact avoidance has already been implemented in the design phase through the adherence to no-go buffers around pans.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Disturbance of birds & displacement effects

Disturbance of avifauna during the construction (and thereafter during maintenance and operational and decommissioning) of the facility and all development alternatives and associated infrastructure is likely to occur. Disturbance of breeding birds is typically of

greatest concern. In this regard any breeding sites of sensitive bird species would be the most important. It is noted that no breeding sites have been identified on site at this stage.

There is no difference between the location and technology options in terms of disturbance and displacement of birds.

Table 7-71: SP3: Formal rating of disturbance of birds during construction

PROJECT PHASE	<i>Construction phase & operations phase to lesser extent</i>			
DIRECT IMPACT	<i>Birds disturbed from their normal activities through the increased noise and activity levels associated with construction</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>More projects will result in overall higher disturbance levels</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required as there are no particularly sensitive features identified (such as breeding sites). General good environmental practice should be implemented during construction in terms of control of vehicles, staff, minimising the impact on the receiving environment as much as possible.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

SPH3 does not overlap any medium or high sensitivity areas from bat perspective. During the construction of SPH3 habitat modification would occur, disturbance and displacement of bats may occur and bat roosts may be disturbed or destroyed.

Two location alternatives for the temporary laydown areas are under consideration for SPH3. The alternatives are both located similar habitats and do not overlap any sensitive features for bats. As such, both alternatives are equally acceptable. Two technology options are under consideration for the BESS. For bat impacts the type of technology used for the BESS is not considered relevant. Both technology options are considered equally acceptable.

Table 7-72: SPH3: Bat habitat modification

IMPACT ON POSSIBLE HABITAT MODIFICATION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Modification of habitat through the removal of vegetation cover and water sources</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Loss of foraging resources for local bat population</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
PROPOSED MITIGATION MEASURES				
<i>This impact may be reduced by limiting the removal of vegetation and available water sources, as far as possible.</i>				
<i>Avoid all high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should the currently assessed layout change, a bat specialist must confirm, that these high sensitive areas have been adequately avoided.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential additional sensitive habitats, to confirm the baseline environment, if construction does not take place within 5 years of the initial bat study.</i>				
<i>Following construction, rehabilitation of all disturbed areas, inclusive of that beyond permanent infrastructure footprints, (e.g. temporary access tracks and laydown areas) must be undertaken.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-73: SPH3: Disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Disturbance of bats during construction activities</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable foraging resources in the broader environment for displaced individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Limit construction activities to daylight hours only and minimise lighting at night, as far as possible.</i>				
<i>Avoid high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should the currently assessed layout change, a bat specialist must confirm, that these high sensitive areas have been adequately avoided.</i>				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-74: SPH3: Bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during construction activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected</i>	Slightly Detrimental	Likely

		<i>environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>		
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-20	low negative		
PROPOSED MITIGATION MEASURES				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.</i>				
<i>If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-75: SPH3: Bat Roost destruction

IMPACT OF POSSIBLE ROOST DESTRUCTION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Destruction of potential bat roosting features</i>			
INDIRECT IMPACT	<i>Reduction of available roosting sites and/or Mortality</i>			
CUMULATIVE IMPACT	<i>Insufficient roosting resources to support the local population and potential increased bat mortality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-	Very low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMPr				
<i>Avoid the destruction or removal of existing farmsteads and trees, as far as possible.</i>				

<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.</i>				
<i>If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.</i>				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

(e) Botanical Impacts

The development of SPH3 would result in extensive but localized loss of relatively undisturbed (unploughed but grazed) Western Free State Clay Grasslands.

The shade effect of the panels on the grassland vegetation is not known and it not easily predicted. There will be space under the panels for grass and other plants to grow. However, the microclimate is likely to be different to that of open grassland, so a different suite of plant species is likely to colonize the space under the solar panels.

Two location alternatives for the temporary laydown area are proposed for SPH3 and two technology options for the BESS. The location and technology alternatives will make no difference on the botanical impact assessment and as such these alternatives are covered in the **Table 7-19**.

Table 7-76: SPH3: Impact of loss of Western Free State Clay Grassland

LOSS OF VEGETATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Removal of natural vegetation: Western Free State Clay Grasslands</i>			
INDIRECT IMPACT	<i>None determined</i>			
CUMULATIVE IMPACT	<i>Loss of Western Free State Clay Grasslands</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term.</i>	-15	3
EXTENT	3	<i>The impacts will be localized to the designated target areas.</i>		
SEVERITY	-2	<i>The severity of the potential impact will be moderate negative.</i>	Moderately Detrimental	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-45	medium - negative		
PROPOSED MITIGATION MEASURES				
<p>The first mitigation measures necessary would be the relocation of <i>Ammocharis coronica</i> bulbs if they cannot be avoided. Ideally the bulb should be lifted when they are dormant (winter) but that would mean traversing the entire area of the SPH sites in the preceding summer and marking every occurrence of these plants. A more practical approach would be to unearth the bulbs during the construction phase and relocating and planting them soon after removal.</p> <p>Secondly, all areas that are disturbed during construction and that are not needed during the operational phase should be rehabilitated, using natural grasses that occur in the area. It would be possible for some grasses and forbs to survive under the panels, but it is difficult to predict the extent of such growth, nor which plant species would grow effectively under the panels.</p>				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last at least 5 years and therefore it is considered to be Long Term.	-5	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
High				

(f) Groundwater Impact

The water required during the construction phase of SPH3 is approximately 9,000m³ per year. The water requirement lies well within the yield potential of the underlying fractured rock aquifer (i.e. 0.5 – 2.0 L/s). It must be noted that at present the use of groundwater is not proposed however if this changes the potential impacts of groundwater abstraction are shown in **Table 7-20**.

Earthmoving plant and/or construction vehicles will be used on site during the construction phase. Use of vehicles presents a risk of groundwater contamination by fuel and oil leakage.

Two location alternatives for the temporary laydown area and two technology options (lithium-ion vs redox flow batteries) were considered for SPH3. The alternatives considered are equally preferred.

Table 7-77: SPH3: Impact table for the lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place).

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Lowering of groundwater level due to over abstraction</i>			
INDIRECT IMPACT	<i>Drying of springs in the area</i>			
CUMULATIVE IMPACT	<i>Permanent damage to the aquifer system in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
<i>DURATION</i>	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-14	2
<i>EXTENT</i>	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
<i>SEVERITY</i>	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
<i>IMPACT ON IRREPLACEBLE RESOURCES</i>	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-28	low - negative		
PROPOSED MITIGATION MEASURES				
<i>If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring. Adhere to the borehole’s safe yield and to monitor water levels and flow.</i>				
<i>Groundwater abstraction volumes must be monitored.</i>				
POST-MITIGATION				
<i>DURATION</i>	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	0	1
<i>EXTENT</i>	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
<i>SEVERITY</i>	0	<i>Negligible</i>	Negligible	Unlikely
<i>IMPACT ON IRREPLACEBLE RESOURCES</i>	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
Medium				

The main risk associated with the construction phase is groundwater contamination from the use of construction vehicles and heavy machinery on-site.

Table 7-78: SPH3: Impact of contamination of groundwater as a result of accidental oil spillages or fuel leakages during the construction and decommissioning phases.

Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages				
PROJECT PHASE	Construction and Decommissioning Phase			
DIRECT IMPACT	Groundwater contamination			
INDIRECT IMPACT	Damage to the vegetation or ecosystem in the area			
CUMULATIVE IMPACT	Long term reduced groundwater quality			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-5	2
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Likely
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-10	very low negative		
PROPOSED MITIGATION MEASURES				
Vehicles must be maintained regularly and kept in a good working order. Dirty water should be captured, to be re-used where possible. No dirty water is allowed to be discharged into the surrounding environment.				
No heavy equipment or vehicles to be left in excavation area when not in use. Drip trays to be used under stationary vehicles and machinery where possible.				
POST-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-4	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
Medium				

(g) Heritage Impact

(i) Impacts to archaeological resources

Impacts to archaeological resources at SHP3 are limited to the possible destruction of isolated background scatter artefacts which have very low to no cultural significance. Impacts will be

direct and permanent but because of the low cultural significance the severity is very low negative.

Two location alternatives were considered for the temporary laydown area, neither of the footprints contain heritage resources. As such, both are equally preferred.

Two technology alternatives were considered for the battery technology for the BESS. Both technology options are equally preferred.

Table 7-79: SPH3: Assessment of construction phase impacts to archaeological sites.

Archaeological impacts				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Destruction of isolated artefacts</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>None</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>None required as the ruin is in poor condition and does not have any special architectural qualities that need to be further recorded.</i>				
<i>No materials to be removed from any other ruins in the wider project area.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Impacts to graves

Impacts to graves for SPH3 are not expected because all identified graves have been avoided by the facility layout. There is still the chance of an unmarked grave being present, or even a marked grave that was not found during the survey. The chances are considered low, however.

Table 7-80: SPH3: Assessment of construction phase impacts to graves

IMPACTS TO GRAVES				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Destruction of graves, including their coverings and possibly human remains</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Destruction of graves, including their coverings and possibly human remains</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-18	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low – negative		
PROPOSED MITIGATION MEASURES				
<i>Farm-style wire fences should be erected around all known and unfenced graves (i.e. waypoints 362 & 404) within the farm portion affected by construction. Pedestrian access gates must be provided and the fences must be located a minimum of 5 m away from all graves.</i>				
<i>All graves to be treated as no-go areas with temporary signage as required.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-18	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Impacts to the cultural landscape SPH 3

No landscape features such as hills and pans will be impacted by SPH3. The impact on cultural landscape is due to the construction activities (construction vehicles and equipment) on site which is a rural landscape.

Table 7-81: SPH3 Assessment of construction phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the introduction of construction equipment and vehicles and all the associated activities on site</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being constructed at once</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	<i>low - negative</i>		
PROPOSED MITIGATION MEASURES				
<i>Keep construction period as short as possible.</i>				
<i>Rehabilitate any areas not needed during operation as soon as possible.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	<i>low – negative</i>		
CONFIDENCE LEVEL				
<i>High</i>				

(h) Palaeontological Impact

Palaeontological impacts would be the destruction of fossils from construction activities. The site as a whole is considered as low sensitivity in terms of palaeontology.

Table 7-82: SPH3: Assessment of the potential impacts to possible paleontological resources considers the criteria below

PALAEOLOGY IMPACTS				
PROJECT PHASE	<i>Construction, Operational and de commissioning Phases</i>			
DIRECT IMPACT	<i>Destruction of fossils in the footprint</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Loss of fossil heritage and scientific knowledge</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-6	<i>Very Low Negative</i>		
PROPOSED MITIGATION MEASURES				
<i>If fossils are found once excavations for foundations and amenities have commenced then they should be photographed, removed and put in a safe place. Photographs should be sent to a palaeontologist to assess their scientific value. If the fossils are important the palaeontologist must obtain a permit from SAHRA, visit the site and remove the fossils for curation and storage in a recognised facility such as a museum or palaeontology department in a university</i>				
<i>If no fossils are found, no action will be required</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	2	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	6	<i>Very Low Positive</i>		
CONFIDENCE LEVEL				
<i>High</i>				

(i) Socio-Economic Impact

(i) Stimulation of the Economy during construction

The size of the Tokologo LM's economy was estimated at R2,170 million at current prices (2022) and primarily comprises of the agricultural and tertiary services sectors. Considering the small economic base of the municipality, the opportunities for the procurement of goods and services within the local economy will be very limited. That being said, it is likely that some of the local businesses will benefit from sub-contracting opportunities, consumer expenditure of the construction crew, and an increase in income of locals who are directly employed in the construction activities, or who benefit from the development of SPH3 through local procurement.

The stimulation of the economy will not be dependent on the layout or technology options of the SPH3; thus, alternatives are equally preferred.

Table 7-83: SPH3: Impact of Economic Stimulation during construction

IMPACT ON ECONOMY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Temporary increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
PROPOSED MITIGATION MEASURES				
<i>To optimise the stimulation of the local economy through direct, indirect and induced effects, the following should be applied where possible:</i>				
<i>Procure construction materials, goods, and products from local and domestic suppliers if feasible</i>				
<i>Employ local contractors where possible</i>				
<i>Note: The proposed mitigation measures will possibly increase the positive impact on the local economy; however, this will not affect the weighting thereof.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3

EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural, and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Creation of Employment during construction

The construction of SPH3 will require temporary employment of construction workers, foremen, and engineers On-site. Construction is expected to last twelve months where at the peak of construction about 150 people will be working on-site. The creation of between 100 and 150 temporary employment opportunities for SPH3 throughout the duration of construction which equates to about 50 FTE.

In addition to those benefitting from direct employment created at the project, various multiplier effects will assist in temporarily supporting existing jobs in the businesses offering services and goods that will be procured during construction activities. The increased temporary income earned by these businesses will in turn stimulate consumption spending, creating another round of multiplier effects.

SPH3 will create the same number of employment opportunities, regardless of its layout on the site; thus, layout alternatives are equally preferred.

Table 7-84: SPH3: Assessment of Employment during construction

IMPACT ON EMPLOYMENT				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Creation of temporary employment opportunities On-site</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of temporary employment opportunities in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important,</i>	Slightly Beneficial	Definite

		<i>sensitive or vulnerable systems or communities are positively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
PROPOSED MITIGATION MEASURES				
<i>The following is recommended to increase the employment opportunities created in the local communities, where feasible:</i>				
<i>Employ labour intensive methods in construction, where feasible</i>				
<i>Employ local residents and communities, where possible</i>				
<i>Utilise local suppliers, where possible</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Reduction of Land Area available for productive farming

The proposed site of SPH3 and surrounding land is currently used for small-scale livestock. The agricultural assessment classified the majority of SPH3 as being of low to very low agricultural potential with small isolated patches of low – moderate and moderate potential land on the edges of the facility. The farmers with livestock on the land proposed for the facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH3 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant’s footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project’s construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH3.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant

differentiation among site layout alternatives can be made. The footprint of the BESS will be the same regardless of which battery technology is used. There is therefore no difference in the impact between the two technology alternatives.

Table 7-85: SPH3: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Construction and Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iv) Loss of Property

An influx of job seekers to the area during the construction phase may result in stock theft and burglaries. The number of workers and duration of construction will not be affected by the layout alternatives or technology alternatives; thus, all alternatives are equally preferred.

Table 7-86: SPH3: Assessment of loss of property

IMPACT ON CRIME LEVELS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in crime associated with the influx of people</i>			
INDIRECT IMPACT	<i>Reduced level of security in and around the proposed facility</i>			
CUMULATIVE IMPACT	<i>No to negligible cumulative impact</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
<i>The following mitigations are advised to be instituted to minimise and possible eliminate the impact altogether:</i>				
<i>Ensure proper fencing and monitoring of the fencing is in place</i>				
<i>Maximise job creation and allocation to locals as far as practically possible. Recruitment of workers should be planned in advance and should not take place on-site. This will reduce the probability of work seekers loitering in the area surrounding the project sites</i>				
<i>Hire additional security personnel during the construction period</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(j) Terrestrial Biodiversity & Faunal Impact

(i) Direct Impact - Destruction of faunal habitat

Clearing or disturbance to natural vegetation for the construction of SPH3 will remove up to 259ha of natural grassland habitat. This includes the burrows of many fossorial species as well as termite mounds which provide a source of food for species such as aardvark and mongoose.

There are two location alternatives for the temporary laydown area for SPH3. Noting that if both are not approved, the area of the second one would likely comprise solar PV panels, therefore the difference in terms of the impact of clearance of natural habitat is negligible. Two technology alternatives for the battery to be used in the BESS have been proposed. As the type of battery used will not alter the footprint of the BESS the alternatives are rated as equal for the impact of clearance of natural habitat.

Table 7-87: SPH3: Destruction of faunal habitat

DESTRUCTION OF FAUNAL HABITAT				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Destruction of faunal habitat</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>Loss of habitat and habitat connectivity</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-21	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays. Only indigenous grasses found in the area must be used for rehabilitation</i>				
<i>Undertake vegetation clearing during the dry season, and outside of the breeding season of burrowing fauna</i>				
<i>If possible, the movement of animals through the sites must be permitted during operations. The use of fencing that will allow the movement of small to medium fauna through would help mitigate the effect of fences acting as barriers. This can be achieved by constructing a fence that has places for animals to crawl through and is not difficult for fleeing animals and birds to see. For example, black mesh panel fencing can be used where gaps of approximately 30 cm high and 50 cm wide and spaced at regular intervals are cut/installed. The tops of these gaps must be smoothed off to limit the chance of wildlife being injured when passing through. The use of barbed wire must be avoided</i>				
<i>The proposed activities must remain within the project footprint</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or</i>				

<i>relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-10	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-30	low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(ii) Direct Impact - Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death. The clearing of ground for the foundations of the PV arrays will destroy burrows, potentially causing injury or death to burrowing animals. Furthermore, the presence of the construction site and personnel may result in negative interactions with fauna, such as hunting or killing animals perceived to be pests.

Regarding the technology alternative for the type of battery used in the BESS for all facilities, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place.

The alternative locations for the temporary laydown area will not change the ratings for this impact.

Table 7-88: SPH3: Injury or death to fauna

INJURY OR DEATH TO FAUNA				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Injury or death to fauna</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-18	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		

SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-54	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by construction workers</i>				
<i>To prevent possible collisions with animals, drivers of construction vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				
<i>Ideally construction should not continue at night so as to avoid potential collisions with nocturnal fauna</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>No wild animal may under any circumstance be hunted, snared, captured, injured or killed. This includes animals perceived to be vermin. Checks of the surrounding natural vegetation must be regularly undertaken to ensure no traps have been set. Any snares or traps found on or adjacent to the site must be removed and disposed of</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts – Pollution and contamination of natural areas

During construction, dust from exposed areas and roads, and litter from construction workers have the potential to pollute the surrounding natural vegetation. The use of dust suppressants, as well as hydrocarbons from vehicles and machinery, have the potential to contaminate soils and ground water, and be washed into the nearby natural pans during high rainfall events. The battery technology alternatives and location alternatives of the temporary laydown area are rated the same and hence are covered in the same table.

Table 7-89: SPH3: Pollution and contamination of natural areas including wetlands and pans

POLLUTION AND CONTAMINATION OF NATURAL AREAS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-15	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-45	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities</i>				
<i>All vehicles and machinery must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>During construction, dust on construction roads must be suppressed using a water tanker</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by construction workers must be prohibited</i>				
<i>Appropriate solid waste disposal facilities must be provided for workers during construction</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iv) Indirect Impacts – Increased potential of invasion by alien vegetation

During construction, the removal of natural vegetation and disturbance to the soil will increase the likelihood of invasion by alien plant species. Alien species establish easily and quickly on bare soil by colonisation or from seeds existing in the seed bank of the soil. Infestation by alien and invasive species will lead to degradation of the surrounding natural habitat and will increase the potential of spread into the greater landscape. In addition, the vehicles and

equipment were likely used on various other sites and could introduce alien invasive plant seeds. This impact is relevant to all the proposed arrays equally and has therefore been assessed in one table for the construction phase.

The location alternative for the temporary laydown area and the technology alternatives for the BESS will not change the ratings for this impact.

Table 7-90: SPH3: Increased potential of invasion by alien vegetation

INCREASED POTENTIAL OF INVASION BY ALIEN VEGETATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Increased potential of invasion by alien vegetation</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities monthly</i>				
<i>All areas cleared of natural vegetation must be rehabilitated. Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays and other cleared areas. Only indigenous grasses found in the area must be used for rehabilitation. This must be advised by the botanist</i>				
<i>An invasive alien plant species management and monitoring plan must be implemented during the construction phase. Monitoring should continue into the operational phase and through and for a period after decommissioning. This should be advised by the botanist</i>				
<i>All alien seedlings and saplings must be removed as they become evident for the duration of construction and during the operational phase. Manual / mechanical removal is preferred to chemical control</i>				
<i>All construction vehicles and equipment must be free of plant material before entering the site</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
High				

(k) Transport Impact

Traffic impacts anticipated to occur during the construction phase of the project are construction related traffic and noise and dust pollution.

Two location alternatives for the temporary laydown area and two technology alternative for the BESS have been proposed. There is no difference in the impacts from a traffic perspective between the alternatives.

Table 7-91: SPH3: Traffic Impacts – Construction Phase

TRAFFIC IMPACT				
PROJECT PHASE	Construction phase			
DIRECT IMPACT	Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site			
INDIRECT IMPACT	Construction traffic on roads might generate dust and noise.			
CUMULATIVE IMPACT	Traffic delays on the surrounding road network.			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-10	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES		No irreplaceable resources will be impacted.		
SIGNIFICANCE	-30	low negative		
PROPOSED MITIGATION MEASURES				
Stagger component delivery to site;				
Reduce the construction period (if possible);				
Dust suppression of gravel roads (internal roads and the access road to the site) during the construction phase, as required.				
Regular maintenance of gravel roads (internal roads and the access road to the site) by the Contractor during the construction phase.				
The use of mobile batching plants and quarries in close proximity to the site (if available and feasible); and				
Staff and general trips should occur outside of peak traffic periods.				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	5	1
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent		

		<i>properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(I) Landscape and Visual Impact

Four visual impacts were identified for SPH3 during the construction, operational phase and decommissioning phase

- Landscape change
- Impact on Protected Areas
- Impact on local roads
- Impact on homesteads
- Light pollution

These impacts would all occur during the construction, operation and decommissioning phase. Impacts would peak once the facility is constructed, remain relatively constant during the operational phase and then decrease during the decommissioning phase.

There is no significant difference in the impact assessment rating for the temporary laydown area alternatives so they are assessed together in the tables below. The type of battery technology used in the BESS would not impact on the assessment of visual impacts and so the tables below cover both technology options.

Table 7-92: SPH3 Landscape change

LANDSCAPE CHANGE				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Change of character due to industrialisation of a Natural Landscape</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of landscape industrialisation due to other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and</i>	Moderately Detrimental	Definite

		<i>processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Plan to maintain the height of structures as low as possible relative to existing ground levels;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
<i>Monitor areas for vegetation cover post-decommissioning and implement remedial actions.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
3. <i>The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				
4. <i>The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i>				

Table 7-93: SPH3 Industrialization of the landscape as seen from Nielsview NR

SPH3 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM NIELSVIEW NR				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Industrialisation of the view from Nielsview NR due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from Protected Areas due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last</i>	0	3

		<i>more than 5 years and as such is rated as Long Term</i>		
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Plan to maintain the height of structures as low as possible relative to existing ground levels;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	0	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>	Negligible	Definite
SEVERITY	0	<i>Negligible</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
3. <i>The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				
4. <i>The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i>				

Table 7-94: Industrialization of the landscape as seen from local roads, SPH3

INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL ROADS, SPH3				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases</i>			
DIRECT IMPACT	<i>Industrialisation of the view from local roads due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from local roads due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>	Moderately Detrimental	Definite
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as affected environment is altered but natural,</i>		

		<i>cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>Plan site levels to minimise earthworks to ensure that levels are not elevated;</i>				
<i>Plan to maintain the height of structures as low as possible;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Construct and/ or plant a 2m high screen along the southern edge of the array cluster</i>				
<i>Plan to protect existing natural site features such as drainage pans;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
5. <i>The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				
6. <i>The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i>				

Table 7-95 SPH3: Industrialization of the landscape as seen from local homesteads

SPH3 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL HOMESTEADS				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Industrialisation of the view from local homesteads due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from local homesteads due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3

EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
Plan to maintain the height of structures as low as possible;				
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;				
Construct / grow 2m high screen along SW and E edges of solar cluster closest to affected homesteads;				
Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;				
Reinstate any areas of vegetation that have been disturbed during construction;				
Remove all temporary works;				
Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;				
Remove infrastructure not required for the post-decommissioning use of the site;				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-5	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
High				
NOTES				
3. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
4. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

Table 7-96 SPH 3 Light pollution

SPH3 LIGHT POLLUTION				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Light pollution from the project spoiling the night time environment and nuisance to neighbors.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of light pollution due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Use low key lighting around buildings and operational areas that is triggered only when people are present;</i>				
<i>Utilise infra-red security systems or motion sensor triggered security lighting;</i>				
<i>Ensure that lighting is focused on the development with no light spillage outside the site;</i>				
<i>No tall mast lighting should be used;</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	0	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
<p>3. <i>The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i></p> <p>4. <i>The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i></p>				

7.4.4 Operational Phase

(a) Agricultural Impact

During the operational phase, areas that where vegetation will remain cleared such as access routes, will remain at risk of soil loss through erosion. During the operation phase, staff and maintenance personnel will access the development area to maintain the infrastructure and make repairs, where required. Biodegradable detergents and water will be used to clean the panels, however this is not expected to result in impacts from an agricultural perspective. The assessment of these impacts are summarised in **Table 7-44** and **Table 7-45**.

Table 7-97: SPH3 Impact significance of soil loss through erosion during the operation phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	<i>Operation Phase</i>			
DIRECT IMPACT	<i>Areas where soil surfaces will remain bare such as access routes and between PV arrays, will remain at risk of soil erosion.</i>			
INDIRECT IMPACT	<i>Eroded areas can expand into nearby areas and result in land degradation.</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil erosion.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>The development area, including internal access routes, as well as areas bordering on the development area, must regularly be monitored to detect early signs of soil erosion on-set.</i>				
<i>If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite

IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-98: SPH3 Impact significance of soil pollution during the operation phase

SOIL POLLUTION				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Soil pollution caused by oil and fuel spills or maintenance materials and domestic waste left on site. The replacement of electrolyte of the redox flow batteries, also pose soil pollution risk.</i>			
INDIRECT IMPACT	<i>Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil pollution</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-14	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills.</i>				
<i>No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area.</i>				
<i>Regularly monitor the BESS area for any signs of oil, grease and fuel spillage or the presence of waste.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(b) Aquatic Impact

During the operation phase, the solar arrays will operate largely unattended and with low maintenance required for more than 20 years. The hard surfaces created by the development may lead to increased runoff. This may lead to increased erosion and sedimentation of the downslope areas. A localised long-term impact (more than 20 years) of low intensity (depending on the distance between the solar arrays and the freshwater features) could be expected that would have a very low overall significance post-mitigation in terms of its impact on the identified aquatic ecosystems in the area.

The only potentially toxic or hazardous materials which would be present in relatively small amounts would be of lubricating oils and hydraulic and insulating fluids. Therefore, contamination of surface or groundwater or soils is highly unlikely.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low. The impacts are also rated the same for the location alternatives for the temporary laydown area and the battery technology options for the BESS.

Table 7-99: SPH3 Operational phase aquatic ecosystem impacts

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION PRE-MITIGATION	CONSEQUENCE	LIKELIHOOD
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Any disturbance during the operation phase should be limited to the approved development footprints and should avoid disturbance of the soil and natural vegetation cover.</i>				
<i>Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.</i>				
<i>Stormwater run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving developed areas.</i>				
<i>Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider. In a scenario where services are installed, these systems need to be adequately installed and maintained to prevent any potential contamination of the water resources on site.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with</i>	-5	1

		<i>the impact will last more than 5 years and as such is rated as Long Term</i>		
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

(c) Avifaunal Impact

(i) Bird fatality at PV facility

Bird fatalities could occur at the site through a number of mechanisms, including collision with PV panels, entanglement in perimeter fence (less likely since developer has chosen to use mesh panel fencing which has a tight weave and birds are less likely to become entangled), electrocution in substations/electrical compounds and others. The location alternatives for the temporary laydown area and the battery technology options for the BESS are rated the same and are all covered in the same table.

Table 7-100: SPH3 bird fatality during operational phase

BIRD FATALITY AT PV FACILITY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Birds killed through various interaction with facility infrastructure</i>			
INDIRECT IMPACT	<i>--</i>			
CUMULATIVE IMPACT	<i>More projects will result in overall higher fatality rates in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any fatalities this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. Operational phase bird monitoring should be conducted for at least one year as per the best practice guidelines – see Section 8.</i>				
POST-MITIGATION				

DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

(ii) Nesting & other use of facility infrastructure by birds

Certain species, in particular doves, pigeons, weavers and crows, are likely to use some of the facility infrastructure for nesting, perching and roosting. At face value this is a positive impact for birds and has been rated as VERY LOW POSITIVE significance both pre and post mitigation. However, where nesting interferes with the operation of the facility this could cause conflict and require management. Nesting on infrastructure also increases the likelihood of bird fatalities occurring through the various mechanism, particularly of young inexperienced birds. No mitigation is required for the impact of the facility on birds through nesting. For the impact of the birds nesting on the facility, the specialist recommends nest management on a case by case basis under the supervision of an avifaunal specialist, and in conformance with all relevant national and provincial legislation. The impact is rated the same for the temporary laydown area and the battery technology options for the BESS.

Table 7-101: SPH3 impact of bird nesting and other use of facility infrastructure by birds

BIRD NESTING, PERCHING & ROOSTING AT PV FACILITY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Birds use infrastructure to perch, roost or nest on</i>			
CUMULATIVE IMPACT	<i>More projects in the area will probably diminish the likelihood of this happening as perch availability will increase</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		

SIGNIFICANCE	7	very low positive		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any nesting which interferes with operations this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. All nest management measures should only be undertaken in compliance with national and provincial environmental legislation in this regard.</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	7	1
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	1	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	7	very low positive		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

Day to day operation and maintenance of the facility may result in disturbance and displacement of bats. The impact is rated the same for the temporary laydown area infrastructure location alternatives and the battery technology options for the BESS.

Table 7-102: SPH3 disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	Disturbance of bats during operational activities			
INDIRECT IMPACT	Displacement			
CUMULATIVE IMPACT	Unavailability of suitable foraging resources in the broader environment for displaced individuals			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	very low negative		
PROPOSED MITIGATION MEASURES				
Limit operational and maintenance activities to daylight hours, as far as possible, and minimise lighting at night.				
All lighting should preferably use low pressure sodium and warm white LED lights.				

Operational and maintenance activities should be limited to the immediate project footprint only.				
Site access should be strictly controlled, to avoid unnecessary disturbance.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-103: SPH3 bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during operational activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	Very low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMP				
<i>All lighting should preferably use low pressure sodium and warm white LED lights.</i>				
<i>Operational and maintenance activities should be limited to the immediate project area.</i>				
<i>Site access should be strictly controlled, to avoid unnecessary disturbance.</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural,	Slightly detrimental	Unlikely

		<i>cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(e) Botanical Impacts

Maintenance activities will require management of vegetation which may result in loss of natural vegetation. The impact is rated the same for the temporary laydown area location alternatives and the battery technology options for the BESS.

Table 7-104: SPH3 loss of Western Free State Grassland during operational phase

LOSS OF VEGETATION				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Direct impact</i>			
INDIRECT IMPACT	<i>--</i>			
CUMULATIVE IMPACT	<i>Loss of Western Free State Clay Grasslands</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is the footprint as it only affects the area in which the proposed activity will occur.</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>When and where possible, vegetation clearing should be undertaken during the dry season.</i>				
<i>Only clear vegetation where absolutely necessary; and</i>				
<i>Stockpile areas for cleared vegetation will be decided and approved by the Project Manager and appointed ECO before construction commences on site and should not be located within drainage lines.</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely

IMPACT ON IRREPLACEBLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-2 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

(f) Groundwater Impact

Similar to the construction phase, the operational phase of the SPH3 will require approximately 1,000 m³/a (0.03 L/s). This does not exceed the regionally mapped yield of the underling aquifer (0.5 – 2.0 L/s). It is not currently planned to use groundwater for the operational phase of this project however if this changes a water use licence will need to be applied for and the potential impacts and mitigation measures are presented in **Table 7-52**.

The principal risks for groundwater contamination that have been identified are the use of cleaning agents for cleaning of PV panels and for dust suppression of internal roads. If required, it is encouraged that water alone is used to conduct these tasks. Alternatively, the PV cleaning agents and dust suppression mixes must be environmentally friendly and should breakdown naturally without causing ingress of harmful chemicals into the environment. The risks and status of groundwater contamination occurring during the operational phase of SPH3 is presented in **Table 7-56**.

The proposed development will require a BESS. Currently two different technologies are being considered, i.e. either Solid State Lithium Batteries (SSLB) or Vanadium Redox Flow Battery Energy Storage Systems (VRFB). Both of these two BESS systems require an electrolyte. The SSLB contain an ethylene carbonate or di-ethyl carbonate electrolyte and the VRFB system will require that an estimate of 3 000 m³ of sulfuric acid solution with vanadium ions electrolyte is stored on site for each Springhaas Facility. The BESS systems will also require cooling systems and these systems could potentially either be water based or it may be refrigerant based systems which used chemicals such as ethylene glycol- based coolants.

The containers that the BESS systems are held in are equipped with a “Clean agent” which is a fires suppression systems that can release a powder/gas into the container to snuff fires. These systems usually leave a residue on the equipment that will need to be cleaned off. With any chemical storage there is always a risk of chemical fires that will need to be put out with water or foam and the waste water from these activities could contain contaminants that should not be let to run off into the environment.

The fire safety systems, refrigerants, electrolyte solutions and the waste products produced from these systems could contaminate the soil and groundwater and all measures should be taken to prevent leaks or spills on the ground. The risks and mitigations for the BESS are presented in **Table 7-57**.

The impact on groundwater levels is rated the same for the temporary laydown area location alternatives and the battery technology options for the BESS.

Table 7-105 SPH3: Impact of lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place)

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	Operational Phase			
DIRECT IMPACT	Lowering of groundwater level due to over abstraction			
INDIRECT IMPACT	Drying of springs in the area			
CUMULATIVE IMPACT	Permanent damage to the aquifer system in the area			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-16	2
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-32	low – negative		
PROPOSED MITIGATION MEASURES				
If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring.				
Adhere to the borehole's safe yield and to monitor water levels and flow.				
Groundwater abstraction volumes must be monitored.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	0	Negligible	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
Medium				

Table 7-106: SPH3 Impact of contamination of groundwater as a result of cleaning agents used for cleaning the solar panels

Potential impact on groundwater as a result of cleaning agents used for cleaning the solar panels.				
PROJECT PHASE	Operational Phase			
DIRECT IMPACT	Contamination of groundwater			
INDIRECT IMPACT	Damage to the vegetation or ecosystem in the area			
CUMULATIVE IMPACT	Long-term reduced groundwater quality			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-16	2

EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-32	low - negative		
PROPOSED MITIGATION MEASURES				
Use environmentally safe cleaning agents that breakdown naturally (biodegradable detergents/green soaps) and that will not cause adverse effects.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	0	Negligible	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
Medium				

Redox flow batteries contain electrolyte solution which needs to be replaced approximately every 15 to 20 years. During replacement of electrolyte there is a risk of leaks or spills. This impact is only applicable to the redox flow batteries as lithium-ion batteries are solid state batteries.

Table 7-107: SPH3 Impact table for contamination of groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)

Potential impact on groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)				
PROJECT PHASE	Operational Phase			
DIRECT IMPACT	Contamination of groundwater			
INDIRECT IMPACT	Damage to the vegetation or ecosystem in the area			
CUMULATIVE IMPACT	Long-term reduced groundwater quality			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-16	2
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent		

		<i>properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or Communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	<i>low - negative</i>		
PROPOSED MITIGATION MEASURES				
<i>Ensure that all electrolyte or chemicals stored or used on site have secondary containments systems in place with reliable leak detection, annunciation in place. Ensure that all chemicals are handled on concrete bunded surfaces and not on bare soil.</i>				
<i>Any waste products produced from the BESS systems should be removed and disposed of appropriately. Waste water produced by fire hydrants should not be allowed to runoff into the environment.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>		
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>	0	1
SEVERITY	0	<i>Negligible</i>		
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>	<i>Negligible</i>	<i>Unlikely</i>
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to the cultural landscape

Because any physical impacts to the landscape would already have occurred during the construction phase, landscape impacts during operation of SPH3 relate only to the presence of the facility in what is otherwise a rural landscape. Impacts to the cultural landscape will occur during the operation phase and last as long as the lifetime of the facility. Because of the flat terrain, the impacts would not be experienced over great distances because intervening vegetation and buildings would offer partial screening. Nonetheless, the immediately surrounding area will experience a degree of change in landscape character and sense of place. The impact significance is rated to low negative before mitigation. The impacts are the same for the location alternatives for the temporary laydown area and the technology options for the batteries for the BESS.

Table 7-108: SPH3: Assessment of operation phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS	
PROJECT PHASE	<i>Operation Phase</i>
DIRECT IMPACT	<i>Alteration of the rural landscape character through the presence of a solar energy facility</i>
INDIRECT IMPACT	<i>None</i>

CUMULATIVE IMPACT		<i>Impacts will be greater with multiple facilities being present</i>		
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Keep all maintenance work within the authorised footprint.</i>				
<i>Minimise night-time light pollution in the area (visual recommendations to be followed to achieve this).</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(h) Socio-Economic Impact

(i) Stimulation of the Local Economy during operations

The operational period of SPH3 is a minimum of 20 years. Of the money spent annually during the operations period, a significant portion will likely comprise of salaries and wages of the Springhaas employees. The operations of the facility will make some contribution towards the growth of the local economy, as it will increase the size of the local electricity sector, as well as stimulate the demand for other sectors' services and goods such as water, transportation, and trade.

No differentiation can be made between the location alternatives for temporary laydown area and battery technology for the BESS. All alternatives are considered in **Table 7-56** and **Table 7-57**.

Table 7-109: 3Assessment of Economic stimulation during operations

STIMULATION OF THE LOCAL ECONOMY DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Long-term increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				
<i>Where feasible, procure goods and services required for the operation of the plant from the local economy</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	16	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Moderately Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	48	moderate positive		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Creation of Employment and increased household income during operations

The operation of SPH3 will require functional and maintenance employees. It is envisaged that about eight direct jobs per facility will be created during the operations phase, which will occur for a duration of 20 years. About 70% of these jobs are to be filled by people from the local communities as they will be low-skilled employment opportunities. Employment of the eight

individuals for the entire operational period will increase their household income, improve their standard of living and benefit their families.

SPH3 will create the same number of employment opportunities, regardless of its location on the site; thus, layout alternatives are equally preferred. The type of battery used in the BESS will also not significantly affect employment alternatives, thus both technology alternatives are equally preferred.

Table 7-110: SPH3 Assessment of employment during operations

CREATION OF EMPLOYMENT AND INCREASED HOUSEHOLD INCOME DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Creation of permanent employment opportunities in the local and regional economy</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of permanent employment opportunities in the region</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				
<i>Where feasible, aim to fill all the positions by labour from the local community</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	24	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Improved municipal service delivery

SPH3 will have a capacity of up to 150MWac and will be connected to the national grid through Eskom substation and generated electricity will be sold nationwide. The proposed project, albeit relatively small, will contribute towards improving National electricity availability; thus, improving the government service delivery, and could potentially also aid in growing the local economy by increasing the overall supply of electricity in the local economy. Furthermore, due to the taxes and rates that will be paid by the project to the municipality, the revenue of the latter will be increased, thus allowing it to improve the service delivery in other areas.

The layout alternatives and BESS technology alternatives will not affect the capacity of the solar facility; thus all alternatives are equally preferred.

Table 7-111: SPH3: Assessment of service delivery improvement

IMPROVED MUNICIPAL SERVICE DELIVERY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>It will likely Improve the local electricity supply if fed to the grid</i>			
INDIRECT IMPACT	<i>Improved standard of living within the region</i>			
CUMULATIVE IMPACT	<i>Improved electricity availability</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	16	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Moderately Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	48	moderate positive		
PROPOSED MITIGATION MEASURES				
<i>No mitigations proposed</i>				

(iv) Reduction of Land Area available for productive farming

The proposed site of SPH3 and surrounding land is currently used for small-scale livestock. The agricultural assessment classified the majority of SPH3 as being of low to very low agricultural potential with small isolated patches of low – moderate and moderate potential land on the edges of the facility. The farmers with livestock on the land proposed for the

facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH3 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant's footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project's construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH3.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant differentiation among site layout alternatives can be made. The location alternative for the temporary laydown area will not affect the impact ratings.

Table 7-112: SPH3: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite

IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.	
SIGNIFICANCE	-18	very low negative	
CONFIDENCE LEVEL			
High			

(i) Terrestrial Biodiversity and Animal Species

(i) Direct Impacts – Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death.

Regarding the technology alternative for the type of battery used in the BESS for SPH3, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place. The impact ratings will be same irrespective of the layout alternatives of the temporary laydown area.

Table 7-113: SPH3 Injury or death to fauna

ALL FACILITIES				
PROJECT PHASE	Operational Phase			
DIRECT IMPACT	Injury or death to fauna			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-16	2
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-32	low negative		
PROPOSED MITIGATION MEASURES				
No wild animal may under any circumstance be handled, removed or be interfered with by maintenance staff				
To prevent possible collisions with animals, drivers of maintenance vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)				
All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans				
Adequate fire prevention and safety measures must be in place. A fire emergency management plan must be in place				
All electrical equipment must be maintained on a regular basis to minimise the risk of fire				
POST-MITIGATION				

DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-6	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
High				

(ii) Indirect Impacts – Pollution and contamination of natural areas

During operations, release of grey water into the environment can cause contamination by detergents. Grey water from cleaning of the solar panels has the potential to contaminate soils and ground water and be washed into the nearby natural pans during high rainfall events. This includes biodegradable detergents used for cleaning the panels, which can accumulate in the soil and be washed into the nearby pans before they break down. Biodegradable detergents can alter the balance of freshwater ecosystems as they promote bacterial growth and lower oxygen levels. The impacts are rated the same for both location alternatives for the temporary laydown area and the battery technology alternatives for the BESS.

Table 7-114: SPH3 Pollution and contamination of natural areas

POLLUTION AND CONTAMINATION OF NATURAL AREAS				
PROJECT PHASE	Operational Phase			
DIRECT IMPACT				
INDIRECT IMPACT	Pollution and contamination of natural areas – no nearby pans or wetlands			
CUMULATIVE IMPACT	Habitat degradation			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	2
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-28	low negative		
PROPOSED MITIGATION MEASURES				
An independent Environmental Control Officer (ECO) must be appointed to oversee operational phase activities at a minimum every 6 months for the first 5 years and then yearly for the rest of the life of the facility				

<i>If possible, panels should be cleaned using water that is clear of detergents only (e.g. potable water or borehole water). The use of grey water should be avoided. Should the need arise to clean the panels with detergents, then biodegradable detergents are preferred. Care must be taken not to allow the detergents to accumulate in the soil</i>				
<i>All maintenance vehicles must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by maintenance staff must be prohibited</i>				
<i>Appropriate solid waste disposal and ablution facilities must be provided for operational staff</i>				
<i>Adequate prevention and safety measures must be in place to avoid leaks to batteries. This includes regular maintenance and replacement of batteries in a timeous manner. Measures must be in place to prevent chemicals leaking into the soil, should damage to the battery occur</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-115: SPH3: Pollution and contamination of natural areas including pans and wetlands

POLLUTION AND CONTAMINATION OF NATURAL AREAS INCLUDING PANS AND WETLANDS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas – including nearby pans or wetlands</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-21	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural and social functions and processes are altered to the extent that the natural process with temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-63	High negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee operational phase activities at a minimum every 6 months for the first 5 years and then yearly for the rest of the life of the facility</i>				

<i>If possible, panels should be cleaned using water that is clear of detergents only (e.g. potable water or borehole water). The use of grey water should be avoided. Should the need arise to clean the panels with detergents, then biodegradable detergents are preferred. Care must be taken not to allow the detergents to accumulate in the soil</i>				
<i>All maintenance vehicles must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by maintenance staff must be prohibited</i>				
<i>Appropriate solid waste disposal and ablution facilities must be provided for operational staff</i>				
<i>Adequate prevention and safety measures must be in place to avoid leaks to batteries. This includes regular maintenance and replacement of batteries in a timeous manner. Measures must be in place to prevent chemicals leaking into the soil, should damage to the battery occur</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-24	<i>very low negative</i>		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts – Disturbance and displacement of fauna

Security lights for SPH3 during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The impacts are rated the same for both location alternatives for the temporary laydown area and the battery technology alternatives for the BESS.

Table 7-116: SPH3 Disturbance and displacement of fauna

DISTURBANCE AND DISPLACEMENT OF FAUNA				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Disturbance to and displacement of fauna – natural grassland</i>			
CUMULATIVE IMPACT	<i>Displacement of fauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		

SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-32	low negative		
PROPOSED MITIGATION MEASURES				
<i>Operations during the night must be avoided to minimise the need for artificial lighting and to reduce the impact of light and noise on nocturnal animals</i>				
<i>Lighting during operations should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects, such as low-pressure sodium lamps, is preferred</i>				
<i>Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(j) Traffic Impact

During the operational phase there will be approximately 8 full time employees on site. Vehicles would access the site for daily operations and maintenance as and when required. The impacts are rated the same for both location alternatives for the temporary laydown area and the battery technology alternatives for the BESS.

Table 7-117 SPH3: Traffic impacts during operation phase

TRAFFIC IMPACTS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Traffic congestion due to the trips generated by the operation of the facility</i>			
INDIRECT IMPACT	<i>The associated noise and dust pollution</i>			
CUMULATIVE IMPACT	<i>Traffic delays on the surrounding road network</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	3

EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
Staff and maintenance trips should occur outside of peak traffic periods; and				
Client/Facility Manager is to ensure that regular maintenance of gravel roads (located within the site boundary, including the access road to the site) occurs during operation phase to minimise/mitigate dust pollution.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
High				

7.4.5 Decommissioning Phase

Upon completion of the operational phase of the project which will last in excess of 20 years the facilities may be decommissioned. Decommissioning activities would entail removal of infrastructure from site and return of the site to a state similar to the pre-construction condition. The decommissioning impacts would not vary significantly between facilities and so all seven facilities are covered **Section 7.7**.

7.4.6 No-Go Alternative

The no-go alternative refers to the option of not developing the facility. The impact assessment for the no-go alternative is the same for all 7 facilities and is covered in **Section 7.8**.

7.4.7 Cumulative Impacts

The cumulative impact considers the development of all seven Springhaas solar PV facilities in addition to the other projects which are proposed within 30km of the facility.

The cumulative impacts were rated the same for each of the 7 solar PV facilities. The cumulative impact assessment is available in **Section 7.9**.

Table 7-118: SPH3 impact summary

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Design/Planning/Pre-Construction Phase			
No impacts identified			
Construction Phase			
Agricultural impacts			
Land use change from livestock farming to energy generation	Negative	Moderate	Low
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance and water quality impacts	Negative	Very low	Very low
Avifaunal impacts			
Destruction of bird habitat during construction	Negative	Low	Low
Disturbance of birds during construction	Negative	Very low	Very low
Bat impacts			
Bat habitat modification	Negative	Very low	Very low
Disturbance and displacement of bats	Negative	Very low	Very low
Possible roost disturbance	Negative	Low	Very low
Bat roost destruction	Negative	Very low	Very low
Botanical impacts			
Loss of vegetation	Negative	Medium	Low
Groundwater impacts			
Lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place)	Negative	Low	Very low
Contamination of groundwater as a result of accidental oil spillages or fuel leakages	Negative	Very low	Very low
Heritage impacts			
Impact on archaeological sites	Negative	Very low	Very low
Impact on graves	Negative	Low	Very low
Impact on cultural landscape	Negative	Low	Low
Palaeontological impacts			
Destruction of fossils	Negative/Positive	Very low (negative)	Very low (positive)
Socio-economic impacts			
Stimulation of the economy during construction	Positive	Low	Low
Employment opportunities	Positive	Low	Low
Reduction in land available for productive farming	Negative	Very low	Very low
Loss of property	Negative	Low	Very low
Terrestrial biodiversity and animal species (faunal) impacts			
Destruction of faunal habitat	Negative	High	Low
Injury or death to fauna	Negative	Moderate	Very low
Pollution and contamination of natural areas	Negative	Moderate	Very low
Disturbance and displacement of fauna – natural grassland	Negative	Low	Very low

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Spread of invasive alien plant species	Negative	Moderate	Very low
Traffic impacts			
Traffic congestion	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads	Negative	Moderate	Very low
Industrialisation of the landscape as seen from local homesteads	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
Operational Phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Soil pollution	Negative	Very low	Very low
Aquatic impacts			
Increased run-off, pollution	Negative	Very low	Very low
Aquatic			
Disturbance of aquatic habitat; water quality impacts	Negative	Very low	Very low
Avifauna impacts			
Bird fatality through interaction with infrastructure	Negative	Very low	Very low
Nesting and use of other infrastructure by birds	Positive	Very low	Very low
Bat impacts			
Disturbance and displacement	Negative	Very low	Very low
Roost disturbance	Negative	Very low	Very low
Botanical impacts			
Loss of vegetation	Negative	Very low	Very low
Groundwater impacts			
Lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place).	Negative	Low	Very low
Contamination of groundwater from use of cleaning agents	Negative	Low	Very low
Contamination of groundwater from leaks or spills from BESS	Negative	Low	Very low
Heritage impacts			
Impact on cultural landscape	Negative	Low	Low
Socio-economic impacts			
Economic stimulation during operations	Positive	Low	Moderate
Employment opportunities	Positive	Low	Low
Improved service delivery	Positive	Moderate	Moderate
Reduction in land available for productive farming	Negative	Very low	Very low
Terrestrial biodiversity and animal species			
Injury or death of fauna	Negative	Low	Very low
Pollution and contamination of natural areas - no nearby pans or wetlands	Negative	Low	Very low
Pollution and contamination of natural areas - nearby pans or wetlands	Negative	High	Low

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Disturbance and displacement of fauna	Negative	Low	Very low
Traffic impact			
Traffic congestion	Negative	Very low	Very low
Palaeontological impacts			
Destruction of fossils	NA	NA	NA
Decommissioning phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance of aquatic habitat, water quality impacts	Negative	Very low	Very low
Avifaunal impacts			
Disturbance of birds	Negative	Very low	Very low
Bat impacts			
Disturbance and displacements	Negative	Very low	Very low
Botanical impacts			
Loss of vegetation	Negative	Low	Low
Groundwater			
Contamination from construction activities	Negative	Very low	Very low
Heritage impacts			
Alteration of the rural landscape character through the presence of construction equipment and vehicles and all the associated activities on site	Negative	Low	Very low
Palaeontological impacts			
Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-Economic impacts			
Impact on the economy	Positive	Very low	Very low
Creation of temporary employment opportunities in the local and regional economy	Positive	Very low	Very low
Terrestrial biodiversity and animal species			
Destruction of novel ⁴ faunal habitat (i.e. grassed areas under the panels where fauna may recolonise after construction)	Negative	Moderate	Very low
Injury or death to animals (due to collisions with construction vehicles or destruction of burrows that have established under the panels)	Negative	Moderate	Very low
Pollution and contamination of natural areas including pans and wetlands	Negative	Moderate	Very low
Disturbance to and displacement to fauna and edge effects – natural grassland	Negative	Low	Very Low
Increased potential of invasion by alien vegetation	Negative	Moderate	Very low
Reestablishment of movement corridors through the landscape due to removal of fences and return to open grassland	Negative	Very low	Low positive
Traffic impacts			

⁴ Novel habitats are human-built, modified, or engineered niches in places that have been altered in structure and function by human activity

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads, with alternative electrical infrastructure compound	Negative	Very low	Very low
Industrialisation of the landscape as seen from local homesteads, with proposed electrical infrastructure compound	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
No-Go Alternative			
Agricultural	Negative	Very low	Very low
Aquatic	Negative	-	Very low-negligible
Avifauna	Negative	Very low	Very low
Bats	Negative	Very low	Very low
Botanical	Negative	Low	Low
Heritage	Negative	Very low	Very low
Transport- Traffic congestion	Negative	Very Low	Very Low
Terrestrial biodiversity and animal species	Negative/positive	Low negative	Very low positive
Socio-economic	NA- no impact, forgone + impacts	NA	NA
Destruction of fossils	NA	NA	NA
Landscape and Visual	Negligible	No impact/NA	No impact/NA
Groundwater Impacts	Negligible	NA	NA
Cumulative impacts			
Agricultural	Negative	Very low	Very low
Aquatic	Negative	Low	Low
Avi-fauna	Negative	Moderate	Moderate
Bats	Negative	Low	Low
Botanical	Negative	Very low	Very low
Heritage	Negative	Moderate	Low
Socio-economic - Impact on the economy- construction	Positive	-	Moderate
Socio-economic -Creation of employment during construction	Positive	-	Moderate
Socio-economic -Reduction in land available for productive farming	Negative	-	Low
Socio-economic -Stimulation of the economy – operations	Positive	-	Moderate
Socio-economic -Employment - operations	Positive	-	Moderate
Socio-economic -Improved municipal service delivery	Positive	-	Moderate
Socio-economic -Loss of property	Negative	-	Low
Socio-economic - Stimulation of economy - decommissioning	Positive	-	Very low
Terrestrial biodiversity	Negative	High	Moderate
Transport	Negative	Low	Very Low

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Landscape and visual	Negative	-	Low
Destruction of fossils	NA	NA	NA
Groundwater: Aquifer system and water quality	Negative	Low- Very Low	Low – Very Low

7.5 Springhaas 4 Detailed Impact Assessment

7.5.1 Alternatives Considered

(a) Technology Alternatives

Two technology alternatives namely lithium-ion and redox flow batteries were considered for the BESS.

(b) No-Go Alternative

The no-go alternative was considered for all seven of the proposed facilities. The impact of the no-go alternative was rated as the same for all seven facilities. The no-go alternative is assessed in **Section 7.8**.

7.5.2 Pre-construction phase

No significant impacts for the pre-construction phase have been identified by any specialist studies or by the EAP for SPH4.

7.5.3 Construction Phase

(a) Agricultural Impact

The most significant agricultural impacts associated with the development of SPH4 will occur during the construction phase when the site is fenced off, vegetation is removed and the soil surface is prepared for the installation of infrastructure.

The footprint of SPH4 contains two small sections of moderate sensitivity agricultural land. These patches are small and isolated from other areas of viable production. The loss of these areas of moderate sensitivity land are therefore considered the same as the loss of low sensitivity areas.

SPH4 was also classified in terms of agricultural potential. The majority of the site is classified as low to very low potential. There is one patch of low- moderate potential land and two small areas of moderate potential land. As these patches of low- moderate and moderate potential agricultural land are isolated from larger patches of moderate sensitivity land they are not viable from a production perspective.

Tables 7-8 – 7-11 cover the two technology options for the BESS. There was no difference in the alternatives proposed from an agricultural perspective.

Table 7-119: SPH4: Impact of land use change from livestock farming to renewable energy generation

LAND USE CHANGE FROM LIVESTOCK FARMING TO ENERGY GENERATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Construction of boundary fence and PV infrastructure will change land use from livestock farming to renewable energy generation</i>			
INDIRECT IMPACT	<i>Intensification of agriculture in other areas or otherwise reduction of livestock produced in the area</i>			
CUMULATIVE IMPACT	<i>Increase in areas where agriculture is converted into other land uses</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Springhaas Solar Facility 3 (Pty) Ltd must provide market-related compensation that will allow the current land users to have the same or better ability to sustain their livelihood.</i>				
<i>Ensure that the final infrastructure layout remains within the fenced off area of the development footprint.</i>				
<i>Prior arrangements must be made with the landowners to ensure that livestock and game animals are moved to areas where they cannot be injured by vehicles traversing the area.</i>				
<i>The use of main access routes by construction vehicles and equipment must do so with consideration of nearby agricultural land users who use the same access routes for farming activities.</i>				
<i>All left-over construction material must be removed from site once construction on a land portion is completed.</i>				
<i>No materials removed from development area must be allowed to be dumped in nearby livestock farming areas.</i>				
<i>No boundary fence must be opened without the landowners' permission.</i>				
<i>No open fires made by the construction teams are allowable during the construction phase.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		

SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-120: SPH4: Impact significance of soil loss through erosion during the construction phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Loss of soil particles from areas where construction activities result in the removal of vegetation from the surface.</i>			
INDIRECT IMPACT	<i>Sparse to no vegetation growth in eroded areas.</i>			
CUMULATIVE IMPACT	<i>Increase in areas exposed to soil erosion</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-18	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Limit vegetation removal from the soil surface to the areas of infrastructure development such as access routes as well as around the foundations of the PV arrays and buildings.</i>				
<i>Vegetation clearance must only be undertaken immediately prior to construction activities and only within the development footprint</i>				
<i>Once construction of an area has been completed, level any remaining soil removed from excavation pits (where the PV arrays will be mounted) that remained on the surface, instead of allowing small stockpiles of soil to remain on the surface where it is exposed to rain and wind. This is applicable to all construction areas, except where topsoil stockpiles must remain for site rehabilitation of specific areas.</i>				
<i>Stormwater channels on site must be designed to minimise the soil erosion risk that results from surface water runoff.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will</i>	-5	3

		<i>last 18 months-5 years and as such is rated as Medium term</i>		
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-121: SPH4: Impact significance of impaired soil functionality caused by compaction

IMPAIRED SOIL FUNCTIONALITY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>The weight and movement of vehicles and equipment over the surface will result in soil compaction.</i>			
INDIRECT IMPACT	<i>Compacted soil have reduced pore space and water infiltration rate. Compacted soil surfaces increase the rate of surface water runoff, especially after a rainfall event.</i>			
CUMULATIVE IMPACT	<i>Increase in areas affected by soil compaction.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-18	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Only allow vehicles and equipment to travel on designated access routes and not anywhere else within the development area.</i>				
<i>Use existing main access routes and internal farm roads where possible and avoid using other areas in the site as temporary access routes.</i>				
<i>Vehicles and equipment must park in designated parking areas.</i>				
<i>Materials must be off-loaded and stored in designated laydown area.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season as wet soil compacts easily as opposed to dry soil.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3

EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-122: SPH4: Impact significance of impaired soil health as a result of soil pollution

IMPAIRED SOIL HEALTH				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Soil pollution can be caused by oil and fuel spills from vehicles and equipment as well as domestic and material waste on site. Should the vanadium redox flow batteries be used for the BESS, spillage of corrosive and environmentally toxic electrolyte is possible. In the case that lithium solid state containerised batteries are used, there is a possibility of thermal runaway that will result in the release of toxic and flammable gasses.</i>			
INDIRECT IMPACT	<i>Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health.</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil pollution.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-21	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>Maintenance must be undertaken regularly on all vehicles and construction equipment to prevent hydrocarbon spills.</i>				
<i>Any waste generated during construction must be stored into designated containers and removed from the site by the construction teams.</i>				
<i>Any left-over construction materials must be removed from the development area.</i>				
<i>The development area must be monitored by the Environmental Control Officer (ECO) to detect any early signs of fuel and oil spills and waste dumping. The ECO must also report any spills from batteries.</i>				
<i>Ensure battery transport and installation is undertaken by accredited staff and contractors.</i>				
<i>Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3

EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
High				

(b) Aquatic Impact

Construction phase activities would result in disturbance of soil and clearing of vegetation. Water quality impacts may occur from batching of concrete on site, hydrocarbon spills and other construction activities.

There is no difference in impacts between the two battery technology options for BESS, the impact assessment table covers both alternatives.

Table 7-123: SPH4: Impact of aquatic ecosystems during the construction phase

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-4	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-4	Very low negative		
PROPOSED MITIGATION MEASURES				
A buffer of at least 250 m between the significant aquatic ecosystems (larger pans) and all the proposed project activities should be maintained (noting that this is already honoured in the proposed layout for all facilities).				
Clearing of indigenous vegetation should not take place within the aquatic features and the recommended buffers, while retaining the topography and cover vegetation within the wider drainage areas through the site is preferred to reduce the potential modification to the way in which water drains through these areas.				
The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance.				
During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills. The solar panels will be washed with water and a				

<i>biodegradable/ greendetergent.</i>				
<i>Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.</i>				
<i>Development within the drainage areas, where located within a proposed facility, will however need to consider stormwater management measures and should avoid impacting on the movement of water through the more seasonally wet areas. Minimal disturbance to the topography and cover vegetation in these areas is recommended.</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-2 very low negative			
CONFIDENCE LEVEL				
<i>High</i>				

(c) Avifaunal Impact

(i) Habitat destruction associated with the construction of the facility

Habitat destruction and alteration will occur during the construction phase of SPH4. The majority of the development footprint would be transformed from its current state to a renewable energy facility. SPH4 will transform approximately 261ha of habitat. Most of this is in a fairly natural state currently, or in the case of arable lands is still accessible and useable for birds foraging.

Table 7-124: SPH4: Formal rating of destruction of bird habitat during construction

DESTRUCTION OF BIRD HABITAT DURING CONSTRUCTION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Transformation of natural habitat into PV facility</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Yes - Larger area transformed from natural habitat</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite

IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-36	low – negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required. Impact avoidance has already been implemented in the design phase through the adherence to no-go buffers around pans.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Disturbance of birds & displacement effects

Disturbance of avifauna during the construction (and thereafter during maintenance and operational and decommissioning) of the facility and all development alternatives and associated infrastructure is likely to occur. Disturbance of breeding birds is typically of greatest concern. In this regard any breeding sites of sensitive bird species would be the most important. It is noted that no breeding sites have been identified on site at this stage.

There is no difference between the location and technology options in terms of disturbance and displacement of birds.

Table 7-125: SP4: Formal rating of disturbance of birds during construction

PROJECT PHASE	<i>Construction phase & operations phase to lesser extent</i>			
DIRECT IMPACT	<i>Birds disturbed from their normal activities through the increased noise and activity levels associated with construction</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>More projects will result in overall higher disturbance levels</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required as there are no particularly sensitive features identified (such as breeding sites). General good environmental practice should be implemented during construction in terms of control of vehicles, staff, minimising the impact on the receiving environment as much as possible.</i>				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-5	1
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

The facility boundary for SPH4 encompasses a pan which is a high sensitivity areas from a bat perspective. The pan along with its 250m ecological buffer have been avoided by the infrastructure layout.

During the construction of SPH4 habitat modification would occur, disturbance and displacement of bats may occur and bat roosts may be disturbed or destroyed.

Two technology options are under consideration for the BESS. For bat impacts the type of technology used for the BESS is not considered relevant. Both technology options are considered equally acceptable.

Table 7-126: SPH4: Bat habitat modification

IMPACT ON POSSIBLE HABITAT MODIFICATION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Modification of habitat through the removal of vegetation cover and water sources</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Loss of foraging resources for local bat population</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-4	2
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Likely

IMPACT ON IRREPLACEABLE RESOURCES	1	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-8	very low negative		
PROPOSED MITIGATION MEASURES				
<i>This impact may be reduced by limiting the removal of vegetation and available water sources, as far as possible.</i>				
<i>Avoid all high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should to the layout occur a bat specialist must confirm, that these high sensitive areas have been adequately avoided.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential additional sensitive habitats, to confirm the baseline environment, if construction does not take place within 5 years of the initial bat study.</i>				
<i>Following construction, rehabilitation of all disturbed areas, inclusive of that beyond permanent infrastructure footprints, (e.g.temporay access tracks and laydown areas) must be undertaken.</i>				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-4	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-127: SPH4: Disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Disturbance of bats during construction activities</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable foraging resources in the broader environment for displaced individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Limit construction activities to daylight hours only and minimise lighting at night, as far as possible.</i>				
<i>Avoid high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should the currently assessed layout change, a bat specialist must confirm, that these high sensitive areas have been adequately avoided.</i>				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
POST-MITIGATION				

DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
Medium				

Table 7-128: SPH4: Bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	Construction phase			
DIRECT IMPACT	Disturbance of roosting bats during construction activities			
INDIRECT IMPACT	Roost abandonment			
CUMULATIVE IMPACT	Unavailability of suitable roosting resources in the broader environment for abandoned individuals			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-10	2
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected.	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-20	low negative		
PROPOSED MITIGATION MEASURES				
All construction activities should be limited to the assessed project footprint only.				
Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.				
If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				

Table 7-129: SPH4: Bat Roost destruction

IMPACT OF POSSIBLE ROOST DESTRUCTION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Destruction of potential bat roosting features</i>			
INDIRECT IMPACT	<i>Reduction of available roosting sites and/or Mortality</i>			
CUMULATIVE IMPACT	<i>Insufficient roosting resources to support the local population and potential increased bat mortality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-10	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>	Slightly Detrimental	Likely
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-20	Low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMPR				
<i>Avoid the destruction or removal of existing farmsteads and trees, as far as possible.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.</i>				
<i>If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.</i>				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>	Negligible	Unlikely
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
CONFIDENCE LEVEL				
Medium				

(e) Botanical Impacts

The development of SPH4 would result in extensive but localized loss of relatively undisturbed (unploughed but grazed) Western Free State Clay Grasslands.

The shade effect of the panels on the grassland vegetation is not known and it not easily predicted. There will be space under the panels for grass and other plants to grow. However, the microclimate is likely to be different to that of open grassland, so a different suite of plant species is likely to colonize the space under the solar panels.

Two technology options are proposed for the BESS. The technology alternatives will make no difference on the botanical impact assessment and as such these alternatives are covered in the **Table 7-19**.

Table 7-130: SPH4: Impact of loss of Western Free State Clay Grassland

LOSS OF VEGETATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Removal of natural vegetation: Western Free State Clay Grasslands</i>			
INDIRECT IMPACT	<i>None determined</i>			
CUMULATIVE IMPACT	<i>Loss of Western Free State Clay Grasslands</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term.</i>	-15	3
EXTENT	3	<i>The impacts will be localized to the designated target areas.</i>		
SEVERITY	-2	<i>The severity of the potential impact will be moderate negative.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-45	medium - negative		
PROPOSED MITIGATION MEASURES				
<i>The first mitigation measures necessary would be the relocation of Ammocharis coranica bulbs if they cannot be avoided. Ideally the bulb should be lifted when they area dormant (winter) but that would mean traversing the entire area of the SPH sites in the preceding summer and marking every occurrence of these plants. A more practical approach would be to unearth the bulbs during the construction phase and relocating and planting them soon after removal.</i>				
<i>Secondly, all areas that are disturbed during construction and that are not needed during the operational phase should be rehabilitated, using natural grasses that occur in the area. It would be possible for some grasses and forbs to survive under the panels, but it is difficult to predict the extent of such growth, nor which plant species would grow effectively under the panels.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last at least 5 years and therefore it is considered to be Long Term.</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(f) Groundwater Impact

The water required during the construction phase of SPH4 is approximately 9,000m³ per year. The water requirement lies well within the yield potential of the underlying fractured rock aquifer (i.e. 0.5 – 2.0 L/s). It must be noted that at present the use of groundwater is not proposed however if this changes the potential impacts of groundwater abstraction are shown in **Table 7-20**.

Earthmoving plant and/or construction vehicles will be used on site during the construction phase. Use of vehicles presents a risk of groundwater contamination by fuel and oil leakage.

Two technology options (lithium-ion vs redox flow batteries) were considered for SPH4. The alternatives considered are equally preferred.

Table 7-131: SPH4: Impact table for the lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place).

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Lowering of groundwater level due to over abstraction</i>			
INDIRECT IMPACT	<i>Drying of springs in the area</i>			
CUMULATIVE IMPACT	<i>Permanent damage to the aquifer system in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
<i>DURATION</i>	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-14	2
<i>EXTENT</i>	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
<i>SEVERITY</i>	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
<i>IMPACT ON IRREPLACEBLE RESOURCES</i>	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-28	low - negative		
PROPOSED MITIGATION MEASURES				
<i>If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring. Adhere to the borehole’s safe yield and to monitor water levels and flow.</i>				
<i>Groundwater abstraction volumes must be monitored.</i>				
POST-MITIGATION				
<i>DURATION</i>	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	0	1

EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	0	Negligible	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
Medium				

The main risk associated with the construction phase is groundwater contamination from the use of construction vehicles and heavy machinery on-site.

Table 7-132: SPH4: Impact of contamination of groundwater as a result of accidental oil spillages or fuel leakages during the construction and decommissioning phases.

Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages				
PROJECT PHASE	Construction and Decommissioning Phase			
DIRECT IMPACT	Groundwater contamination			
INDIRECT IMPACT	Damage to the vegetation or ecosystem in the area			
CUMULATIVE IMPACT	Long term reduced groundwater quality			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-5	2
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Likely
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-10	very low negative		
PROPOSED MITIGATION MEASURES				
Vehicles must be maintained regularly and kept in a good working order. Dirty water should be captured, to be re-used where possible. No dirty water is allowed to be discharged into the surrounding environment.				
No heavy equipment or vehicles to be left in excavation area when not in use. Drip trays to be used under stationary vehicles and machinery where possible.				
POST-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-4	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural,	Negligible	Unlikely

		<i>cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to archaeological resources

Impacts to archaeological resources at SHP4 are limited to the possible destruction of isolated background scatter artefacts which have very low to no cultural significance. Impacts will be direct and permanent but because of the low cultural significance the severity is very low negative.

Two technology alternatives were considered for the battery technology for the BESS. Both technology options are equally preferred.

Table 7-133: SPH4: Assessment of construction phase impacts to archaeological sites.

Archaeological impacts				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Destruction of a isolated artefacts</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>None</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>None required as the ruin is in poor condition and does not have any special architectural qualities that need to be further recorded.</i>				
<i>No materials to be removed from any other ruins in the wider project area.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment</i>	Negligible	Definite

		<i>in such a way that natural, cultural and social functions and processes are minimally affected</i>	
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>	
SIGNIFICANCE	-18	very low negative	
CONFIDENCE LEVEL			
<i>High</i>			

(ii) Impacts to graves

Impacts to graves for SPH4 are not expected because all identified graves have been avoided by the facility layout. There is still the chance of an unmarked grave being present, or even a marked grave that was not found during the survey. The chances are considered low, however. The impact on graves applies equally to both technology alternatives.

Table 7-134: SPH4: Assessment of construction phase impacts to graves

IMPACTS TO GRAVES				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Destruction of graves, including their coverings and possibly human remains</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Destruction of graves, including their coverings and possibly human remains</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-18	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low – negative		
PROPOSED MITIGATION MEASURES				
<i>Farm-style wire fences should be erected around all known and unfenced graves (i.e. waypoints 362 & 404) within the farm portion affected by construction. Pedestrian access gates must be provided and the fences must be located a minimum of 5 m away from all graves.</i>				
<i>All graves to be treated as no-go areas with temporary signage as required.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-18	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		

SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Impacts to the cultural landscape SPH4

No landscape features such as hills and pans will be impacted by SPH4. The impact on cultural landscape is due to the construction activities (construction vehicles and equipment) on site which is a rural landscape.

Table 7-135: SPH4 Assessment of construction phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the introduction of construction equipment and vehicles and all the associated activities on site</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being constructed at once</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Keep construction period as short as possible.</i>				
<i>Rehabilitate any areas not needed during operation as soon as possible.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		

SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low – negative		
CONFIDENCE LEVEL				
<i>High</i>				

(h) Palaeontological Impact

Palaeontological impacts would be the destruction of fossils from construction activities. The site as a whole is considered as low sensitivity in terms of palaeontology.

Table 7-136: SPH4: Assessment of the potential impacts to possible paleontological resources considers the criteria below

PALAEOLOGY IMPACTS				
PROJECT PHASE	<i>Construction, Operational and de commissioning Phases</i>			
DIRECT IMPACT	<i>Destruction of fossils in the footprint</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Loss of fossil heritage and scientific knowledge</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-6	<i>Very Low Negative</i>		
PROPOSED MITIGATION MEASURES				
<i>If fossils are found once excavations for foundations and amenities have commenced then they should be photographed, removed and put in a safe place. Photographs should be sent to a palaeontologist to assess their scientific value. If the fossils are important the palaeontologist must obtain a permit from SAHRA, visit the site and remove the fossils for curation and storage in a recognised facility such as a museum or palaeontology department in a university</i>				
<i>If no fossils are found, no action will be required</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	2	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a</i>	Negligible	Definite

		<i>way that natural, cultural and social functions and processes are minimally improved</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	6	Very Low Positive		
CONFIDENCE LEVEL				
<i>High</i>				

(i) Socio-Economic Impact

(i) Stimulation of the Economy during construction

The size of the Tokologo LM's economy was estimated at R2,170 million at current prices (2022) and primarily comprises of the agricultural and tertiary services sectors. Considering the small economic base of the municipality, the opportunities for the procurement of goods and services within the local economy will be very limited. That being said, it is likely that some of the local businesses will benefit from sub-contracting opportunities, consumer expenditure of the construction crew, and an increase in income of locals who are directly employed in the construction activities, or who benefit from the development of SPH4 through local procurement.

The stimulation of the economy will not be dependent on the technology options of the SPH4; thus, the battery technology alternatives are equally preferred.

Table 7-137: SPH4: Impact of Economic Stimulation during construction

IMPACT ON ECONOMY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Temporary increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
PROPOSED MITIGATION MEASURES				
<i>To optimise the stimulation of the local economy through direct, indirect and induced effects, the following should be applied where possible:</i>				

<i>Procure construction materials, goods, and products from local and domestic suppliers if feasible</i>				
<i>Employ local contractors where possible</i>				
<i>Note: The proposed mitigation measures will possibly increase the positive impact on the local economy; however, this will not affect the weighting thereof.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural, and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Creation of Employment during construction

The construction of SPH4 will require temporary employment of construction workers, foremen, and engineers On-site. Construction is expected to last twelve months where at the peak of construction about 150 people will be working on-site. The creation of between 100 and 150 temporary employment opportunities for SPH4 throughout the duration of construction which equates to about 50 FTE.

In addition to those benefitting from direct employment created at the project, various multiplier effects will assist in temporarily supporting existing jobs in the businesses offering services and goods that will be procured during construction activities. The increased temporary income earned by these businesses will in turn stimulate consumption spending, creating another round of multiplier effects.

SPH4 will create the same number of employment opportunities, regardless of its layout on the site; thus, layout alternatives are equally preferred.

Table 7-138: SPH4: Assessment of Employment during construction

IMPACT ON EMPLOYMENT				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Creation of temporary employment opportunities On-site</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of temporary employment opportunities in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3

EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	2	The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	30	low positive		
PROPOSED MITIGATION MEASURES				
<i>The following is recommended to increase the employment opportunities created in the local communities, where feasible:</i>				
<i>Employ labour intensive methods in construction, where feasible</i>				
<i>Employ local residents and communities, where possible</i>				
<i>Utilise local suppliers, where possible</i>				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term	10	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	2	The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	30	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Reduction of Land Area available for productive farming

The proposed site of SPH4 and surrounding land is currently used for small-scale livestock. The agricultural assessment classified the majority of SPH4 as being of low to very low agricultural potential with small isolated patches of low – moderate and moderate potential land on the edges of the facility. The farmers with livestock on the land proposed for the facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH4 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant’s footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project’s construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH4.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant differentiation among site layout alternatives can be made. The footprint of the BESS will be the same regardless of which battery technology is used. There is therefore no difference in the impact between the two technology alternatives.

Table 7-139: SPH4: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Construction and Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iv) Loss of Property

An influx of job seekers to the area during the construction phase may result in stock theft and burglaries. The number of workers and duration of construction will not be affected by the technology alternatives; thus, all alternatives are equally preferred.

Table 7-140: SPH4: Assessment of loss of property

IMPACT ON CRIME LEVELS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in crime associated with the influx of people</i>			
INDIRECT IMPACT	<i>Reduced level of security in and around the proposed facility</i>			
CUMULATIVE IMPACT	<i>No to negligible cumulative impact</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
<i>The following mitigations are advised to be instituted to minimise and possible eliminate the impact altogether:</i>				
<i>Ensure proper fencing and monitoring of the fencing is in place</i>				
<i>Maximise job creation and allocation to locals as far as practically possible. Recruitment of workers should be planned in advance and should not take place on-site. This will reduce the probability of work seekers loitering in the area surrounding the project sites</i>				
<i>Hire additional security personnel during the construction period</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(j) Terrestrial Biodiversity & Faunal Impact

(i) Direct Impact - Destruction of faunal habitat

Clearing or disturbance to natural vegetation for the construction of SPH4 will remove up to 261ha of natural grassland habitat. This includes the burrows of many fossorial species as well as termite mounds which provide a source of food for species such as aardvark and mongoose.

Two technology alternatives for the battery to be used in the BESS have been proposed. As the type of battery used will not alter the footprint of the BESS the alternatives are rated as equal for the impact of clearance of natural habitat.

Table 7-141: SPH4: Destruction of faunal habitat

DESTRUCTION OF FAUNAL HABITAT				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Destruction of faunal habitat</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>Loss of habitat and habitat connectivity</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-21	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays. Only indigenous grasses found in the area must be used for rehabilitation</i>				
<i>Undertake vegetation clearing during the dry season, and outside of the breeding season of burrowing fauna</i>				
<i>If possible, the movement of animals through the sites must be permitted during operations. The use of fencing that will allow the movement of small to medium fauna through would help mitigate the effect of fences acting as barriers. This can be achieved by constructing a fence that has places for animals to crawl through and is not difficult for fleeing animals and birds to see. For example, black mesh panel fencing can be used where gaps of approximately 30 cm high and 50 cm wide and spaced at regular intervals are cut/installed. The tops of these gaps must be smoothed off to limit the chance of wildlife being injured when passing through. The use of barbed wire must be avoided</i>				
<i>The proposed activities must remain within the project footprint</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-10	3

EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-30	low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(ii) Direct Impact - Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death. The clearing of ground for the foundations of the PV arrays will destroy burrows, potentially causing injury or death to burrowing animals. Furthermore, the presence of the construction site and personnel may result in negative interactions with fauna, such as hunting or killing animals perceived to be pests.

Regarding the technology alternative for the type of battery used in the BESS for all facilities, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place.

Table 7-142: SPH4: Injury or death to fauna

INJURY OR DEATH TO FAUNA				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Injury or death to fauna</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-18	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-3	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-54	moderate negative		

PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by construction workers</i>				
<i>To prevent possible collisions with animals, drivers of construction vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				
<i>Ideally construction should not continue at night so as to avoid potential collisions with nocturnal fauna</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>No wild animal may under any circumstance be hunted, snared, captured, injured or killed. This includes animals perceived to be vermin. Checks of the surrounding natural vegetation must be regularly undertaken to ensure no traps have been set. Any snares or traps found on or adjacent to the site must be removed and disposed of</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts – Disturbance and displacement of fauna

Construction activities have the potential to cause disturbance to fauna inhabiting the natural grassland through noise, vibrations, and light (if construction continues after dark). Security lights for the solar facilities during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The technology alternatives for the BESS will not change the ratings for this impact.

Table 7-143: SPH4: Disturbance and displacement of fauna

DISTURBANCE AND DISPLACEMENT OF FAUNA				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Disturbance to and displacement of fauna – natural grassland</i>			
CUMULATIVE IMPACT	<i>Displacement of fauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-</i>	-18	2

		<i>18 months and as such is rated as Short term</i>		
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-36	low negative		
PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>Ideally construction activities should cease at night to minimise the need for artificial lighting and to reduce the impact of noise and vibrations on nocturnal animals</i>				
<i>Lighting during construction should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects, such as low-pressure sodium lamps, is preferred</i>				
<i>Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-10	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(iv) Indirect Impacts – Pollution and contamination of natural areas

During construction, dust from exposed areas and roads, and litter from construction workers have the potential to pollute the surrounding natural vegetation. The use of dust suppressants, as well as hydrocarbons from vehicles and machinery, have the potential to contaminate soils and ground water, and be washed into the nearby natural pans during high rainfall events. The battery technology alternatives are rated the same and hence are covered in the same table.

Table 7-144: SPH4: Pollution and contamination of natural areas

POLLUTION AND CONTAMINATION OF NATURAL AREAS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-15	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-45	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities</i>				
<i>All vehicles and machinery must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>During construction, dust on construction roads must be suppressed using a water tanker</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by construction workers must be prohibited</i>				
<i>Appropriate solid waste disposal facilities must be provided for workers during construction</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(v) Indirect Impacts – Increased potential of invasion by alien vegetation

During construction, the removal of natural vegetation and disturbance to the soil will increase the likelihood of invasion by alien plant species. Alien species establish easily and quickly on bare soil by colonisation or from seeds existing in the seed bank of the soil. Infestation by alien and invasive species will lead to degradation of the surrounding natural habitat and will increase the potential of spread into the greater landscape. In addition, the vehicles and

equipment were likely used on various other sites and could introduce alien invasive plant seeds. This impact is relevant to all the proposed arrays equally and has therefore been assessed in one table for the construction phase.

The technology alternatives for the BESS will not change the ratings for this impact.

Table 7-145: SPH4: Increased potential of invasion by alien vegetation

INCREASED POTENTIAL OF INVASION BY ALIEN VEGETATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Increased potential of invasion by alien vegetation</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities monthly</i>				
<i>All areas cleared of natural vegetation must be rehabilitated. Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays and other cleared areas. Only indigenous grasses found in the area must be used for rehabilitation. This must be advised by the botanist</i>				
<i>An invasive alien plant species management and monitoring plan must be implemented during the construction phase. Monitoring should continue into the operational phase and through and for a period after decommissioning. This should be advised by the botanist</i>				
<i>All alien seedlings and saplings must be removed as they become evident for the duration of construction and during the operational phase. Manual / mechanical removal is preferred to chemical control</i>				
<i>All construction vehicles and equipment must be free of plant material before entering the site</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
High				

(k) Transport Impact

Traffic impacts anticipated to occur during the construction phase of the project are construction related traffic and noise and dust pollution.

Two technology alternative for the BESS have been proposed. There is no difference in the impacts from a traffic perspective between the alternatives.

Table 7-146: SPH4: Traffic Impacts – Construction Phase

TRAFFIC IMPACT				
PROJECT PHASE	Construction phase			
DIRECT IMPACT	Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site			
INDIRECT IMPACT	Construction traffic on roads might generate dust and noise.			
CUMULATIVE IMPACT	Traffic delays on the surrounding road network.			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-10	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES		No irreplaceable resources will be impacted.		
SIGNIFICANCE	-30	low negative		
PROPOSED MITIGATION MEASURES				
Stagger component delivery to site;				
Reduce the construction period (if possible);				
Dust suppression of gravel roads (internal roads and the access road to the site) during the construction phase, as required. Regular maintenance of gravel roads (internal roads and the access road to the site) by the Contractor during the construction phase.				
The use of mobile batching plants and quarries in close proximity to the site (if available and feasible); and				
Staff and general trips should occur outside of peak traffic periods.				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	5	1
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		

SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(I) Landscape and Visual Impact

Four visual impacts were identified for SPH4 during the construction, operational phase and decommissioning phase

- Landscape change
- Impact on Protected Areas
- Impact on local roads
- Impact on homesteads
- Light pollution

These impacts would all occur during the construction, operation and decommissioning phase. Impacts would peak once the facility is constructed, remain relatively constant during the operational phase and then decrease during the decommissioning phase.

The type of battery technology used in the BESS would not impact on the assessment of visual impacts and so the tables below cover both technology options.

Table 7-147: SPH4 Landscape change

LANDSCAPE CHANGE				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Change of character due to industrialisation of a Natural Landscape</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of landscape industrialisation due to other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable</i>	Moderately Detrimental	Definite

		systems or communities are negatively affected		
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Plan to maintain the height of structures as low as possible relative to existing ground levels;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
<i>Monitor areas for vegetation cover post-decommissioning and implement remedial actions.</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
5. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
6. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

Table 7-148: SPH4 Industrialization of the landscape as seen from Nielsview NR

SPH4 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM NIELSVIEW NR				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Industrialisation of the view from Nielsview NR due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from Protected Areas due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3

EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
Plan to maintain the height of structures as low as possible relative to existing ground levels;				
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;				
Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;				
Reinstate any areas of vegetation that have been disturbed during construction;				
Remove all temporary works;				
Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;				
Remove infrastructure not required for the post-decommissioning use of the site;				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	0	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
High				
NOTES				
5. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
6. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

Table 7-149: Industrialization of the landscape as seen from local roads, SPH4

INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL ROADS, SPH4				
PROJECT PHASE	Construction, Operational & Decommissioning Phases			
DIRECT IMPACT	Industrialisation of the view from local roads due to this project.			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Extension of industrialisation of views from local roads due to this and other electrical infrastructure projects			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that	Slightly Detrimental	Definite

		<i>natural, cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low negative		
PROPOSED MITIGATION MEASURES				
<i>Plan site levels to minimise earthworks to ensure that levels are not elevated;</i>				
<i>Plan to maintain the height of structures as low as possible;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Construct and/ or plant a 2m high screen along the southern edge of the array cluster</i>				
<i>Plan to protect existing natural site features such as drainage pans;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long term</i>	0	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	0	<i>Negligible</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>	<i>Negligible</i>	Definite
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
7. <i>The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				
8. <i>The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i>				

Table 7-150 SPH4: Industrialization of the landscape as seen from local homesteads

SPH4 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL HOMESTEADS				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Industrialisation of the view from local homesteads due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from local homesteads due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and</i>	Moderately Detrimental	Definite

		<i>processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Plan to maintain the height of structures as low as possible;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Construct / grow 2m high screen along SW and E edges of solar cluster closest to affected homesteads;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months – 5 years and as such is rated as medium term</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
5. <i>The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				
6. <i>The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i>				

Table 7-151 SPH4 Light pollution

SPH4 LIGHT POLLUTION				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Light pollution from the project spoiling the night time environment and nuisance to neighbors.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of light pollution due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3

EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
Use low key lighting around buildings and operational areas that is triggered only when people are present;				
Utilise infra-red security systems or motion sensor triggered security lighting;				
Ensure that lighting is focused on the development with no light spillage outside the site;				
No tall mast lighting should be used;				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	0	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
High				
NOTES				
5. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
6. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

7.5.4 Operational Phase

(a) Agricultural Impact

During the operational phase, areas that where vegetation will remain cleared such as access routes, will remain at risk of soil loss through erosion. During the operation phase, staff and maintenance personnel will access the development area to maintain the infrastructure and make repairs, where required. Biodegradable detergents and water will be used to clean the panels, however this is not expected to result in impacts from an agricultural perspective. The assessment of these impacts are summarised in **Table 7-44** and **Table 7-45**.

Table 7-152: SPH4 Impact significance of soil loss through erosion during the operation phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	Operation Phase			
DIRECT IMPACT	Areas where soil surfaces will remain bare such as access routes and between PV arrays, will remain at risk of soil erosion.			
INDIRECT IMPACT	Eroded areas can expand into nearby areas and result in land degradation.			
CUMULATIVE IMPACT	Increase in areas at risk of soil erosion.			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
The development area, including internal access routes, as well as areas bordering on the development area, must regularly be monitored to detect early signs of soil erosion on-set.				
If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-6	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
High				

Table 7-153: SPH4 Impact significance of soil pollution during the operation phase

SOIL POLLUTION				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Soil pollution caused by oil and fuel spills or maintenance materials and domestic waste left on site. The replacement of electrolyte of the redox flow batteries, also pose soil pollution risk.</i>			
INDIRECT IMPACT	<i>Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil pollution</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-14	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills.</i>				
<i>No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area.</i>				
<i>Regularly monitor the BESS area for any signs of oil, grease and fuel spillage or the presence of waste.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(b) Aquatic Impact

During the operation phase, the solar arrays will operate largely unattended and with low maintenance required for more than 20 years. The hard surfaces created by the development may lead to increased runoff. This may lead to increased erosion and sedimentation of the downslope areas. A localised long-term impact (more than 20 years) of low intensity (depending on the distance between the solar arrays and the freshwater features) could be expected that would have a very low overall significance post-mitigation in terms of its impact on the identified aquatic ecosystems in the area.

The only potentially toxic or hazardous materials which would be present in relatively small amounts would be of lubricating oils and hydraulic and insulating fluids. Therefore, contamination of surface or groundwater or soils is highly unlikely.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low. The impacts are rated the same for the battery technology alternatives for the BESS.

Table 7-154: SPH4 Operational phase aquatic ecosystem impacts

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION PRE-MITIGATION	CONSEQUENCE	LIKELIHOOD
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Any disturbance during the operation phase should be limited to the approved development footprints and should avoid disturbance of the soil and natural vegetation cover.</i>				
<i>Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.</i>				
<i>Stormwater run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving developed areas.</i>				
<i>Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider. In a scenario where services are installed, these systems need to be adequately installed and maintained to prevent any potential contamination of the water resources on site.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with</i>	-5	1

		<i>the impact will last more than 5 years and as such is rated as Long Term</i>		
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

(c) Avifaunal Impact

(i) Bird fatality at PV facility

Bird fatalities could occur at the site through a number of mechanisms, including collision with PV panels, entanglement in perimeter fence (less likely since developer has chosen to use mesh panel fencing which has a tight weave and birds are less likely to become entangled), electrocution in substations/electrical compounds and others. The battery technology options for the BESS are rated the same and are both covered in the same table.

Table 7-155: SPH4 bird fatality during operational phase

BIRD FATALITY AT PV FACILITY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Birds killed through various interaction with facility infrastructure</i>			
INDIRECT IMPACT	<i>--</i>			
CUMULATIVE IMPACT	<i>More projects will result in overall higher fatality rates in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any fatalities this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. Operational phase bird monitoring should be conducted for at least one year as per the best practice guidelines – see Section 8.</i>				
POST-MITIGATION				

DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

(ii) Nesting & other use of facility infrastructure by birds

Certain species, in particular doves, pigeons, weavers and crows, are likely to use some of the facility infrastructure for nesting, perching and roosting. At face value this is a positive impact for birds and has been rated as VERY LOW POSITIVE significance both pre and post mitigation. However, where nesting interferes with the operation of the facility this could cause conflict and require management. Nesting on infrastructure also increases the likelihood of bird fatalities occurring through the various mechanism, particularly of young inexperienced birds. No mitigation is required for the impact of the facility on birds through nesting. For the impact of the birds nesting on the facility, the specialist recommends nest management on a case by case basis under the supervision of an avifaunal specialist, and in conformance with all relevant national and provincial legislation. The impact is rated the same for the both battery technology alternatives for the BESS.

Table 7-156: SPH4 impact of bird nesting and other use of facility infrastructure by birds

BIRD NESTING, PERCHING & ROOSTING AT PV FACILITY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Birds use infrastructure to perch, roost or nest on</i>			
CUMULATIVE IMPACT	<i>More projects in the area will probably diminish the likelihood of this happening as perch availability will increase</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		

SIGNIFICANCE	7	very low positive		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any nesting which interferes with operations this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. All nest management measures should only be undertaken in compliance with national and provincial environmental legislation in this regard.</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	7	1
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	1	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	7	very low positive		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

Day to day operation and maintenance of the facility may result in disturbance and displacement of bats. The impact is rated the same for both battery technology options for the BESS.

Table 7-157: SPH4 disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	Disturbance of bats during operational activities			
INDIRECT IMPACT	Displacement			
CUMULATIVE IMPACT	Unavailability of suitable foraging resources in the broader environment for displaced individuals			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	very low negative		
PROPOSED MITIGATION MEASURES				
Limit operational and maintenance activities to daylight hours, as far as possible, and minimise lighting at night.				
All lighting should preferably use low pressure sodium and warm white LED lights.				
Operational and maintenance activities should be limited to the immediate project footprint only.				
Site access should be strictly controlled, to avoid unnecessary disturbance.				

POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-158: SPH4 bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during operational activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	2
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-28	Low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMPr				
<i>All lighting should preferably use low pressure sodium and warm white LED lights.</i>				
<i>During operational and maintenance activities, avoid all movement and noise around medium sensitivity areas.</i>				
<i>Operational and maintenance activities should be limited to the immediate project area.</i>				
<i>Site access should be strictly controlled, to avoid unnecessary disturbance.</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly detrimental	Unlikely

IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(e) Botanical Impacts

Maintenance activities will require management of vegetation which may result in loss of natural vegetation. The impact is rated the same for both battery technology options for the BESS.

Table 7-159: SPH4 loss of Western Free State Grassland during operational phase

LOSS OF VEGETATION				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Direct impact</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>Loss of Western Free State Clay Grasslands</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is the footprint as it only affects the area in which the proposed activity will occur.</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>When and where possible, vegetation clearing should be undertaken during the dry season.</i>				
<i>Only clear vegetation where absolutely necessary; and</i>				
<i>Stockpile areas for cleared vegetation will be decided and approved by the Project Manager and appointed ECO before construction commences on site and should not be located within drainage lines.</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-2	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(f) Groundwater Impact

Similar to the construction phase, the operational phase of the SPH4 will require approximately 1,000 m³/a (0.03 L/s). This does not exceed the regionally mapped yield of the underlying aquifer (0.5 – 2.0 L/s). It is not currently planned to use groundwater for the operational phase of this project however if this changes a water use licence will need to be applied for and the potential impacts and mitigation measures are presented in **Table 7-52**.

The principal risks for groundwater contamination that have been identified are the use of cleaning agents for cleaning of PV panels and for dust suppression of internal roads. If required, it is encouraged that water alone is used to conduct these tasks. Alternatively, the PV cleaning agents and dust suppression mixes must be environmentally friendly and should breakdown naturally without causing ingress of harmful chemicals into the environment. The risks and status of groundwater contamination occurring during the operational phase of SPH4 is presented in **Table 7-56**.

The proposed development will require a BESS. Currently two different technologies are being considered, i.e. either Solid State Lithium Batteries (SSLB) or Vanadium Redox Flow Battery Energy Storage Systems (VRFB). Both of these two BESS systems require an electrolyte. The SSLB contain an ethylene carbonate or di-ethyl carbonate electrolyte and the VRFB system will require that an estimate of 3 000 m³ of sulfuric acid solution with vanadium ions electrolyte is stored on site for each Springhaas Facility. The BESS systems will also require cooling systems and these systems could potentially either be water based or it may be refrigerant based systems which used chemicals such as ethylene glycol- based coolants.

The containers that the BESS systems are held in are equipped with a “Clean agent” which is a fires suppression systems that can release a powder/gas into the container to snuff fires. These systems usually leave a residue on the equipment that will need to be cleaned off. With any chemical storage there is always a risk of chemical fires that will need to be put out with water or foam and the waste water from these activities could contain contaminants that should not be let to run off into the environment.

The fire safety systems, refrigerants, electrolyte solutions and the waste products produced from these systems could contaminate the soil and groundwater and all measures should be taken to prevent leaks or spills on the ground. The risks and mitigations for the BESS are presented in **Table 7-57**.

The impact on groundwater levels is rated the same for both battery technology alternatives for the BESS.

Table 7-160 SPH4: Impact of lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place)

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	Operational Phase			
DIRECT IMPACT	Lowering of groundwater level due to over abstraction			
INDIRECT IMPACT	Drying of springs in the area			
CUMULATIVE IMPACT	Permanent damage to the aquifer system in the area			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-16	2
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-32	low – negative		
PROPOSED MITIGATION MEASURES				
If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring.				
Adhere to the borehole's safe yield and to monitor water levels and flow.				
Groundwater abstraction volumes must be monitored.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	0	Negligible	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
Medium				

Table 7-161: SPH4 Impact of contamination of groundwater as a result of cleaning agents used for cleaning the solar panels

Potential impact on groundwater as a result of cleaning agents used for cleaning the solar panels.				
PROJECT PHASE	Operational Phase			
DIRECT IMPACT	Contamination of groundwater			
INDIRECT IMPACT	Damage to the vegetation or ecosystem in the area			
CUMULATIVE IMPACT	Long-term reduced groundwater quality			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-16	2

EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-32	low - negative		
PROPOSED MITIGATION MEASURES				
Use environmentally safe cleaning agents that breakdown naturally (biodegradable detergents/green soaps) and that will not cause adverse effects.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	0	Negligible	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
Medium				

Redox flow batteries contain electrolyte solution which needs to be replaced approximately every 15 to 20 years. During replacement of electrolyte there is a risk of leaks or spills. This impact is only applicable to the redox flow batteries as lithium-ion batteries are solid state batteries.

Table 7-162: SPH4 Impact table for contamination of groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)

Potential impact on groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)				
PROJECT PHASE	Operational Phase			
DIRECT IMPACT	Contamination of groundwater			
INDIRECT IMPACT	Damage to the vegetation or ecosystem in the area			
CUMULATIVE IMPACT	Long-term reduced groundwater quality			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-16	2
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent		

		<i>properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or Communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	<i>low - negative</i>		
PROPOSED MITIGATION MEASURES				
<i>Ensure that all electrolyte or chemicals stored or used on site have secondary containments systems in place with reliable leak detection, annunciation in place. Ensure that all chemicals are handled on concrete bunded surfaces and not on bare soil.</i>				
<i>Any waste products produced from the BESS systems should be removed and disposed of appropriately. Waste water produced by fire hydrants should not be allowed to runoff into the environment.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>		
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>	0	1
SEVERITY	0	<i>Negligible</i>		
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>	<i>Negligible</i>	<i>Unlikely</i>
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to the cultural landscape

Because any physical impacts to the landscape would already have occurred during the construction phase, landscape impacts during operation of SPH4 relate only to the presence of the facility in what is otherwise a rural landscape. Impacts to the cultural landscape will occur during the operation phase and last as long as the lifetime of the facility. Because of the flat terrain, the impacts would not be experienced over great distances because intervening vegetation and buildings would offer partial screening. Nonetheless, the immediately surrounding area will experience a degree of change in landscape character and sense of place. The impact significance is rated to low negative before mitigation. The impacts are the same for both technology options for the batteries for the BESS.

Table 7-163: SPH4: Assessment of operation phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Operation Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the presence of a solar energy facility</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being present</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Keep all maintenance work within the authorised footprint.</i>				
<i>Minimise night-time light pollution in the area (visual recommendations to be followed to achieve this).</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(h) Socio-Economic Impact

(i) Stimulation of the Local Economy during operations

The operational period of SPH4 is a minimum of 20 years. Of the money spent annually during the operations period, a significant portion will likely comprise of salaries and wages of the Springhaas employees. The operations of the facility will make some contribution towards the growth of the local economy, as it will increase the size of the local electricity sector, as well as stimulate the demand for other sectors' services and goods such as water, transportation, and trade.

No differentiation can be made between the and battery technology alternatives for the BESS. The technology alternatives are considered in **Table 7-56 and Table 7-57.**

Table 7-164: SPH4: Assessment of Economic stimulation during operations

STIMULATION OF THE LOCAL ECONOMY DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Long-term increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				
<i>Where feasible, procure goods and services required for the operation of the plant from the local economy</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	16	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Moderately Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	48	moderate positive		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Creation of Employment and increased household income during operations

The operation of SPH4 will require functional and maintenance employees. It is envisaged that about eight direct jobs per facility will be created during the operations phase, which will occur for a duration of 20 years. About 70% of these jobs are to be filled by people from the local communities as they will be low-skilled employment opportunities. Employment of the eight individuals for the entire operational period will increase their household income, improve their standard of living and benefit their families.

SPH4 will create the same number of employment opportunities, regardless of its location on the site; thus, layout alternatives are equally preferred. The type of battery used in the BESS will also not significantly affect employment alternatives, thus both technology alternatives are equally preferred.

Table 7-165: SPH4 Assessment of employment during operations

CREATION OF EMPLOYMENT AND INCREASED HOUSEHOLD INCOME DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Creation of permanent employment opportunities in the local and regional economy</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of permanent employment opportunities in the region</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				
<i>Where feasible, aim to fill all the positions by labour from the local community</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	24	low positive		
CONFIDENCE LEVEL				
High				

(iii) Improved municipal service delivery

SPH4 will have a capacity of up to 150MWac and will be connected to the national grid through Eskom substation and generated electricity will be sold nationwide. The proposed project, albeit relatively small, will contribute towards improving National electricity availability; thus, improving the government service delivery, and could potentially also aid in growing the local economy by increasing the overall supply of electricity in the local economy. Furthermore, due to the taxes and rates that will be paid by the project to the municipality, the revenue of the latter will be increased, thus allowing it to improve the service delivery in other areas.

The layout alternatives and BESS technology alternatives will not affect the capacity of the solar facility; thus all alternatives are equally preferred.

Table 7-166: SPH4: Assessment of service delivery improvement

IMPROVED MUNICIPAL SERVICE DELIVERY				
PROJECT PHASE	Operational phase			
DIRECT IMPACT	It will likely improve the local electricity supply if fed to the grid			
INDIRECT IMPACT	Improved standard of living within the region			
CUMULATIVE IMPACT	Improved electricity availability			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	16	3
EXTENT	4	The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries		
SEVERITY	2	The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected	Moderately Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	48	moderate positive		
PROPOSED MITIGATION MEASURES				
No mitigations proposed				

(iv) Reduction of Land Area available for productive farming

The proposed site of SPH4 and surrounding land is currently used for small-scale livestock. The agricultural assessment classified the majority of SPH4 as being of low to very low agricultural potential with small isolated patches of low – moderate and moderate potential land on the edges of the facility. The farmers with livestock on the land proposed for the facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH4 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant’s footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project’s construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH4.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant differentiation among site layout alternatives can be made. The different battery technology alternatives will not affect the impact ratings.

Table 7-167: SPH4: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	<i>very low negative</i>		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3

EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(i) Terrestrial Biodiversity and Animal Species

(i) Direct Impacts – Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death.

Regarding the technology alternative for the type of battery used in the BESS for SPH4, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place.

Table 7-168: SPH4 Injury or death to fauna

ALL FACILITIES				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Injury or death to fauna</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-32	low negative		
PROPOSED MITIGATION MEASURES				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by maintenance staff</i>				
<i>To prevent possible collisions with animals, drivers of maintenance vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				

<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>Adequate fire prevention and safety measures must be in place. A fire emergency management plan must be in place</i>				
<i>All electrical equipment must be maintained on a regular basis to minimise the risk of fire</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Indirect Impacts – Pollution and contamination of natural areas

During operations, release of grey water into the environment can cause contamination by detergents. Grey water from cleaning of the solar panels has the potential to contaminate soils and ground water and be washed into the nearby natural pans during high rainfall events. This includes biodegradable detergents used for cleaning the panels, which can accumulate in the soil and be washed into the nearby pans before they break down. Biodegradable detergents can alter the balance of freshwater ecosystems as they promote bacterial growth and lower oxygen levels. The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-169: SPH4 pollution and contamination of natural areas

POLLUTION AND CONTAMINATION OF NATURAL AREAS INCLUDING PANS AND WETLANDS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas – including nearby pans or wetlands</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-21	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Highly detrimental	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee operational phase activities at a minimum every 6 months for the first 5 years and then yearly for the rest of the life of the facility</i>				
<i>If possible, panels should be cleaned using water that is clear of detergents only (e.g. potable water or borehole water). The use of grey water should be avoided. Should the need arise to clean the panels with detergents, then biodegradable detergents are preferred. Care must be taken not to allow the detergents to accumulate in the soil</i>				
<i>All maintenance vehicles must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by maintenance staff must be prohibited</i>				
<i>Appropriate solid waste disposal and ablution facilities must be provided for operational staff</i>				
<i>Adequate prevention and safety measures must be in place to avoid leaks to batteries. This includes regular maintenance and replacement of batteries in a timeous manner. Measures must be in place to prevent chemicals leaking into the soil, should damage to the battery occur</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-12	2
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-24	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts – Disturbance and displacement of fauna

Security lights for SPH4 during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland and rocky outcrops adjacent to the facility, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-170: SPH4 disturbance and displacement of fauna – natural grassland and rocky outcrops

DISTURBANCE AND DISPLACEMENT OF FAUNA – ROCKY OUTCROPS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Disturbance to and displacement of fauna – natural grassland and rocky outcrops</i>			
CUMULATIVE IMPACT	<i>Displacement of fauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				

DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-48	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>Operations during the night must be avoided to minimise the need for artificial lighting and to reduce the impact of light and noise on nocturnal animals</i>				
<i>Lighting during operations should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light, and has a low attraction to insects, such as low-pressure sodium lamps, is preferred</i>				
<i>The rocky outcrops must be declared as no-go areas for maintenance workers. Maintenance workers must remain within the facility boundaries when servicing or cleaning panels and equipment</i>				
<i>Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light. Lighting must be directed away from the rocky outcrops</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(j) Traffic Impact

During the operational phase there will be approximately 8 full time employees on site. Vehicles would access the site for daily operations and maintenance as and when required. The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-171 SPH4: Traffic impacts during operation phase

TRAFFIC IMPACTS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Traffic congestion due to the trips generated by the operation of the facility</i>			
INDIRECT IMPACT	<i>The associated noise and dust pollution</i>			
CUMULATIVE IMPACT	<i>Traffic delays on the surrounding road network</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Staff and maintenance trips should occur outside of peak traffic periods; and</i>				
<i>Client/Facility Manager is to ensure that regular maintenance of gravel roads (located within the site boundary, including the access road to the site) occurs during operation phase to minimise/mitigate dust pollution.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

7.5.5 Decommissioning Phase

Upon completion of the operational phase of the project which will last in excess of 20 years the facilities may be decommissioned. Decommissioning activities would entail removal of infrastructure from site and return of the site to a state similar to the pre-construction condition. The decommissioning impacts would not vary significantly between facilities and so all seven facilities are covered **Section 7.7**.

7.5.6 No-Go Alternative

The no-go alternative refers to the option of not developing the facility. The impact assessment for the no-go alternative is the same for all 7 facilities and is covered in **Section 7.8**.

7.5.7 Cumulative Impacts

The cumulative impact considers the development of all seven Springhaas solar PV facilities in addition to the other projects which are proposed within 30km of the facility.

The cumulative impacts were rated the same for each of the 7 solar PV facilities. The cumulative impact assessment is available in **Section 7.9**.

Table 7-172: SPH4 impact summary

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Design/Planning/Pre-Construction Phase			
No impacts identified			
Construction Phase			
Agricultural impacts			
Land use change from livestock farming to energy generation	Negative	Moderate	Low
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance and water quality impacts	Negative	Very low	Very low
Avifaunal impacts			
Destruction of bird habitat during construction	Negative	Low	Low
Disturbance of birds during construction	Negative	Very low	Very low
Bat impacts			
Bat habitat modification	Negative	Very low	Very low
Disturbance and displacement of bats	Negative	Very low	Very low
Possible roost disturbance	Negative	Low	Very low
Bat roost destruction	Negative	Low	Very low
Botanical impacts			
Loss of vegetation	Negative	Medium	Low
Groundwater impacts			
Lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place)	Negative	Low	Very low
Contamination of groundwater as a result of accidental oil spillages or fuel leakages	Negative	Very low	Very low
Heritage impacts			
Impact on archaeological sites	Negative	Very low	Very low
Impact on graves	Negative	Low	Very low
Impact on cultural landscape	Negative	Low	Low

Palaeontological impacts			
Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-economic impacts			
Stimulation of the economy during construction	Positive	Low	Low
Employment opportunities	Positive	Low	Low
Reduction in land available for productive farming	Negative	Very low	Very low
Loss of property	Negative	Low	Very low
Terrestrial biodiversity and animal species (faunal) impacts			
Destruction of faunal habitat	Negative	High	Low
Injury or death to fauna	Negative	Moderate	Very low
Disturbance and displacement of fauna	Negative	Low	Very low
Pollution and contamination of natural areas	Negative	Moderate	Very low
Increased potential of invasion by alien vegetation	Negative	Moderate	Very low
Traffic impacts			
Traffic congestion	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads	Negative	Low	Very low
Industrialisation of the landscape as seen from local homesteads	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
Operational Phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Soil pollution	Negative	Very low	Very low
Aquatic impacts			
Increased run-off, pollution	Negative	Very low	Very low
Aquatic			
Disturbance of aquatic habitat; water quality impacts	Negative	Very low	Very low
Avifauna impacts			
Bird fatality through interaction with infrastructure	Negative	Very low	Very low
Nesting and use of other infrastructure by birds	Positive	Very low	Very low
Bat impacts			
Disturbance and displacement	Negative	Very low	Very low
Roost disturbance	Negative	Low	Very low
Botanical impacts			
Loss of vegetation	Negative	Very low	Very low
Groundwater impacts			
Lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place).	Negative	Low	Very low
Contamination of groundwater from use of cleaning agents	Negative	Low	Very low
Contamination of groundwater from leaks or spills from BESS	Negative	Low	Very low

Heritage impacts			
Impact on cultural landscape	Negative	Low	Low
Socio-economic impacts			
Economic stimulation during operations	Positive	Low	Moderate
Employment opportunities	Positive	Low	Low
Improved service delivery	Positive	Moderate	Moderate
Reduction in land available for productive farming	Negative	Very low	Very low
Terrestrial biodiversity and animal species			
Injury or death of fauna	Negative	Low	Very low
Pollution and contamination of natural areas including pans and wetlands	Negative	High	Low
Disturbance and displacement of fauna –rocky outcrops	Negative	Moderate	Very low
Traffic impact			
Traffic congestion	Negative	Very low	Very low
Palaeontological impacts			
Destruction of fossils	NA	NA	NA
Decommissioning phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance of aquatic habitat, water quality impacts	Negative	Very low	Very low
Avifaunal impacts			
Disturbance of birds	Negative	Very low	Very low
Bat impacts			
Disturbance and displacements	Negative	Very low	Very low
Botanical impacts			
Loss of vegetation	Negative	Low	Low
Groundwater			
Contamination from construction activities	Negative	Very low	Very low
Heritage impacts			
Alteration of the rural landscape character through the presence of construction equipment and vehicles and all the associated activities on site	Negative	Low	Very low
Palaeontological impacts			
Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-Economic impacts			
Impact on the economy	Positive	Very low	Very low
Creation of temporary employment opportunities in the local and regional economy	Positive	Very low	Very low
Terrestrial biodiversity and animal species			
Destruction of novel ⁵ faunal habitat (i.e. grassed areas under the panels where fauna may recolonise after construction)	Negative	Moderate	Very low

⁵ Novel habitats are human-built, modified, or engineered niches in places that have been altered in structure and function by human activity

Injury or death to animals (due to collisions with construction vehicles or destruction of burrows that have established under the panels)	Negative	Moderate	Very low
Pollution and contamination of natural areas including pans and wetlands	Negative	High	Very low
Disturbance to and displacement to fauna and edge effects – natural grassland	Negative	Low	Very Low
Increased potential of invasion by alien vegetation	Negative	Moderate	Very low
Reestablishment of movement corridors through the landscape due to removal of fences and return to open grassland	Negative	Very low	Low positive
Traffic impacts			
Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads	Negative	Very low	Very low
Industrialisation of the landscape as seen from local homesteads	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
No-Go Alternative			
Agricultural	Negative	Very low	Very low
Aquatic	Negative	-	Very low-negligible
Avifauna	Negative	Very low	Very low
Bats	Negative	Very low	Very low
Botanical	Negative	Low	Low
Heritage	Negative	Very low	Very low
Transport- Traffic congestion	Negative	Very Low	Very Low
Terrestrial biodiversity and animal species	Negative/positive	Low negative	Very low positive
Socio-economic	NA- no impact, forgone + impacts	NA	NA
Destruction of fossils	NA	NA	NA
Landscape and Visual	Negligible	No impact/NA	No impact/NA
Groundwater Impacts	Negligible	NA	NA
Cumulative impacts			
Agricultural	Negative	Very low	Very low
Aquatic	Negative	Low	Low
Avi-fauna	Negative	Moderate	Moderate
Bats	Negative	Low	Low
Botanical	Negative	Very low	Very low
Heritage	Negative	Moderate	Low
Socio-economic - Impact on the economy- construction	Positive	-	Moderate
Socio-economic -Creation of employment during construction	Positive	-	Moderate

Socio-economic -Reduction in land available for productive farming	Negative	-	Low
Socio-economic -Stimulation of the economy – operations	Positive	-	Moderate
Socio-economic -Employment - operations	Positive	-	Moderate
Socio-economic -Improved municipal service delivery	Positive	-	Moderate
Socio-economic -Loss of property	Negative	-	Low
Socio-economic - Stimulation of economy - decommissioning	Positive	-	Very low
Terrestrial biodiversity	Negative	High	Moderate
Transport	Negative	Low	Very Low
Landscape and visual	Negative	-	Low
Destruction of fossils	NA	NA	NA
Groundwater: Aquifer system and water quality	Negative	Low- Very Low	Low – Very Low

7.6 Springhaas 5 Detailed Impact Assessment

7.6.1 Alternatives Considered

(a) Technology Alternatives

Two technology alternatives namely lithium-ion and redox flow batteries were considered for the BESS.

(b) No-Go Alternative

The no-go alternative was considered for all seven of the proposed facilities. The impact of the no-go alternative was rated as the same for all seven facilities. The no-go alternative is assessed in **Section 7.8**.

7.6.2 Pre-construction phase

No significant impacts for the pre-construction phase have been identified by any specialist studies or by the EAP for SPH5.

7.6.3 Construction Phase

(a) Agricultural Impact

The most significant agricultural impacts associated with the development of SPH5 will occur during the construction phase when the site is fenced off, vegetation is removed and the soil surface is prepared for the installation of infrastructure.

The footprint of SPH5 is fully located in low sensitivity agricultural land..

SPH5 was also classified in terms of agricultural potential. The entire site is classified as low to very low potential with the exception of one area of low- moderate potential land. This

patch of low- moderate and moderate potential agricultural land is from larger patches of moderate sensitivity land and is not viable from a production perspective.

Tables 7-8 – 7-11 cover the two technology options for the BESS. There was no difference in the alternatives proposed from an agricultural perspective.

Table 7-173: SPH5: Impact of land use change from livestock farming to renewable energy generation

LAND USE CHANGE FROM LIVESTOCK FARMING TO ENERGY GENERATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Construction of boundary fence and PV infrastructure will change land use from livestock farming to renewable energy generation</i>			
INDIRECT IMPACT	<i>Intensification of agriculture in other areas or otherwise reduction of livestock produced in the area</i>			
CUMULATIVE IMPACT	<i>Increase in areas where agriculture is converted into other land uses</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	Moderately Detrimental	Definite
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Springhaas Solar Facility 3 (Pty) Ltd must provide market-related compensation that will allow the current land users to have the same or better ability to sustain their livelihood.</i>				
<i>Ensure that the final infrastructure layout remains within the fenced off area of the development footprint.</i>				
<i>Prior arrangements must be made with the landowners to ensure that livestock and game animals are moved to areas where they cannot be injured by vehicles traversing the area.</i>				
<i>The use of main access routes by construction vehicles and equipment must do so with consideration of nearby agricultural land users who use the same access routes for farming activities.</i>				
<i>All left-over construction material must be removed from site once construction on a land portion is completed.</i>				
<i>No materials removed from development area must be allowed to be dumped in nearby livestock farming areas.</i>				
<i>No boundary fence must be opened without the landowners' permission.</i>				
<i>No open fires made by the construction teams are allowable during the construction phase.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will</i>	-7	3

		<i>last more than 5 years and as such is rated as Long Term</i>		
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-174: SPH5: Impact significance of soil loss through erosion during the construction phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Loss of soil particles from areas where construction activities result in the removal of vegetation from the surface.</i>			
INDIRECT IMPACT	<i>Sparse to no vegetation growth in eroded areas.</i>			
CUMULATIVE IMPACT	<i>Increase in areas exposed to soil erosion</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-18	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Limit vegetation removal from the soil surface to the areas of infrastructure development such as access routes as well as around the foundations of the PV arrays and buildings.</i>				
<i>Vegetation clearance must only be undertaken immediately prior to construction activities and only within the development footprint</i>				
<i>Once construction of an area has been completed, level any remaining soil removed from excavation pits (where the PV arrays will be mounted) that remained on the surface, instead of allowing small stockpiles of soil to remain on the surface where it is exposed to rain and wind. This is applicable to all construction areas, except where topsoil stockpiles must remain for site rehabilitation of specific areas.</i>				
<i>Stormwater channels on site must be designed to minimise the soil erosion risk that results from surface water runoff.</i>				

<i>Where possible, conduct the construction activities outside of the rainy season.</i>				
POST-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-5	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-175: SPH5: Impact significance of impaired soil functionality caused by compaction

IMPAIRED SOIL FUNCTIONALITY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>The weight and movement of vehicles and equipment over the surface will result in soil compaction.</i>			
INDIRECT IMPACT	<i>Compacted soil have reduced pore space and water infiltration rate. Compacted soil surfaces increase the rate of surface water runoff, especially after a rainfall event.</i>			
CUMULATIVE IMPACT	<i>Increase in areas affected by soil compaction.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-18	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-3	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Only allow vehicles and equipment to travel on designated access routes and not anywhere else within the development area.</i>				
<i>Use existing main access routes and internal farm roads where possible and avoid using other areas in the site as temporary access routes.</i>				
<i>Vehicles and equipment must park in designated parking areas.</i>				
<i>Materials must be off-loaded and stored in designated laydown area.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season as wet soil compacts easily as opposed to dry soil.</i>				
POST-MITIGATION				

DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-5	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
High				

Table 7-176: SPH5: Impact significance of impaired soil health as a result of soil pollution

IMPAIRED SOIL HEALTH				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Soil pollution can be caused by oil and fuel spills from vehicles and equipment as well as domestic and material waste on site. Should the vanadium redox flow batteries be used for the BESS, spillage of corrosive and environmentally toxic electrolyte is possible. In the case that lithium solid state containerised batteries are used, there is a possibility of thermal runaway that will result in the release of toxic and flammable gasses.			
INDIRECT IMPACT	Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health.			
CUMULATIVE IMPACT	Increase in areas at risk of soil pollution.			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-21	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-3	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.	Highly detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
Maintenance must be undertaken regularly on all vehicles and construction equipment to prevent hydrocarbon spills.				
Any waste generated during construction must be stored into designated containers and removed from the site by the construction teams.				
Any left-over construction materials must be removed from the development area.				
The development area must be monitored by the Environmental Control Officer (ECO) to detect any early signs of fuel and oil spills and waste dumping. The ECO must also report any spills from batteries.				
Ensure battery transport and installation is undertaken by accredited staff and contractors.				
Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.				
POST-MITIGATION				

DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-5	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
High				

(b) Aquatic Impact

Construction phase activities would result in disturbance of soil and clearing of vegetation. Water quality impacts may occur from batching of concrete on site, hydrocarbon spills and other construction activities.

There is no difference in impacts between the two battery technology options for BESS, the impact assessment table covers both alternatives.

Table 7-177: SPH5: Impact of aquatic ecosystems during the construction phase

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Disturbance of aquatic habitat; water quality impacts			
INDIRECT IMPACT	Modification of flow and alien vegetation invasion in aquatic features			
CUMULATIVE IMPACT	Degradation of the ecological condition of aquatic ecosystems			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long term	-14	3
EXTENT	3	The extent of the impact is rated as Local as it affects only the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	Moderate negative		
PROPOSED MITIGATION MEASURES				
A buffer of at least 250 m between the significant aquatic ecosystems (larger pans) and all the proposed project activities should be maintained (noting that this is already honoured in the proposed layout for all facilities).				
Clearing of indigenous vegetation should not take place within the aquatic features and the recommended buffers, while				

<i>retaining the topography and cover vegetation within the wider drainage areas through the site is preferred to reduce the potential modification to the way in which water drains through these areas.</i>				
<i>The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance.</i>				
<i>During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills. The solar panels will be washed with water and a biodegradable/ greendetergent.</i>				
<i>Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.</i>				
<i>Development within the drainage areas, where located within a proposed facility, will however need to consider stormwater management measures and should avoid impacting on the movement of water through the more seasonally wet areas. Minimal disturbance to the topography and cover vegetation in these areas is recommended.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-12	2
EXTENT	2	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.</i>	Slightly Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-24 low negative			
CONFIDENCE LEVEL				
<i>High</i>				

(c) Avifaunal Impact

(i) Habitat destruction associated with the construction of the facility

Habitat destruction and alteration will occur during the construction phase of SPH4. The majority of the development footprint would be transformed from its current state to a renewable energy facility. SPH4 will transform approximately 261ha of habitat. Most of this is in a fairly natural state currently, or in the case of arable lands is still accessible and useable for birds foraging.

Table 7-178: SPH5: Formal rating of destruction of bird habitat during construction

DESTRUCTION OF BIRD HABITAT DURING CONSTRUCTION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Transformation of natural habitat into PV facility</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Yes - Larger area transformed from natural habitat</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	3

EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-36	low – negative		
PROPOSED MITIGATION MEASURES				
There is no specific mitigation required. Impact avoidance has already been implemented in the design phase through the adherence to no-go buffers around pans.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-12	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-36	low - negative		
CONFIDENCE LEVEL				
High				

(ii) Disturbance of birds & displacement effects

Disturbance of avifauna during the construction (and thereafter during maintenance and operational and decommissioning) of the facility and all development alternatives and associated infrastructure is likely to occur. Disturbance of breeding birds is typically of greatest concern. In this regard any breeding sites of sensitive bird species would be the most important. It is noted that no breeding sites have been identified on site at this stage.

There is no difference between the location and technology options in terms of disturbance and displacement of birds.

Table 7-179: SP4: Formal rating of disturbance of birds during construction

PROJECT PHASE	Construction phase & operations phase to lesser extent			
DIRECT IMPACT	Birds disturbed from their normal activities through the increased noise and activity levels associated with construction			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	More projects will result in overall higher disturbance levels			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				

DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required as there are no particularly sensitive features identified (such as breeding sites). General good environmental practice should be implemented during construction in terms of control of vehicles, staff, minimising the impact on the receiving environment as much as possible.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

The facility boundary for SPH5 encompasses a pan which is a high sensitivity areas from a bat perspective. The pan along with its 250m ecological buffer have been avoided by the infrastructure layout.

During the construction of SPH5 habitat modification would occur, disturbance and displacement of bats may occur and bat roosts may be disturbed or destroyed.

Two technology options are under consideration for the BESS. For bat impacts the type of technology used for the BESS is not considered relevant. Both technology options are considered equally acceptable.

Table 7-180: SPH4: Bat habitat modification

IMPACT ON POSSIBLE HABITAT MODIFICATION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Modification of habitat through the removal of vegetation cover and water sources</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Loss of foraging resources for local bat population</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
PROPOSED MITIGATION MEASURES				
<i>This impact may be reduced by limiting the removal of vegetation and available water sources, as far as possible.</i>				
<i>Avoid all high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should any changes or expansion take place to the boundary of the facility a bat specialist must provide input to confirm that these changes are acceptable in terms of the avoidance of high sensitivity areas.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential additional sensitive habitats, to confirm the baseline environment, if construction does not take place within 5 years of the initial bat study.</i>				
<i>Following construction, rehabilitation of all disturbed areas, inclusive of that beyond permanent infrastructure footprints, (e.g. temporary access tracks and laydown areas) must be undertaken.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-181: SPH5: Disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Disturbance of bats during construction activities</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable foraging resources in the broader environment for displaced individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Limit construction activities to daylight hours only and minimise lighting at night, as far as possible.</i>				
<i>Avoid high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should the currently assessed layout change, a bat specialist must confirm, that these high sensitive areas have been adequately avoided.</i>				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-182: SPH5: Bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during construction activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way</i>	Negligible	Unlikely

		<i>that natural, cultural and social functions and processes are minimally affected.</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	low negative		
PROPOSED MITIGATION MEASURES				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.</i>				
<i>If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-183: SPH4: Bat Roost destruction

IMPACT OF POSSIBLE ROOST DESTRUCTION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Destruction of potential bat roosting features</i>			
INDIRECT IMPACT	<i>Reduction of available roosting sites and/or Mortality</i>			
CUMULATIVE IMPACT	<i>Insufficient roosting resources to support the local population and potential increased bat mortality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	Low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMPR				
<i>Avoid the destruction or removal of existing farmsteads and trees, as far as possible.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.</i>				
<i>If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.</i>				

<i>All construction activities should be limited to the assessed project footprint only.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(e) Botanical Impacts

The development of SPH5 would result in extensive but localized loss of relatively undisturbed (unploughed but grazed) Western Free State Clay Grasslands.

The shade effect of the panels on the grassland vegetation is not known and it not easily predicted. There will be space under the panels for grass and other plants to grow. However, the microclimate is likely to be different to that of open grassland, so a different suite of plant species is likely to colonize the space under the solar panels.

Two technology options are proposed for the BESS. The technology alternatives will make no difference on the botanical impact assessment and as such these alternatives are covered in the **Table 7-19**.

Table 7-184: SPH5: Impact of loss of Western Free State Clay Grassland

LOSS OF VEGETATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Removal of natural vegetation: Western Free State Clay Grasslands</i>			
INDIRECT IMPACT	<i>None determined</i>			
CUMULATIVE IMPACT	<i>Loss of Western Free State Clay Grasslands</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term.</i>	-15	3
EXTENT	3	<i>The impacts will be localized to the designated target areas.</i>		
SEVERITY	-2	<i>The severity of the potential impact will be moderate negative.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-45	medium - negative		
PROPOSED MITIGATION MEASURES				

The first mitigation measures necessary would be the relocation of **Ammocharis coronica** bulbs if they cannot be avoided. Ideally the bulb should be lifted when they are dormant (winter) but that would mean traversing the entire area of the SPH sites in the preceding summer and marking every occurrence of these plants. A more practical approach would be to unearth the bulbs during the construction phase and relocating and planting them soon after removal.

Secondly, all areas that are disturbed during construction and that are not needed during the operational phase should be rehabilitated, using natural grasses that occur in the area. It would be possible for some grasses and forbs to survive under the panels, but it is difficult to predict the extent of such growth, nor which plant species would grow effectively under the panels.

POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last at least 5 years and therefore it is considered to be Long Term.	-5	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
High				

(f) Groundwater Impact

The water required during the construction phase of SPH5 is approximately 9,000m³ per year. The water requirement lies well within the yield potential of the underlying fractured rock aquifer (i.e. 0.5 – 2.0 L/s). It must be noted that at present the use of groundwater is not proposed however if this changes the potential impacts of groundwater abstraction are shown in **Table 7-20**.

Earthmoving plant and/or construction vehicles will be used on site during the construction phase. Use of vehicles presents a risk of groundwater contamination by fuel and oil leakage.

Two technology options (lithium-ion vs redox flow batteries) were considered for SPH5. The alternatives considered are equally preferred.

Table 7-185: SPH5: Impact table for the lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place).

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Lowering of groundwater level due to over abstraction			
INDIRECT IMPACT	Drying of springs in the area			
CUMULATIVE IMPACT	Permanent damage to the aquifer system in the area			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-14	2
EXTENT	3	The extent of the impact is rated as Local as it affects the development		

		<i>area and adjacent properties</i>		
<i>SEVERITY</i>	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
<i>IMPACT ON IRREPLACEBLE RESOURCES</i>	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-28	low - negative		
PROPOSED MITIGATION MEASURES				
<i>If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring. Adhere to the borehole’s safe yield and to monitor water levels and flow.</i>				
<i>Groundwater abstraction volumes must be monitored.</i>				
POST-MITIGATION				
<i>DURATION</i>	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	0	1
<i>EXTENT</i>	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
<i>SEVERITY</i>	0	<i>Negligible</i>	Negligible	Unlikely
<i>IMPACT ON IRREPLACEBLE RESOURCES</i>	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

The main risk associated with the construction phase is groundwater contamination from the use of construction vehicles and heavy machinery on-site.

Table 7-186: SPH5: Impact of contamination of groundwater as a result of accidental oil spillages or fuel leakages during the construction and decommissioning phases.

Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages				
PROJECT PHASE	<i>Construction and Decommissioning Phase</i>			
DIRECT IMPACT	<i>Groundwater contamination</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the</i>	Negligible	Likely

		<i>environment in such a way that natural, cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-10	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Vehicles must be maintained regularly and kept in a good working order. Dirty water should be captured, to be re-used where possible. No dirty water is allowed to be discharged into the surrounding environment.</i>				
<i>No heavy equipment or vehicles to be left in excavation area when not in use. Drip trays to be used under stationary vehicles and machinery where possible.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>		
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>	- 4	1
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to archaeological resources

Impacts to archaeological resources at SHP4 are limited to the possible destruction of isolated background scatter artefacts which have very low to no cultural significance. Impacts will be direct and permanent but because of the low cultural significance the severity is very low negative.

Two technology alternatives were considered for the battery technology for the BESS. Both technology options are equally preferred.

Table 7-187: SPH5: Assessment of construction phase impacts to archaeological sites.

Archaeological impacts				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Destruction of isolated artefacts			
INDIRECT IMPACT	None			
CUMULATIVE IMPACT	None			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-6	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
None required as the ruin is in poor condition and does not have any special architectural qualities that need to be further recorded.				
No materials to be removed from any other ruins in the wider project area.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-6	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
High				

(ii) Impacts to graves

Impacts to graves for SPH5 are not expected because all identified graves have been avoided by the facility layout. There is still the chance of an unmarked grave being present, or even a marked grave that was not found during the survey. The chances are considered low, however. The impact on graves applies equally to both technology alternatives.

Table 7-188: SPH5: Assessment of construction phase impacts to graves

IMPACTS TO GRAVES				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Destruction of graves, including their coverings and possibly human remains			
INDIRECT IMPACT	None			
CUMULATIVE IMPACT	Destruction of graves, including their coverings and possibly human remains			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-18	2
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-3	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-36	low – negative		
PROPOSED MITIGATION MEASURES				
Farm-style wire fences should be erected around all known and unfenced graves (i.e. waypoints 362 & 404) within the farm portion affected by construction. Pedestrian access gates must be provided and the fences must be located a minimum of 5 m away from all graves.				
All graves to be treated as no-go areas with temporary signage as required.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-18	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-3	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
High				

(iii) Impacts to the cultural landscape SPH4

No landscape features such as hills and pans will be impacted by SPH5. The impact on cultural landscape is due to the construction activities (construction vehicles and equipment) on site which is a rural landscape.

Table 7-189: SPH5 Assessment of construction phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the introduction of construction equipment and vehicles and all the associated activities on site</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being constructed at once</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Keep construction period as short as possible.</i>				
<i>Rehabilitate any areas not needed during operation as soon as possible.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low – negative		
CONFIDENCE LEVEL				
<i>High</i>				

(h) Palaeontological Impact

Palaeontological impacts would be the destruction of fossils from construction activities. The site as a whole is considered as low sensitivity in terms of palaeontology.

Table 7-190: SPH5: Assessment of the potential impacts to possible paleontological resources considers the criteria below

PALAEOLOGY IMPACTS				
PROJECT PHASE	<i>Construction, Operational and de commissioning Phases</i>			
DIRECT IMPACT	<i>Destruction of fossils in the footprint</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Loss of fossil heritage and scientific knowledge</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-6	<i>Very Low Negative</i>		
PROPOSED MITIGATION MEASURES				
<i>If fossils are found once excavations for foundations and amenities have commenced then they should be photographed, removed and put in a safe place. Photographs should be sent to a palaeontologist to assess their scientific value. If the fossils are important the palaeontologist must obtain a permit from SAHRA, visit the site and remove the fossils for curation and storage in a recognised facility such as a museum or palaeontology department in a university</i>				
<i>If no fossils are found, no action will be required</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	2	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	6	<i>Very Low Positive</i>		
CONFIDENCE LEVEL				
<i>High</i>				

(i) Socio-Economic Impact

(i) Stimulation of the Economy during construction

The size of the Tokologo LM's economy was estimated at R2,170 million at current prices (2022) and primarily comprises of the agricultural and tertiary services sectors. Considering the small economic base of the municipality, the opportunities for the procurement of goods and services within the local economy will be very limited. That being said, it is likely that some of the local businesses will benefit from sub-contracting opportunities, consumer expenditure of the construction crew, and an increase in income of locals who are directly employed in the construction activities, or who benefit from the development of SPH5 through local procurement.

The stimulation of the economy will not be dependent on the technology options of the SPH5; thus, the battery technology alternatives are equally preferred.

Table 7-191: SPH5: Impact of Economic Stimulation during construction

IMPACT ON ECONOMY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Temporary increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
PROPOSED MITIGATION MEASURES				
<i>To optimise the stimulation of the local economy through direct, indirect and induced effects, the following should be applied where possible:</i>				
<i>Procure construction materials, goods, and products from local and domestic suppliers if feasible</i>				
<i>Employ local contractors where possible</i>				
<i>Note: The proposed mitigation measures will possibly increase the positive impact on the local economy; however, this will not affect the weighting thereof.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3

EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural, and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Creation of Employment during construction

The construction of SPH5 will require temporary employment of construction workers, foremen, and engineers On-site. Construction is expected to last twelve months where at the peak of construction about 150 people will be working on-site. The creation of between 100 and 150 temporary employment opportunities for SPH5 throughout the duration of construction which equates to about 50 FTE.

In addition to those benefitting from direct employment created at the project, various multiplier effects will assist in temporarily supporting existing jobs in the businesses offering services and goods that will be procured during construction activities. The increased temporary income earned by these businesses will in turn stimulate consumption spending, creating another round of multiplier effects.

SPH4 will create the same number of employment opportunities, regardless of its layout on the site; thus, layout alternatives are equally preferred.

Table 7-192: SPH5: Assessment of Employment during construction

IMPACT ON EMPLOYMENT				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Creation of temporary employment opportunities On-site</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of temporary employment opportunities in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important,</i>	Slightly Beneficial	Definite

		<i>sensitive or vulnerable systems or communities are positively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
PROPOSED MITIGATION MEASURES				
<i>The following is recommended to increase the employment opportunities created in the local communities, where feasible:</i>				
<i>Employ labour intensive methods in construction, where feasible</i>				
<i>Employ local residents and communities, where possible</i>				
<i>Utilise local suppliers, where possible</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Reduction of Land Area available for productive farming

The proposed site of SPH5 and surrounding land is currently used for small-scale livestock. The agricultural assessment classified the majority of SPH4 comprised entirely of low to very low agricultural potential with one small isolated patches of low – moderate potential land. The farmers with livestock on the land proposed for the facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH5 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant’s footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project’s construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH5.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant

differentiation among site layout alternatives can be made. The footprint of the BESS will be the same regardless of which battery technology is used. There is therefore no difference in the impact between the two technology alternatives.

Table 7-193: SPH5: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Construction and Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iv) Loss of Property

An influx of job seekers to the area during the construction phase may result in stock theft and burglaries. The number of workers and duration of construction will not be affected by the technology alternatives; thus, all alternatives are equally preferred.

Table 7-194: SPH5: Assessment of loss of property

IMPACT ON CRIME LEVELS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in crime associated with the influx of people</i>			
INDIRECT IMPACT	<i>Reduced level of security in and around the proposed facility</i>			
CUMULATIVE IMPACT	<i>No to negligible cumulative impact</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
<i>The following mitigations are advised to be instituted to minimise and possible eliminate the impact altogether:</i>				
<i>Ensure proper fencing and monitoring of the fencing is in place</i>				
<i>Maximise job creation and allocation to locals as far as practically possible. Recruitment of workers should be planned in advance and should not take place on-site. This will reduce the probability of work seekers loitering in the area surrounding the project sites</i>				
<i>Hire additional security personnel during the construction period</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(j) Terrestrial Biodiversity & Faunal Impact

(i) Direct Impact - Destruction of faunal habitat

Clearing or disturbance to natural vegetation for the construction of SPH5 will remove up to 177ha of natural grassland habitat. This includes the burrows of many fossorial species as well

as termite mounds which provide a source of food for species such as aardvark and mongoose.

Two technology alternatives for the battery to be used in the BESS have been proposed. As the type of battery used will not alter the footprint of the BESS the alternatives are rated as equal for the impact of clearance of natural habitat.

Table 7-195: SPH5: Destruction of faunal habitat

DESTRUCTION OF FAUNAL HABITAT				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Destruction of faunal habitat</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>Loss of habitat and habitat connectivity</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-21	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays. Only indigenous grasses found in the area must be used for rehabilitation</i>				
<i>Undertake vegetation clearing during the dry season, and outside of the breeding season of burrowing fauna</i>				
<i>If possible, the movement of animals through the sites must be permitted during operations. The use of fencing that will allow the movement of small to medium fauna through would help mitigate the effect of fences acting as barriers. This can be achieved by constructing a fence that has places for animals to crawl through and is not difficult for fleeing animals and birds to see. For example, black mesh panel fencing can be used where gaps of approximately 30 cm high and 50 cm wide and spaced at regular intervals are cut/installed. The tops of these gaps must be smoothed off to limit the chance of wildlife being injured when passing through. The use of barbed wire must be avoided</i>				
<i>The proposed activities must remain within the project footprint</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-10	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected</i>	Slightly detrimental	Definite

		<i>environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-30	low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(ii) Direct Impact - Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death. The clearing of ground for the foundations of the PV arrays will destroy burrows, potentially causing injury or death to burrowing animals. Furthermore, the presence of the construction site and personnel may result in negative interactions with fauna, such as hunting or killing animals perceived to be pests.

Regarding the technology alternative for the type of battery used in the BESS for all facilities, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place.

Table 7-196: SPH5: Injury or death to fauna

INJURY OR DEATH TO FAUNA				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Injury or death to fauna</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-18	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-54	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by construction workers</i>				

<i>To prevent possible collisions with animals, drivers of construction vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				
<i>Ideally construction should not continue at night so as to avoid potential collisions with nocturnal fauna</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>No wild animal may under any circumstance be hunted, snared, captured, injured or killed. This includes animals perceived to be vermin. Checks of the surrounding natural vegetation must be regularly undertaken to ensure no traps have been set. Any snares or traps found on or adjacent to the site must be removed and disposed of</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts – Disturbance and displacement of fauna

Construction activities have the potential to cause disturbance to fauna inhabiting the natural grassland through noise, vibrations, and light (if construction continues after dark). Security lights for the solar facilities during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The technology alternatives for the BESS will not change the ratings for this impact.

Table 7-197: SPH5: Disturbance and displacement of fauna

DISTURBANCE AND DISPLACEMENT OF FAUNA				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Disturbance to and displacement of fauna – natural grassland</i>			
CUMULATIVE IMPACT	<i>Displacement of fauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-18	2

EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-36	low negative		
PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>Ideally construction activities should cease at night to minimise the need for artificial lighting and to reduce the impact of noise and vibrations on nocturnal animals</i>				
<i>Lighting during construction should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects, such as low-pressure sodium lamps, is preferred</i>				
<i>Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-10	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(iv) Indirect Impacts – Pollution and contamination of natural areas

During construction, dust from exposed areas and roads, and litter from construction workers have the potential to pollute the surrounding natural vegetation. The use of dust suppressants, as well as hydrocarbons from vehicles and machinery, have the potential to contaminate soils and ground water, and be washed into the nearby natural pans during high rainfall events. The battery technology alternatives are rated the same and hence are covered in the same table.

Table 7-198: SPH5: Pollution and contamination of natural areas

POLLUTION AND CONTAMINATION OF NATURAL AREAS	
PROJECT PHASE	<i>Construction Phase</i>
DIRECT IMPACT	

INDIRECT IMPACT	<i>Pollution and contamination of natural areas</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-15	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-45	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities</i>				
<i>All vehicles and machinery must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>During construction, dust on construction roads must be suppressed using a water tanker</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by construction workers must be prohibited</i>				
<i>Appropriate solid waste disposal facilities must be provided for workers during construction</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(v) Indirect Impacts – Increased potential of invasion by alien vegetation

During construction, the removal of natural vegetation and disturbance to the soil will increase the likelihood of invasion by alien plant species. Alien species establish easily and quickly on bare soil by colonisation or from seeds existing in the seed bank of the soil. Infestation by alien and invasive species will lead to degradation of the surrounding natural habitat and will increase the potential of spread into the greater landscape. In addition, the vehicles and equipment were likely used on various other sites and could introduce alien invasive plant seeds. This impact is relevant to all the proposed arrays equally and has therefore been assessed in one table for the construction phase.

The technology alternatives for the BESS will not change the ratings for this impact.

Table 7-199: SPH5: Increased potential of invasion by alien vegetation

INCREASED POTENTIAL OF INVASION BY ALIEN VEGETATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Increased potential of invasion by alien vegetation</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities monthly</i>				
<i>All areas cleared of natural vegetation must be rehabilitated. Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays and other cleared areas. Only indigenous grasses found in the area must be used for rehabilitation. This must be advised by the botanist</i>				
<i>An invasive alien plant species management and monitoring plan must be implemented during the construction phase. Monitoring should continue into the operational phase and through and for a period after decommissioning. This should be advised by the botanist</i>				
<i>All alien seedlings and saplings must be removed as they become evident for the duration of construction and during the operational phase. Manual / mechanical removal is preferred to chemical control</i>				
<i>All construction vehicles and equipment must be free of plant material before entering the site</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(k) Transport Impact

Traffic impacts anticipated to occur during the construction phase of the project are construction related traffic and noise and dust pollution.

Two technology alternative for the BESS have been proposed. There is no difference in the impacts from a traffic perspective between the alternatives.

Table 7-200: SPH5: Traffic Impacts – Construction Phase

TRAFFIC IMPACT				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site</i>			
INDIRECT IMPACT	<i>Construction traffic on roads might generate dust and noise.</i>			
CUMULATIVE IMPACT	<i>Traffic delays on the surrounding road network.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES		<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low negative		
PROPOSED MITIGATION MEASURES				
<i>Stagger component delivery to site;</i>				
<i>Reduce the construction period (if possible);</i>				
<i>Dust suppression of gravel roads (internal roads and the access road to the site) during the construction phase, as required.</i>				
<i>Regular maintenance of gravel roads (internal roads and the access road to the site) by the Contractor during the construction phase.</i>				
<i>The use of mobile batching plants and quarries in close proximity to the site (if available and feasible); and</i>				
<i>Staff and general trips should occur outside of peak traffic periods.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
Medium				

(I) Landscape and Visual Impact

Four visual impacts were identified for SPH5 during the construction, operational phase and decommissioning phase

- Landscape change
- Impact on Protected Areas
- Impact on local roads
- Impact on homesteads
- Light pollution

These impacts would all occur during the construction, operation and decommissioning phase. Impacts would peak once the facility is constructed, remain relatively constant during the operational phase and then decrease during the decommissioning phase.

The type of battery technology used in the BESS would not impact on the assessment of visual impacts and so the tables below cover both technology options.

Table 7-201: SPH5 Landscape change

LANDSCAPE CHANGE				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Change of character due to industrialisation of a Natural Landscape</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of landscape industrialisation due to other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				

<i>Plan to maintain the height of structures as low as possible relative to existing ground levels;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
<i>Monitor areas for vegetation cover post-decommissioning and implement remedial actions.</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21 low - negative			
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
7. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
8. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

Table 7-202: SPH5 Industrialization of the landscape as seen from Nielsview NR

SPH5 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM NIELSVIEW NR				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Industrialisation of the view from Nielsview NR due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from Protected Areas due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				

<i>Plan to maintain the height of structures as low as possible relative to existing ground levels;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	0	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	0	<i>Negligible</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>	Negligible	Definite
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
7. <i>The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				
8. <i>The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i>				

Table 7-203: Industrialization of the landscape as seen from local roads, SPH5

INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL ROADS, SPH5				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases</i>			
DIRECT IMPACT	<i>Industrialisation of the view from local roads due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from local roads due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low negative		
PROPOSED MITIGATION MEASURES				
<i>Plan site levels to minimise earthworks to ensure that levels are not elevated;</i>				
<i>Plan to maintain the height of structures as low as possible;</i>				

<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Construct and/ or plant a 2m high screen along the southern edge of the array cluster</i>				
<i>Plan to protect existing natural site features such as drainage pans;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long term</i>	0	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	0	<i>Negligible</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>	<i>Negligible</i>	<i>Definite</i>
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
9. <i>The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				
10. <i>The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i>				

Table 7-204 SPH5: Industrialization of the landscape as seen from local homesteads

SPH5 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL HOMESTEADS				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Industrialisation of the view from local homesteads due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from local homesteads due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	<i>Moderately Detrimental</i>	<i>Definite</i>
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	<i>moderate - negative</i>		
PROPOSED MITIGATION MEASURES				

<i>Plan to maintain the height of structures as low as possible;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Construct / grow 2m high screen along SW and E edges of solar cluster closest to affected homesteads;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months – 5 years and as such is rated as medium term</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
7. <i>The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				
8. <i>The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i>				

Table 7-205 SPH5 Light pollution

SPH4 LIGHT POLLUTION				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Light pollution from the project spoiling the night time environment and nuisance to neighbors.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of light pollution due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
Use low key lighting around buildings and operational areas that is triggered only when people are present;				
Utilise infra-red security systems or motion sensor triggered security lighting;				
Ensure that lighting is focused on the development with no light spillage outside the site;				
No tall mast lighting should be used;				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	0	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	0	Negligible		
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.	Negligible	Definite
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
High				
NOTES				
7. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
8. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

7.6.4 Operational Phase

(a) Agricultural Impact

During the operational phase, areas that where vegetation will remain cleared such as access routes, will remain at risk of soil loss through erosion. During the operation phase, staff and maintenance personnel will access the development area to maintain the infrastructure and make repairs, where required. Biodegradable detergents and water will be used to clean the panels, however this is not expected to result in impacts from an agricultural perspective. The assessment of these impacts are summarised in **Table 7-44 and Table 7-45**.

Table 7-206: SPH5 Impact significance of soil loss through erosion during the operation phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	Operation Phase			
DIRECT IMPACT	Areas where soil surfaces will remain bare such as access routes and between PV arrays, will remain at risk of soil erosion.			
INDIRECT IMPACT	Eroded areas can expand into nearby areas and result in land degradation.			
CUMULATIVE IMPACT	Increase in areas at risk of soil erosion.			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	3

EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
The development area, including internal access routes, as well as areas bordering on the development area, must regularly be monitored to detect early signs of soil erosion on-set.				
If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-6	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
High				

Table 7-207: SPH5 Impact significance of soil pollution during the operation phase

SOIL POLLUTION				
PROJECT PHASE	Operational phase			
DIRECT IMPACT	Soil pollution caused by oil and fuel spills or maintenance materials and domestic waste left on site. The replacement of electrolyte of the redox flow batteries, also pose soil pollution risk.			
INDIRECT IMPACT	Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health			
CUMULATIVE IMPACT	Increase in areas at risk of soil pollution			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and	Moderately Detrimental	Unlikely

		<i>processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-14	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills.</i>				
<i>No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area.</i>				
<i>Regularly monitor the BESS area for any signs of oil, grease and fuel spillage or the presence of waste.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(b) Aquatic Impact

During the operation phase, the solar arrays will operate largely unattended and with low maintenance required for more than 20 years. The hard surfaces created by the development may lead to increased runoff. This may lead to increased erosion and sedimentation of the downslope areas. A localised long-term impact (more than 20 years) of low intensity (depending on the distance between the solar arrays and the freshwater features) could be expected that would have a very low overall significance post-mitigation in terms of its impact on the identified aquatic ecosystems in the area.

The only potentially toxic or hazardous materials which would be present in relatively small amounts would be of lubricating oils and hydraulic and insulating fluids. Therefore, contamination of surface or groundwater or soils is highly unlikely.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low. The impacts are rated the same for the battery technology alternatives for the BESS.

Table 7-208: SPH5 Operational phase aquatic ecosystem impacts

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Likely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-24	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Any disturbance during the operation phase should be limited to the approved development footprints and should avoid disturbance of the soil and natural vegetation cover.</i>				
<i>Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.</i>				
<i>Stormwater run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving developed areas.</i>				
<i>Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider. In a scenario where services are installed, these systems need to be adequately installed and maintained to prevent any potential contamination of the water resources on site.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Likely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE		-12 very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(c) Avifaunal Impact

(i) Bird fatality at PV facility

Bird fatalities could occur at the site through a number of mechanisms, including collision with PV panels, entanglement in perimeter fence (less likely since developer has chosen to use mesh panel fencing which has a tight weave and birds are less likely to become entangled),

electrocution in substations/electrical compounds and others. The battery technology options for the BESS are rated the same and are both covered in the same table.

Table 7-209: SPH5 bird fatality during operational phase

BIRD FATALITY AT PV FACILITY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Birds killed through various interaction with facility infrastructure</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>More projects will result in overall higher fatality rates in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any fatalities this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. Operational phase bird monitoring should be conducted for at least one year as per the best practice guidelines – see Section 8.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
CONFIDENCE LEVEL				
Medium				

(ii) Nesting & other use of facility infrastructure by birds

Certain species, in particular doves, pigeons, weavers and crows, are likely to use some of the facility infrastructure for nesting, perching and roosting. At face value this is a positive impact for birds and has been rated as VERY LOW POSITIVE significance both pre and post mitigation. However, where nesting interferes with the operation of the facility this could cause conflict and require management. Nesting on infrastructure also increases the likelihood of bird fatalities occurring through the various mechanism, particularly of young inexperienced birds.

No mitigation is required for the impact of the facility on birds through nesting. For the impact of the birds nesting on the facility, the specialist recommends nest management on a case by case basis under the supervision of an avifaunal specialist, and in conformance with all relevant national and provincial legislation. The impact is rated the same for the both battery technology alternatives for the BESS.

Table 7-210: SPH4 impact of bird nesting and other use of facility infrastructure by birds

BIRD NESTING, PERCHING & ROOSTING AT PV FACILITY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Birds use infrastructure to perch, roost or nest on</i>			
CUMULATIVE IMPACT	<i>More projects in the area will probably diminish the likelihood of this happening as perch availability will increase</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	7	very low positive		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any nesting which interferes with operations this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. All nest management measures should only be undertaken in compliance with national and provincial environmental legislation in this regard.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	7	very low positive		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

Day to day operation and maintenance of the facility may result in disturbance and displacement of bats. The impact is rated the same for both battery technology options for the BESS.

Table 7-211: SPH5 disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	Disturbance of bats during operational activities			
INDIRECT IMPACT	Displacement			
CUMULATIVE IMPACT	Unavailability of suitable foraging resources in the broader environment for displaced individuals			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	<i>Slightly Detrimental</i>	<i>Unlikely</i>
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	<i>very low negative</i>		
PROPOSED MITIGATION MEASURES				
Limit operational and maintenance activities to daylight hours, as far as possible, and minimise lighting at night.				
All lighting should preferably use low pressure sodium and warm white LED lights.				
Operational and maintenance activities should be limited to the immediate project footprint only.				
Site access should be strictly controlled, to avoid unnecessary disturbance.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	<i>Slightly detrimental</i>	<i>Unlikely</i>
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	<i>very low negative</i>		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-212: SPH5 bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during operational activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-7	Low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMPr				
<i>All lighting should preferably use low pressure sodium and warm white LED lights.</i>				
<i>During operational and maintenance activities, avoid all movement and noise around medium sensitivity areas.</i>				
<i>Operational and maintenance activities should be limited to the immediate project area.</i>				
<i>Site access should be strictly controlled, to avoid unnecessary disturbance.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(e) Botanical Impacts

Maintenance activities will require management of vegetation which may result in loss of natural vegetation. The impact is rated the same for both battery technology options for the BESS.

Table 7-213: SPH5 loss of Western Free State Grassland during operational phase

LOSS OF VEGETATION				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Direct impact</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>Loss of Western Free State Clay Grasslands</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is the footprint as it only affects the area in which the proposed activity will occur.</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>When and where possible, vegetation clearing should be undertaken during the dry season.</i>				
<i>Only clear vegetation where absolutely necessary; and</i>				
<i>Stockpile areas for cleared vegetation will be decided and approved by the Project Manager and appointed ECO before construction commences on site and should not be located within drainage lines.</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-2	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(f) Groundwater Impact

Similar to the construction phase, the operational phase of the SPH5 will require approximately 1,000 m³/a (0.03 L/s). This does not exceed the regionally mapped yield of the underling aquifer (0.5 – 2.0 L/s). It is not currently planned to use groundwater for the operational phase of this project however if this changes a water use licence will need to be applied for and the potential impacts and mitigation measures are presented in **Table 7-214**.

The principal risks for groundwater contamination that have been identified are the use of cleaning agents for cleaning of PV panels and for dust suppression of internal roads. If required, it is encouraged that water alone is used to conduct these tasks. Alternatively, the PV cleaning agents and dust suppression mixes must be environmentally friendly and should breakdown naturally without causing ingress of harmful chemicals into the environment. The risks and status of groundwater contamination occurring during the operational phase of SPH4 is presented in **Table 7-125**.

The proposed development will require a BESS. Currently two different technologies are being considered, i.e. either Solid State Lithium Batteries (SSLB) or Vanadium Redox Flow Battery Energy Storage Systems (VRFB). Both of these two BESS systems require an electrolyte. The SSLB contain an ethylene carbonate or di-ethyl carbonate electrolyte and the VRFB system will require that an estimate of 3 000 m³ of sulfuric acid solution with vanadium ions electrolyte is stored on site for each Springhaas Facility. The BESS systems will also require cooling systems and these systems could potentially either be water based or it may be refrigerant based systems which used chemicals such as ethylene glycol- based coolants.

The containers that the BESS systems are held in are equipped with a “Clean agent” which is a fires suppression systems that can release a powder/gas into the container to snuff fires. These systems usually leave a residue on the equipment that will need to be cleaned off. With any chemical storage there is always a risk of chemical fires that will need to be put out with water or foam and the waste water from these activities could contain contaminants that should not be let to run off into the environment.

The fire safety systems, refrigerants, electrolyte solutions and the waste products produced from these systems could contaminate the soil and groundwater and all measures should be taken to prevent leaks or spills on the ground. The risks and mitigations for the BESS are presented in **Table 7-126**.

The impact on groundwater levels is rated the same for both battery technology alternatives for the BESS.

Table 7-214 SPH5: Impact of lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place)

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Lowering of groundwater level due to over abstraction</i>			
INDIRECT IMPACT	<i>Drying of springs in the area</i>			
CUMULATIVE IMPACT	<i>Permanent damage to the aquifer system in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected</i>	Moderately	Likely

		<i>environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Detrimental	
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	<i>low – negative</i>		
PROPOSED MITIGATION MEASURES				
<i>If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring.</i>				
<i>Adhere to the borehole’s safe yield and to monitor water levels and flow.</i>				
<i>Groundwater abstraction volumes must be monitored.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-215: SPH5 Impact of contamination of groundwater as a result of cleaning agents used for cleaning the solar panels

Potential impact on groundwater as a result of cleaning agents used for cleaning the solar panels.				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Contamination of groundwater</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long-term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	<i>low - negative</i>		
PROPOSED MITIGATION MEASURES				
<i>Use environmentally safe cleaning agents that breakdown naturally (biodegradable detergents/green soaps) and that will not cause adverse effects.</i>				

POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
Medium				

Redox flow batteries contain electrolyte solution which needs to be replaced approximately every 15 to 20 years. During replacement of electrolyte there is a risk of leaks or spills. This impact is only applicable to the redox flow batteries as lithium-ion batteries are solid state batteries.

Table 7-216: SPH5 Impact table for contamination of groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)

Potential impact on groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Contamination of groundwater</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long-term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or Communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Ensure that all electrolyte or chemicals stored or used on site have secondary containments systems in place with reliable leak detection, annunciation in place. Ensure that all chemicals are handled on concrete bunded surfaces and not on bare soil.</i>				
<i>Any waste products produced from the BESS systems should be removed and disposed of appropriately.</i>				

<i>Waste water produced by fire hydrants should not be allowed to runoff into the environment.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to the cultural landscape

Because any physical impacts to the landscape would already have occurred during the construction phase, landscape impacts during operation of SPH5 relate only to the presence of the facility in what is otherwise a rural landscape. Impacts to the cultural landscape will occur during the operation phase and last as long as the lifetime of the facility. Because of the flat terrain, the impacts would not be experienced over great distances because intervening vegetation and buildings would offer partial screening. Nonetheless, the immediately surrounding area will experience a degree of change in landscape character and sense of place. The impact significance is rated to low negative before mitigation. The impacts are the same for both technology options for the batteries for the BESS.

Table 7-217: SPH5: Assessment of operation phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Operation Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the presence of a solar energy facility</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being present</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Keep all maintenance work within the authorised footprint.</i>				

<i>Minimise night-time light pollution in the area (visual recommendations to be followed to achieve this).</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(h) Socio-Economic Impact

(i) Stimulation of the Local Economy during operations

The operational period of SPH5 is a minimum of 20 years. Of the money spent annually during the operations period, a significant portion will likely comprise of salaries and wages of the Springhaas employees. The operations of the facility will make some contribution towards the growth of the local economy, as it will increase the size of the local electricity sector, as well as stimulate the demand for other sectors' services and goods such as water, transportation, and trade.

No differentiation can be made between the and battery technology alternatives for the BESS. The technology alternatives are considered in **Table 7-56** and **Table 7-57**.

Table 7-218: SPH5: Assessment of Economic stimulation during operations

STIMULATION OF THE LOCAL ECONOMY DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Long-term increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				
<i>Where feasible, procure goods and services required for the operation of the plant from the local economy</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	16	3
EXTENT	4	The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries		
SEVERITY	2	The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected	Moderately Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	48	moderate positive		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Creation of Employment and increased household income during operations

The operation of SPH5 will require functional and maintenance employees. It is envisaged that about eight direct jobs per facility will be created during the operations phase, which will occur for a duration of 20 years. About 70% of these jobs are to be filled by people from the local communities as they will be low-skilled employment opportunities. Employment of the eight individuals for the entire operational period will increase their household income, improve their standard of living and benefit their families.

SPH5 will create the same number of employment opportunities, regardless of its location on the site; thus, layout alternatives are equally preferred. The type of battery used in the BESS will also not significantly affect employment alternatives, thus both technology alternatives are equally preferred.

Table 7-219: SPH5 Assessment of employment during operations

CREATION OF EMPLOYMENT AND INCREASED HOUSEHOLD INCOME DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Creation of permanent employment opportunities in the local and regional economy</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of permanent employment opportunities in the region</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	8	3

EXTENT	4	The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries		
SEVERITY	1	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				
Where feasible, aim to fill all the positions by labour from the local community				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	8	3
EXTENT	4	The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries		
SEVERITY	1	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	24	low positive		
CONFIDENCE LEVEL				
High				

(iii) Improved municipal service delivery

SPH5 will have a capacity of up to 150MWac and will be connected to the national grid through Eskom substation and generated electricity will be sold nationwide. The proposed project, albeit relatively small, will contribute towards improving National electricity availability; thus, improving the government service delivery, and could potentially also aid in growing the local economy by increasing the overall supply of electricity in the local economy. Furthermore, due to the taxes and rates that will be paid by the project to the municipality, the revenue of the latter will be increased, thus allowing it to improve the service delivery in other areas.

The layout alternatives and BESS technology alternatives will not affect the capacity of the solar facility; thus all alternatives are equally preferred.

Table 7-220: SPH5: Assessment of service delivery improvement

IMPROVED MUNICIPAL SERVICE DELIVERY	
PROJECT PHASE	<i>Operational phase</i>
DIRECT IMPACT	<i>It will likely improve the local electricity supply if fed to the grid</i>
INDIRECT IMPACT	<i>Improved standard of living within the region</i>
CUMULATIVE IMPACT	<i>Improved electricity availability</i>

DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	16	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Moderately Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	48	moderate positive		
PROPOSED MITIGATION MEASURES				
<i>No mitigations proposed</i>				

(iv) Reduction of Land Area available for productive farming

The proposed site of SPH5 and surrounding land is currently used for small-scale livestock. The agricultural assessment classified the majority of SPH5 as being of low to very low agricultural potential with one small isolated patch of low – moderate potential land. The farmers with livestock on the land proposed for the facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH5 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant’s footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project’s construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH5.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant differentiation among site layout alternatives can be made. The different battery technology alternatives will not affect the impact ratings.

Table 7-221: SPH5: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(i) Terrestrial Biodiversity and Animal Species

(i) Direct Impacts – Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death.

Regarding the technology alternative for the type of battery used in the BESS for SPH5, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread into the

surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place.

Table 7-222: SPH5 Injury or death to fauna

ALL FACILITIES				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Injury or death to fauna</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-32	low negative		
PROPOSED MITIGATION MEASURES				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by maintenance staff</i>				
<i>To prevent possible collisions with animals, drivers of maintenance vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				
<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>Adequate fire prevention and safety measures must be in place. A fire emergency management plan must be in place</i>				
<i>All electrical equipment must be maintained on a regular basis to minimise the risk of fire</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Indirect Impacts – Pollution and contamination of natural areas

During operations, release of grey water into the environment can cause contamination by detergents. Grey water from cleaning of the solar panels has the potential to contaminate soils and ground water and be washed into the nearby natural pans during high rainfall events. This includes biodegradable detergents used for cleaning the panels, which can accumulate in the soil and be washed into the nearby pans before they break down. Biodegradable detergents can alter the balance of freshwater ecosystems as they promote bacterial growth and lower oxygen levels. The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-223: SPH5 Pollution and contamination of natural areas including pans and wetland

POLLUTION AND CONTAMINATION OF NATURAL AREAS INCLUDING PANS AND WETLANDS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas – including nearby pans or wetlands</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-21	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee operational phase activities at a minimum every 6 months for the first 5 years and then yearly for the rest of the life of the facility</i>				
<i>If possible, panels should be cleaned using water that is clear of detergents only (e.g. potable water or borehole water). The use of grey water should be avoided. Should the need arise to clean the panels with detergents, then biodegradable detergents are preferred. Care must be taken not to allow the detergents to accumulate in the soil</i>				
<i>All maintenance vehicles must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by maintenance staff must be prohibited</i>				
<i>Appropriate solid waste disposal and ablution facilities must be provided for operational staff</i>				
<i>Adequate prevention and safety measures must be in place to avoid leaks to batteries. This includes regular maintenance and replacement of batteries in a timeous manner. Measures must be in place to prevent chemicals leaking into the soil, should damage to the battery occur</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		

SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-24	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts – Disturbance and displacement of fauna

Security lights for SPH4 during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland and rocky outcrops adjacent to the facility, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-224: SPH5 Disturbance and displacement of fauna – natural grassland and rocky outcrops

DISTURBANCE AND DISPLACEMENT OF FAUNA – NATURAL GRASSLAND				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Disturbance to and displacement of fauna – natural grassland and rocky outcrops</i>			
CUMULATIVE IMPACT	<i>Displacement of fauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-48	low negative		
PROPOSED MITIGATION MEASURES				
<i>Operations during the night must be avoided to minimise the need for artificial lighting and to reduce the impact of light and noise on nocturnal animals</i>				
<i>Lighting during operations should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects, such as low-pressure sodium lamps, is preferred</i>				

Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light

POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
High				

(j) Traffic Impact

During the operational phase there will be approximately 8 full time employees on site. Vehicles would access the site for daily operations and maintenance as and when required. The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-225 SPH5: Traffic impacts during operation phase

TRAFFIC IMPACTS				
PROJECT PHASE	Operational Phase			
DIRECT IMPACT	Traffic congestion due to the trips generated by the operation of the facility			
INDIRECT IMPACT	The associated noise and dust pollution			
CUMULATIVE IMPACT	Traffic delays on the surrounding road network			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
Staff and maintenance trips should occur outside of peak traffic periods; and				
Client/Facility Manager is to ensure that regular maintenance of gravel roads (located within the site boundary, including the access road to the site) occurs during operation phase to minimise/mitigate dust pollution.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	0	Negligible	Negligible	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
High				

7.6.5 Decommissioning Phase

Upon completion of the operational phase of the project which will last in excess of 20 years the facilities may be decommissioned. Decommissioning activities would entail removal of infrastructure from site and return of the site to a state similar to the pre-construction condition. The decommissioning impacts would not vary significantly between facilities and so all seven facilities are covered **Section 7.7**.

7.6.6 No-Go Alternative

The no-go alternative refers to the option of not developing the facility. The impact assessment for the no-go alternative is the same for all 7 facilities and is covered in **Section 7.8**.

7.6.7 Cumulative Impacts

The cumulative impact considers the development of all seven Springhaas solar PV facilities in addition to the other projects which are proposed within 30km of the facility.

The cumulative impacts were rated the same for each of the 7 solar PV facilities. The cumulative impact assessment is available in **Section 7.9**.

Table 7-226: SPH5 impact summary

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Design/Planning/Pre-Construction Phase			
No impacts identified			
Construction Phase			
Agricultural impacts			
Land use change from livestock farming to energy generation	Negative	Moderate	Low
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance and water quality impacts	Negative	Very low	Very low
Avifaunal impacts			
Destruction of bird habitat during construction	Negative	Low	Low
Disturbance of birds during construction	Negative	Very low	Very low
Bat impacts			

Bat habitat modification	Negative	Very low	Very low
Disturbance and displacement of bats	Negative	Very low	Very low
Possible roost disturbance	Negative	Low	Very low
Bat roost destruction	Negative	Low	Very low
Botanical impacts			
Loss of vegetation	Negative	Medium	Low
Groundwater impacts			
Lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place)	Negative	Low	Very low
Contamination of groundwater as a result of accidental oil spillages or fuel leakages	Negative	Very low	Very low
Heritage impacts			
Impact on archaeological sites	Negative	Very low	Very low
Impact on graves	Negative	Low	Very low
Impact on cultural landscape	Negative	Low	Low
Palaeontological impacts			
Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-economic impacts			
Stimulation of the economy during construction	Positive	Low	Low
Employment opportunities	Positive	Low	Low
Reduction in land available for productive farming	Negative	Very low	Very low
Loss of property	Negative	Low	Very low
Terrestrial biodiversity and animal species (faunal) impacts			
Destruction of faunal habitat	Negative	High	Low
Injury or death to fauna	Negative	Moderate	Very low
Disturbance and displacement of fauna	Negative	Low	Very low
Pollution and contamination of natural areas	Negative	Moderate	Very low
Increased potential of invasion by alien vegetation	Negative	Moderate	Very low
Traffic impacts			
Traffic congestion	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads	Negative	Low	Very low
Industrialisation of the landscape as seen from local homesteads	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
Operational Phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Soil pollution	Negative	Very low	Very low
Aquatic impacts			
Increased run-off, pollution	Negative	Very low	Very low
Aquatic			

Disturbance of aquatic habitat; water quality impacts	Negative	Very low	Very low
Avifauna impacts			
Bird fatality through interaction with infrastructure	Negative	Very low	Very low
Nesting and use of other infrastructure by birds	Positive	Very low	Very low
Bat impacts			
Disturbance and displacement	Negative	Very low	Very low
Roost disturbance	Negative	Low	Very low
Botanical impacts			
Loss of vegetation	Negative	Very low	Very low
Groundwater impacts			
Lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place).	Negative	Low	Very low
Contamination of groundwater from use of cleaning agents	Negative	Low	Very low
Contamination of groundwater from leaks or spills from BESS	Negative	Low	Very low
Heritage impacts			
Impact on cultural landscape	Negative	Low	Low
Socio-economic impacts			
Economic stimulation during operations	Positive	Low	Moderate
Employment opportunities	Positive	Low	Low
Improved service delivery	Positive	Moderate	Moderate
Reduction in land available for productive farming	Negative	Very low	Very low
Terrestrial biodiversity and animal species			
Injury or death of fauna	Negative	Low	Very low
Pollution and contamination of natural areas including pans and wetlands	Negative	High	Very low
Disturbance and displacement of fauna –natural grassland and rocky outcrops	Negative	Moderate	Very low
Traffic impact			
Traffic congestion	Negative	Very low	Very low
Palaeontological impacts			
Destruction of fossils	NA	NA	NA
Decommissioning phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance of aquatic habitat, water quality impacts	Negative	Very low	Very low
Avifaunal impacts			
Disturbance of birds	Negative	Very low	Very low
Bat impacts			
Disturbance and displacements	Negative	Very low	Very low
Botanical impacts			
Loss of vegetation	Negative	Low	Low

Groundwater			
Contamination from construction activities	Negative	Very low	Very low
Heritage impacts			
Alteration of the rural landscape character through the presence of construction equipment and vehicles and all the associated activities on site	Negative	Low	Very low
Palaeontological impacts			
Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-Economic impacts			
Impact on the economy	Positive	Very low	Very low
Creation of temporary employment opportunities in the local and regional economy	Positive	Very low	Very low
Terrestrial biodiversity and animal species			
Destruction of novel ⁶ faunal habitat (i.e. grassed areas under the panels where fauna may recolonise after construction)	Negative	Moderate	Very low
Injury or death to animals (due to collisions with construction vehicles or destruction of burrows that have established under the panels)	Negative	Moderate	Very low
Pollution and contamination of natural areas including pans and wetlands	Negative	High	Very low
Disturbance to and displacement to fauna and edge effects – natural grassland	Negative	Low	Very Low
Increased potential of invasion by alien vegetation	Negative	Moderate	Very low
Reestablishment of movement corridors through the landscape due to removal of fences and return to open grassland	Negative	Very low	Low positive
Traffic impacts			
Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads	Negative	Very low	Very low
Industrialisation of the landscape as seen from local homesteads	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
No-Go Alternative			
Agricultural	Negative	Very low	Very low
Aquatic	Negative	-	Very low-negligible
Avifauna	Negative	Very low	Very low
Bats	Negative	Very low	Very low
Botanical	Negative	Low	Low
Heritage	Negative	Very low	Very low
Transport- Traffic congestion	Negative	Very Low	Very Low
Terrestrial biodiversity and animal species	Negative/ positive	Low negative	Very low positive
Socio-economic	NA- no impact,	NA	NA

⁶ Novel habitats are human-built, modified, or engineered niches in places that have been altered in structure and function by human activity

	forgone + impacts		
Destruction of fossils	NA	NA	NA
Landscape and Visual	Negligible	No impact/NA	No impact/NA
Groundwater Impacts	Negligible	NA	NA
Cumulative impacts			
Agricultural	Negative	Very low	Very low
Aquatic	Negative	Low	Low
Avi-fauna	Negative	Moderate	Moderate
Bats	Negative	Low	Low
Botanical	Negative	Very low	Very low
Heritage	Negative	Moderate	Low
Socio-economic - Impact on the economy- construction	Positive	-	Moderate
Socio-economic -Creation of employment during construction	Positive	-	Moderate
Socio-economic -Reduction in land available for productive farming	Negative	-	Low
Socio-economic -Stimulation of the economy – operations	Positive	-	Moderate
Socio-economic -Employment - operations	Positive	-	Moderate
Socio-economic -Improved municipal service delivery	Positive	-	Moderate
Socio-economic -Loss of property	Negative	-	Low
Socio-economic - Stimulation of economy - decommissioning	Positive	-	Very low
Terrestrial biodiversity	Negative	High	Moderate
Transport	Negative	Low	Very Low
Landscape and visual	Negative	-	Low
Destruction of fossils	NA	NA	NA
Groundwater: Aquifer system and water quality	Negative	Low- Very Low	Low – Very Low

7.7 Springhaas 6 Detailed Impact Assessment

7.7.1 Alternatives Considered

(a) Technology Alternatives

Two technology alternatives namely lithium-ion and redox flow batteries were considered for the BESS.

(b) No-Go Alternative

The no-go alternative was considered for all seven of the proposed facilities. The impact of the no-go alternative was rated as the same for all seven facilities. The no-go alternative is assessed in **Section 7.8**.

7.7.2 Pre-construction phase

No significant impacts for the pre-construction phase have been identified by any specialist studies or by the EAP for SPH6.

7.7.3 Construction Phase

(a) Agricultural Impact

The most significant agricultural impacts associated with the development of SPH6 will occur during the construction phase when the site is fenced off, vegetation is removed and the soil surface is prepared for the installation of infrastructure.

The footprint of SPH6 is fully located in low sensitivity agricultural land.

SPH6 was also classified in terms of agricultural potential. The entire site is classified as a mix of low to very low potential and low to moderate potential land.

Tables 7-173 – 7-176 cover the two technology options for the BESS. There was no difference in the alternatives proposed from an agricultural perspective.

Table 7-227: SPH6: Impact of land use change from livestock farming to renewable energy generation

LAND USE CHANGE FROM LIVESTOCK FARMING TO ENERGY GENERATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Construction of boundary fence and PV infrastructure will change land use from livestock farming to renewable energy generation</i>			
INDIRECT IMPACT	<i>Intensification of agriculture in other areas or otherwise reduction of livestock produced in the area</i>			
CUMULATIVE IMPACT	<i>Increase in areas where agriculture is converted into other land uses</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		

PROPOSED MITIGATION MEASURES				
<i>Springhaas Solar Facility 3 (Pty) Ltd must provide market-related compensation that will allow the current land users to have the same or better ability to sustain their livelihood.</i>				
<i>Ensure that the final infrastructure layout remains within the fenced off area of the development footprint.</i>				
<i>Prior arrangements must be made with the landowners to ensure that livestock and game animals are moved to areas where they cannot be injured by vehicles traversing the area.</i>				
<i>The use of main access routes by construction vehicles and equipment must do so with consideration of nearby agricultural land users who use the same access routes for farming activities.</i>				
<i>All left-over construction material must be removed from site once construction on a land portion is completed.</i>				
<i>No materials removed from development area must be allowed to be dumped in nearby livestock farming areas.</i>				
<i>No boundary fence must be opened without the landowners' permission.</i>				
<i>No open fires made by the construction teams are allowable during the construction phase.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-228: SPH6: Impact significance of soil loss through erosion during the construction phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Loss of soil particles from areas where construction activities result in the removal of vegetation from the surface.</i>			
INDIRECT IMPACT	<i>Sparse to no vegetation growth in eroded areas.</i>			
CUMULATIVE IMPACT	<i>Increase in areas exposed to soil erosion</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-18	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily</i>	Moderately Detrimental	Definite

		<i>or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>		
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Limit vegetation removal from the soil surface to the areas of infrastructure development such as access routes as well as around the foundations of the PV arrays and buildings.</i>				
<i>Vegetation clearance must only be undertaken immediately prior to construction activities and only within the development footprint</i>				
<i>Once construction of an area has been completed, level any remaining soil removed from excavation pits (where the PV arrays will be mounted) that remained on the surface, instead of allowing small stockpiles of soil to remain on the surface where it is exposed to rain and wind. This is applicable to all construction areas, except where topsoil stockpiles must remain for site rehabilitation of specific areas.</i>				
<i>Stormwater channels on site must be designed to minimise the soil erosion risk that results from surface water runoff.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-229: SPH6: Impact significance of impaired soil functionality caused by compaction

IMPAIRED SOIL FUNCTIONALITY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>The weight and movement of vehicles and equipment over the surface will result in soil compaction.</i>			
INDIRECT IMPACT	<i>Compacted soil have reduced pore space and water infiltration rate. Compacted soil surfaces increase the rate of surface water runoff, especially after a rainfall event.</i>			
CUMULATIVE IMPACT	<i>Increase in areas affected by soil compaction.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-18	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will</i>	Moderately Detrimental	Definite

		<i>temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Only allow vehicles and equipment to travel on designated access routes and not anywhere else within the development area.</i>				
<i>Use existing main access routes and internal farm roads where possible and avoid using other areas in the site as temporary access routes.</i>				
<i>Vehicles and equipment must park in designated parking areas.</i>				
<i>Materials must be off-loaded and stored in designated laydown area.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season as wet soil compacts easily as opposed to dry soil.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-230: SPH6: Impact significance of impaired soil health as a result of soil pollution

IMPAIRED SOIL HEALTH				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Soil pollution can be caused by oil and fuel spills from vehicles and equipment as well as domestic and material waste on site. Should the vanadium redox flow batteries be used for the BESS, spillage of corrosive and environmentally toxic electrolyte is possible. In the case that lithium solid state containerised batteries are used, there is a possibility of thermal runaway that will result in the release of toxic and flammable gasses.</i>			
INDIRECT IMPACT	<i>Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health.</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil pollution.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-21	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and</i>	Highly detrimental	Definite

		<i>valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>Maintenance must be undertaken regularly on all vehicles and construction equipment to prevent hydrocarbon spills.</i>				
<i>Any waste generated during construction must be stored into designated containers and removed from the site by the construction teams.</i>				
<i>Any left-over construction materials must be removed from the development area.</i>				
<i>The development area must be monitored by the Environmental Control Officer (ECO) to detect any early signs of fuel and oil spills and waste dumping. The ECO must also report any spills from batteries.</i>				
<i>Ensure battery transport and installation is undertaken by accredited staff and contractors.</i>				
<i>Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(b) Aquatic Impact

Construction phase activities would result in disturbance of soil and clearing of vegetation. Water quality impacts may occur from batching of concrete on site, hydrocarbon spills and other construction activities.

There is no difference in impacts between the two battery technology options for BESS, the impact assessment table covers both alternatives.

Table 7-231: SPH6: Impact of aquatic ecosystems during the construction phase

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long term</i>	-14	3

EXTENT	3	The extent of the impact is rated as Local as it affects only the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	Moderate negative		
PROPOSED MITIGATION MEASURES				
A buffer of at least 250 m between the significant aquatic ecosystems (larger pans) and all the proposed project activities should be maintained (noting that this is already honoured in the proposed layout for all facilities).				
Clearing of indigenous vegetation should not take place within the aquatic features and the recommended buffers, while retaining the topography and cover vegetation within the wider drainage areas through the site is preferred to reduce the potential modification to the way in which water drains through these areas.				
The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance.				
During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills. The solar panels will be washed with water and a biodegradable/ greendetergent.				
Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.				
Development within the drainage areas, where located within a proposed facility, will however need to consider stormwater management measures and should avoid impacting on the movement of water through the more seasonally wet areas. Minimal disturbance to the topography and cover vegetation in these areas is recommended.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary	-12	2
EXTENT	2	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-2	The severity of the impact is rated as Moderate as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.	Slightly Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-24	low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(c) Avifaunal Impact

(i) Habitat destruction associated with the construction of the facility

Habitat destruction and alteration will occur during the construction phase of SPH6. The majority of the development footprint would be transformed from its current state to a

renewable energy facility. SPH6 will transform approximately 428ha of habitat. Most of this is in a fairly natural state currently, or in the case of arable lands is still accessible and useable for birds foraging.

Table 7-232: SPH6: Formal rating of destruction of bird habitat during construction

DESTRUCTION OF BIRD HABITAT DURING CONSTRUCTION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Transformation of natural habitat into PV facility</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Yes - Larger area transformed from natural habitat</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-18	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural and social functions and processes are altered to the extent that natural processes will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are significantly affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	moderate – negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required. Impact avoidance has already been implemented in the design phase through the adherence to no-go buffers around pans.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Disturbance of birds & displacement effects

Disturbance of avifauna during the construction (and thereafter during maintenance and operational and decommissioning) of the facility and all development alternatives and associated infrastructure is likely to occur. Disturbance of breeding birds is typically of

greatest concern. In this regard any breeding sites of sensitive bird species would be the most important. It is noted that no breeding sites have been identified on site at this stage.

There is no difference between the location and technology options in terms of disturbance and displacement of birds.

Table 7-233: SPH6: Formal rating of disturbance of birds during construction

PROJECT PHASE	<i>Construction phase & operations phase to lesser extent</i>			
DIRECT IMPACT	<i>Birds disturbed from their normal activities through the increased noise and activity levels associated with construction</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>More projects will result in overall higher disturbance levels</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required as there are no particularly sensitive features identified (such as breeding sites). General good environmental practice should be implemented during construction in terms of control of vehicles, staff, minimising the impact on the receiving environment as much as possible.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

The facility boundary for SPH6 overlaps one medium sensitivity areas from a bat perspective. During the construction of SPH6 habitat modification would occur, disturbance and displacement of bats may occur and bat roosts may be disturbed or destroyed.

Two technology options are under consideration for the BESS. For bat impacts the type of technology used for the BESS is not considered relevant. Both technology options are considered equally acceptable.

Table 7-234: SPH6: Bat habitat modification

IMPACT ON POSSIBLE HABITAT MODIFICATION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Modification of habitat through the removal of vegetation cover and water sources</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Loss of foraging resources for local bat population</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	<i>very low negative</i>		
PROPOSED MITIGATION MEASURES				
<i>This impact may be reduced by limiting the removal of vegetation and available water sources, as far as possible.</i>				
<i>Avoid all high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should any changes or expansion take place to the boundary of the facility a bat specialist must provide input to confirm that these changes are acceptable in terms of the avoidance of high sensitivity areas.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential additional sensitive habitats, to confirm the baseline environment, if construction does not take place within 5 years of the initial bat study.</i>				
<i>Following construction, rehabilitation of all disturbed areas, inclusive of that beyond permanent infrastructure footprints, (e.g. temporary access tracks and laydown areas) must be undertaken.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	<i>very low negative</i>		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-235: SPH6: Disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS

PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Disturbance of bats during construction activities</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable foraging resources in the broader environment for displaced individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Limit construction activities to daylight hours only and minimise lighting at night, as far as possible.</i>				
<i>Avoid high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should any changes or expansion take place to the boundaries, a bat specialist must provide input to confirm that these changes are acceptable in terms of avoidance of high sensitivity areas.</i>				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-236: SPH6: Bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during construction activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected.</i>	Negligible	Unlikely

IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	low negative		
PROPOSED MITIGATION MEASURES				
All construction activities should be limited to the assessed project footprint only.				
Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.				
If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
Medium				

Table 7-237: SPH4: Bat Roost destruction

IMPACT OF POSSIBLE ROOST DESTRUCTION				
PROJECT PHASE	Construction phase			
DIRECT IMPACT	Destruction of potential bat roosting features			
INDIRECT IMPACT	Reduction of available roosting sites and/or Mortality			
CUMULATIVE IMPACT	Insufficient roosting resources to support the local population and potential increased bat mortality			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	Low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMPr				
Avoid the destruction or removal of existing farmsteads and trees, as far as possible.				
Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.				
If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.				
All construction activities should be limited to the assessed project footprint only.				

POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-4	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-8	very low negative		
CONFIDENCE LEVEL				
Medium				

(e) Botanical Impacts

The development of SPH6 would result in extensive but localized loss of relatively undisturbed (unploughed but grazed) Western Free State Clay Grasslands.

The shade effect of the panels on the grassland vegetation is not known and it not easily predicted. There will be space under the panels for grass and other plants to grow. However, the microclimate is likely to be different to that of open grassland, so a different suite of plant species is likely to colonize the space under the solar panels.

Two technology options are proposed for the BESS. The technology alternatives will make no difference on the botanical impact assessment and as such these alternatives are covered in the **Table 7-19**.

Table 7-238: SPH6: Impact of loss of Western Free State Clay Grassland

LOSS OF VEGETATION				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Removal of natural vegetation: Western Free State Clay Grasslands			
INDIRECT IMPACT	None determined			
CUMULATIVE IMPACT	Loss of Western Free State Clay Grasslands			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term.	-15	3
EXTENT	3	The impacts will be localized to the designated target areas.		
SEVERITY	-2	The severity of the potential impact will be moderate negative.	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-45	medium - negative		
PROPOSED MITIGATION MEASURES				

The first mitigation measures necessary would be the relocation of **Ammocharis coronica** bulbs if they cannot be avoided. Ideally the bulb should be lifted when they are dormant (winter) but that would mean traversing the entire area of the SPH sites in the preceding summer and marking every occurrence of these plants. A more practical approach would be to unearth the bulbs during the construction phase and relocating and planting them soon after removal.

Secondly, all areas that are disturbed during construction and that are not needed during the operational phase should be rehabilitated, using natural grasses that occur in the area. It would be possible for some grasses and forbs to survive under the panels, but it is difficult to predict the extent of such growth, nor which plant species would grow effectively under the panels.

POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last at least 5 years and therefore it is considered to be Long Term.	-5	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
High				

(f) Groundwater Impact

The water required during the construction phase of SPH6 is approximately 18,000m³ per year. The water requirement lies well within the yield potential of the underlying fractured rock aquifer (i.e. 0.5 – 2.0 L/s). It must be noted that at present the use of groundwater is not proposed however if this changes the potential impacts of groundwater abstraction are shown in **Table 7-185**.

Earthmoving plant and/or construction vehicles will be used on site during the construction phase. Use of vehicles presents a risk of groundwater contamination by fuel and oil leakage.

Two technology options (lithium-ion vs redox flow batteries) were considered for SPH6. The alternatives considered are equally preferred.

Table 7-239: SPH6: Impact table for the lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place).

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Lowering of groundwater level due to over abstraction			
INDIRECT IMPACT	Drying of springs in the area			
CUMULATIVE IMPACT	Permanent damage to the aquifer system in the area			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-14	2
EXTENT	3	The extent of the impact is rated as Local as it affects the development		

		<i>area and adjacent properties</i>		
<i>SEVERITY</i>	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
<i>IMPACT ON IRREPLACEBLE RESOURCES</i>	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-28	low - negative		
PROPOSED MITIGATION MEASURES				
<i>If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring. Adhere to the borehole’s safe yield and to monitor water levels and flow.</i>				
<i>Groundwater abstraction volumes must be monitored.</i>				
POST-MITIGATION				
<i>DURATION</i>	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	0	1
<i>EXTENT</i>	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
<i>SEVERITY</i>	0	<i>Negligible</i>	Negligible	Unlikely
<i>IMPACT ON IRREPLACEBLE RESOURCES</i>	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

The main risk associated with the construction phase is groundwater contamination from the use of construction vehicles and heavy machinery on-site.

Table 7-240: SPH6: Impact of contamination of groundwater as a result of accidental oil spillages or fuel leakages during the construction and decommissioning phases.

Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages				
PROJECT PHASE	<i>Construction and Decommissioning Phase</i>			
DIRECT IMPACT	<i>Groundwater contamination</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
<i>DURATION</i>	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	2
<i>EXTENT</i>	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
<i>SEVERITY</i>	-1	<i>The severity of the impact is rated as Low negative as the impact affects the</i>	Negligible	Likely

		<i>environment in such a way that natural, cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-10	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Vehicles must be maintained regularly and kept in a good working order. Dirty water should be captured, to be re-used where possible. No dirty water is allowed to be discharged into the surrounding environment.</i>				
<i>No heavy equipment or vehicles to be left in excavation area when not in use. Drip trays to be used under stationary vehicles and machinery where possible.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>		
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>	-4	1
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to archaeological resources

Impacts to archaeological resources at SHP4 are limited to the possible destruction of isolated background scatter artefacts which have very low to no cultural significance. Impacts will be direct and permanent but because of the low cultural significance the severity is very low negative.

Two technology alternatives were considered for the battery technology for the BESS. Both technology options are equally preferred.

Table 7-241: SPH6: Assessment of construction phase impacts to archaeological sites.

Archaeological impacts				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Destruction of isolated artefacts</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>None</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3

EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
None required as the ruin is in poor condition and does not have any special architectural qualities that need to be further recorded.				
No materials to be removed from any other ruins in the wider project area.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-6	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
High				

(ii) Impacts to graves

Impacts to graves for SPH6 are not expected because all identified graves have been avoided by the facility layout. There is still the chance of an unmarked grave being present, or even a marked grave that was not found during the survey. The chances are considered low, however. The impact on graves applies equally to both technology alternatives.

Table 7-242: SPH6: Assessment of construction phase impacts to graves

IMPACTS TO GRAVES				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Destruction of graves, including their coverings and possibly human remains			
INDIRECT IMPACT	None			
CUMULATIVE IMPACT	Destruction of graves, including their coverings and possibly human remains			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-18	2
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		

SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low – negative		
PROPOSED MITIGATION MEASURES				
<i>Farm-style wire fences should be erected around all known and unfenced graves (i.e. waypoints 362 & 404) within the farm portion affected by construction. Pedestrian access gates must be provided and the fences must be located a minimum of 5 m away from all graves.</i>				
<i>All graves to be treated as no-go areas with temporary signage as required.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-18	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Impacts to the cultural landscape SPH6

No landscape features such as hills and pans will be impacted by SPH6. The impact on cultural landscape is due to the construction activities (construction vehicles and equipment) on site which is a rural landscape.

Table 7-243: SPH6 Assessment of construction phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the introduction of construction equipment and vehicles and all the associated activities on site</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being constructed at once</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				

DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-10	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
Keep construction period as short as possible.				
Rehabilitate any areas not needed during operation as soon as possible.				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-10	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-30	low – negative		
CONFIDENCE LEVEL				
High				

(h) Palaeontological Impact

Palaeontological impacts would be the destruction of fossils from construction activities. The site as a whole is considered as low sensitivity in terms of palaeontology.

Table 7-244: SPH6: Assessment of the potential impacts to possible paleontological resources considers the criteria below

PALAEOLOGY IMPACTS				
PROJECT PHASE	Construction, Operational and de commissioning Phases			
DIRECT IMPACT	Destruction of fossils in the footprint			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Loss of fossil heritage and scientific knowledge			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				

DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-6	<i>Very Low Negative</i>		
PROPOSED MITIGATION MEASURES				
<i>If fossils are found once excavations for foundations and amenities have commenced then they should be photographed, removed and put in a safe place. Photographs should be sent to a palaeontologist to assess their scientific value. If the fossils are important the palaeontologist must obtain a permit from SAHRA, visit the site and remove the fossils for curation and storage in a recognised facility such as a museum or palaeontology department in a university</i>				
<i>If no fossils are found, no action will be required</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	2	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	6	<i>Very Low Positive</i>		
CONFIDENCE LEVEL				
<i>High</i>				

(i) Socio-Economic Impact

(i) Stimulation of the Economy during construction

The size of the Tokologo LM's economy was estimated at R2,170 million at current prices (2022) and primarily comprises of the agricultural and tertiary services sectors. Considering the small economic base of the municipality, the opportunities for the procurement of goods and services within the local economy will be very limited. That being said, it is likely that some of the local businesses will benefit from sub-contracting opportunities, consumer expenditure of the construction crew, and an increase in income of locals who are directly employed in the construction activities, or who benefit from the development of SPH6 through local procurement.

The stimulation of the economy will not be dependent on the technology options of the SPH6; thus, the battery technology alternatives are equally preferred.

Table 7-245: SPH6: Impact of Economic Stimulation during construction

IMPACT ON ECONOMY				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Temporary increase in production and GDP in the local economy			
INDIRECT IMPACT	Improved household income and increased business sales in the local economy			
CUMULATIVE IMPACT	Temporary increase in production and GDP in the regional economy			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term	10	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	2	The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	30	low positive		
PROPOSED MITIGATION MEASURES				
To optimise the stimulation of the local economy through direct, indirect and induced effects, the following should be applied where possible:				
Procure construction materials, goods, and products from local and domestic suppliers if feasible				
Employ local contractors where possible				
Note: The proposed mitigation measures will possibly increase the positive impact on the local economy; however, this will not affect the weighting thereof.				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term	10	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	2	The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural, and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	30	low positive		
CONFIDENCE LEVEL				
High				

(ii) Creation of Employment during construction

The construction of SPH6 will require temporary employment of construction workers, foremen, and engineers On-site. Construction is expected to last twelve months where at the peak of construction about 300 people will be working on-site.

In addition to those benefitting from direct employment created at the project, various multiplier effects will assist in temporarily supporting existing jobs in the businesses offering services and goods that will be procured during construction activities. The increased temporary income earned by these businesses will in turn stimulate consumption spending, creating another round of multiplier effects.

SPH4 will create the same number of employment opportunities, regardless of its layout on the site; thus, layout alternatives are equally preferred.

Table 7-246: SPH6: Assessment of Employment during construction

IMPACT ON EMPLOYMENT				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Creation of temporary employment opportunities On-site</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of temporary employment opportunities in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	<i>low positive</i>		
PROPOSED MITIGATION MEASURES				
<i>The following is recommended to increase the employment opportunities created in the local communities, where feasible:</i>				
<i>Employ labour intensive methods in construction, where feasible</i>				
<i>Employ local residents and communities, where possible</i>				
<i>Utilise local suppliers, where possible</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and</i>	Slightly Beneficial	Definite

		<i>processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>	
SIGNIFICANCE	30	low positive	
CONFIDENCE LEVEL			
<i>High</i>			

(iii) Reduction of Land Area available for productive farming

The proposed site of SPH6 and surrounding land is currently used for small-scale livestock. The agricultural assessment classified the majority of SPH6 comprised of low – very low and low - moderate potential land. The farmers with livestock on the land proposed for the facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH6 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant’s footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project’s construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH6.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant differentiation among site layout alternatives can be made. The footprint of the BESS will be the same regardless of which battery technology is used. There is therefore no difference in the impact between the two technology alternatives.

Table 7-247: SPH6: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Construction and Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural,</i>	Negligible	Definite

		<i>cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iv) Loss of Property

An influx of job seekers to the area during the construction phase may result in stock theft and burglaries. The number of workers and duration of construction will not be affected by the technology alternatives; thus, all alternatives are equally preferred.

Table 7-248: SPH6: Assessment of loss of property

IMPACT ON CRIME LEVELS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in crime associated with the influx of people</i>			
INDIRECT IMPACT	<i>Reduced level of security in and around the proposed facility</i>			
CUMULATIVE IMPACT	<i>No to negligible cumulative impact</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		

SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
<i>The following mitigations are advised to be instituted to minimise and possible eliminate the impact altogether:</i>				
<i>Ensure proper fencing and monitoring of the fencing is in place</i>				
<i>Maximise job creation and allocation to locals as far as practically possible. Recruitment of workers should be planned in advance and should not take place on-site. This will reduce the probability of work seekers loitering in the area surrounding the project sites</i>				
<i>Hire additional security personnel during the construction period</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(j) Terrestrial Biodiversity & Faunal Impact

(i) Direct Impact - Destruction of faunal habitat

Clearing or disturbance to natural vegetation for the construction of SPH6 will remove up to 428ha of natural grassland habitat. This includes the burrows of many fossorial species as well as termite mounds which provide a source of food for species such as aardvark and mongoose.

Two technology alternatives for the battery to be used in the BESS have been proposed. As the type of battery used will not alter the footprint of the BESS the alternatives are rated as equal for the impact of clearance of natural habitat.

Table 7-249: SPH6: Destruction of faunal habitat

DESTRUCTION OF FAUNAL HABITAT				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Destruction of faunal habitat</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>Loss of habitat and habitat connectivity</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-21	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or</i>	Highly detrimental	Definite

		<i>social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays. Only indigenous grasses found in the area must be used for rehabilitation</i>				
<i>Undertake vegetation clearing during the dry season, and outside of the breeding season of burrowing fauna</i>				
<i>If possible, the movement of animals through the sites must be permitted during operations. The use of fencing that will allow the movement of small to medium fauna through would help mitigate the effect of fences acting as barriers. This can be achieved by constructing a fence that has places for animals to crawl through and is not difficult for fleeing animals and birds to see. For example, black mesh panel fencing can be used where gaps of approximately 30 cm high and 50 cm wide and spaced at regular intervals are cut/installed. The tops of these gaps must be smoothed off to limit the chance of wildlife being injured when passing through. The use of barbed wire must be avoided</i>				
<i>The proposed activities must remain within the project footprint</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-10	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-30	low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(ii) Direct Impact - Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death. The clearing of ground for the foundations of the PV arrays will destroy burrows, potentially causing injury or death to burrowing animals. Furthermore, the presence of the construction site and personnel may result in negative interactions with fauna, such as hunting or killing animals perceived to be pests.

Regarding the technology alternative for the type of battery used in the BESS for all facilities, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread

into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place.

Table 7-250: SPH6: Injury or death to fauna

INJURY OR DEATH TO FAUNA				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Injury or death to fauna</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-18	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-54	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by construction workers</i>				
<i>To prevent possible collisions with animals, drivers of construction vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				
<i>Ideally construction should not continue at night so as to avoid potential collisions with nocturnal fauna</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>No wild animal may under any circumstance be hunted, snared, captured, injured or killed. This includes animals perceived to be vermin. Checks of the surrounding natural vegetation must be regularly undertaken to ensure no traps have been set. Any snares or traps found on or adjacent to the site must be removed and disposed of</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely

IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	<i>very low negative</i>		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts – Disturbance and displacement of fauna

Construction activities have the potential to cause disturbance to fauna inhabiting the natural grassland through noise, vibrations, and light (if construction continues after dark). Security lights for the solar facilities during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The technology alternatives for the BESS will not change the ratings for this impact.

Table 7-251: SPH6: Disturbance and displacement of fauna

DISTURBANCE AND DISPLACEMENT OF FAUNA				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Disturbance to and displacement of fauna – natural grassland</i>			
CUMULATIVE IMPACT	<i>Displacement of fauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-18	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-36	<i>low negative</i>		
PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>Ideally construction activities should cease at night to minimise the need for artificial lighting and to reduce the impact of noise and vibrations on nocturnal animals</i>				
<i>Lighting during construction should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects, such as low-pressure sodium lamps, is preferred</i>				
<i>Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light</i>				
POST-MITIGATION				

DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-10	2
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-10	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(iv) Indirect Impacts – Pollution and contamination of natural areas

During construction, dust from exposed areas and roads, and litter from construction workers have the potential to pollute the surrounding natural vegetation. The use of dust suppressants, as well as hydrocarbons from vehicles and machinery, have the potential to contaminate soils and ground water, and be washed into the nearby natural pans during high rainfall events. The battery technology alternatives are rated the same and hence are covered in the same table.

Table 7-252: SPH6: Pollution and contamination of natural areas

POLLUTION AND CONTAMINATION OF NATURAL AREAS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-15	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-3	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-45	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities</i>				
<i>All vehicles and machinery must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>During construction, dust on construction roads must be suppressed using a water tanker</i>				

<i>Dumping of solid waste in natural areas, including cigarette butts and litter by construction workers must be prohibited</i>				
<i>Appropriate solid waste disposal facilities must be provided for workers during construction</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(v) Indirect Impacts – Increased potential of invasion by alien vegetation

During construction, the removal of natural vegetation and disturbance to the soil will increase the likelihood of invasion by alien plant species. Alien species establish easily and quickly on bare soil by colonisation or from seeds existing in the seed bank of the soil. Infestation by alien and invasive species will lead to degradation of the surrounding natural habitat and will increase the potential of spread into the greater landscape. In addition, the vehicles and equipment were likely used on various other sites and could introduce alien invasive plant seeds. This impact is relevant to all the proposed arrays equally and has therefore been assessed in one table for the construction phase.

The technology alternatives for the BESS will not change the ratings for this impact.

Table 7-253: SPH6: Increased potential of invasion by alien vegetation

INCREASED POTENTIAL OF INVASION BY ALIEN VEGETATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Increased potential of invasion by alien vegetation</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities monthly</i>				
<i>All areas cleared of natural vegetation must be rehabilitated. Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays and other cleared areas. Only indigenous grasses found in the area must be used for rehabilitation. This must be advised by the botanist</i>				
<i>An invasive alien plant species management and monitoring plan must be implemented during the construction phase. Monitoring should continue into the operational phase and through and for a period after decommissioning. This should be advised by the botanist</i>				
<i>All alien seedlings and saplings must be removed as they become evident for the duration of construction and during the operational phase. Manual / mechanical removal is preferred to chemical control</i>				
<i>All construction vehicles and equipment must be free of plant material before entering the site</i>				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-4	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(k) Transport Impact

Traffic impacts anticipated to occur during the construction phase of the project are construction related traffic and noise and dust pollution.

Two technology alternative for the BESS have been proposed. There is no difference in the impacts from a traffic perspective between the alternatives.

Table 7-254: SPH6: Traffic Impacts – Construction Phase

TRAFFIC IMPACT				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site</i>			
INDIRECT IMPACT	<i>Construction traffic on roads might generate dust and noise.</i>			
CUMULATIVE IMPACT	<i>Traffic delays on the surrounding road network.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-10	3

EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES		No irreplaceable resources will be impacted.		
SIGNIFICANCE	-30	low negative		
PROPOSED MITIGATION MEASURES				
Stagger component delivery to site;				
Reduce the construction period (if possible);				
Dust suppression of gravel roads (internal roads and the access road to the site) during the construction phase, as required.				
Regular maintenance of gravel roads (internal roads and the access road to the site) by the Contractor during the construction phase.				
The use of mobile batching plants and quarries in close proximity to the site (if available and feasible); and				
Staff and general trips should occur outside of peak traffic periods.				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	5	1
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
Medium				

(I) Landscape and Visual Impact

Four visual impacts were identified for SPH6 during the construction, operational phase and decommissioning phase

- Landscape change
- Impact on Protected Areas
- Impact on local roads
- Impact on homesteads
- Light pollution

These impacts would all occur during the construction, operation and decommissioning phase. Impacts would peak once the facility is constructed, remain relatively constant during the operational phase and then decrease during the decommissioning phase.

The type of battery technology used in the BESS would not impact on the assessment of visual impacts and so the tables below cover both technology options.

Table 7-255: SPH6 Landscape change

LANDSCAPE CHANGE				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Change of character due to industrialisation of a Natural Landscape</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of landscape industrialisation due to other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Plan to maintain the height of structures as low as possible relative to existing ground levels;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
<i>Monitor areas for vegetation cover post-decommissioning and implement remedial actions.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
High				
NOTES				
9. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
10. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

Table 7-256: SPH6 Industrialization of the landscape as seen from Nielsview NR

SPH6 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM NIELSVIEW NR				
PROJECT PHASE	Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.			
DIRECT IMPACT	Industrialisation of the view from Nielsview NR due to this project.			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Extension of industrialisation of views from Protected Areas due to this and other electrical infrastructure projects			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate low negative		
PROPOSED MITIGATION MEASURES				
Plan to maintain the height of structures as low as possible relative to existing ground levels;				
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;				
Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;				
Reinstate any areas of vegetation that have been disturbed during construction;				
Remove all temporary works;				
Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;				
Remove infrastructure not required for the post-decommissioning use of the site;				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	3

EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	Negligible	Slighly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low negative		
CONFIDENCE LEVEL				
High				
NOTES				
9. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
10. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

Table 7-257: Industrialization of the landscape as seen from local roads, SPH6

INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL ROADS, SPH6				
PROJECT PHASE	Construction, Operational & Decommissioning Phases			
DIRECT IMPACT	Industrialisation of the view from local roads due to this project.			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Extension of industrialisation of views from local roads due to this and other electrical infrastructure projects			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low negative		
PROPOSED MITIGATION MEASURES				
Plan site levels to minimise earthworks to ensure that levels are not elevated;				
Plan to maintain the height of structures as low as possible;				
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;				
Construct and/or plant a 2m high screen along the southern edge of the array cluster				
Plan to protect existing natural site features such as drainage pans;				
Reinstate any areas of vegetation that have been disturbed during construction;				
Remove all temporary works;				
Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;				
Remove infrastructure not required for the post-decommissioning use of the site;				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long term	-14	3

EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
High				
NOTES				
11. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
12. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

Table 7-258 SPH6: Industrialization of the landscape as seen from local homesteads

SPH6 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL HOMESTEADS				
PROJECT PHASE	Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.			
DIRECT IMPACT	Industrialisation of the view from local homesteads due to this project.			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Extension of industrialisation of views from local homesteads due to this and other electrical infrastructure projects			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
Plan to maintain the height of structures as low as possible;				
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;				
Construct / grow 2m high screen along SW and E edges of solar cluster closest to affected homesteads;				
Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;				
Reinstate any areas of vegetation that have been disturbed during construction;				
Remove all temporary works;				
Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;				

<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 18 months – 5 years and as such is rated as medium term	-5	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
9. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
10. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

Table 7-259 SPH6 Light pollution

SPH4 LIGHT POLLUTION				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Light pollution from the project spoiling the night time environment and nuisance to neighbors.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of light pollution due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Use low key lighting around buildings and operational areas that is triggered only when people are present;</i>				
<i>Utilise infra-red security systems or motion sensor triggered security lighting;</i>				
<i>Ensure that lighting is focused on the development with no light spillage outside the site;</i>				

<i>No tall mast lighting should be used;</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	0	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
9. <i>The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				
10. <i>The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i>				

7.7.4 Operational Phase

(a) Agricultural Impact

During the operational phase, areas that where vegetation will remain cleared such as access routes, will remain at risk of soil loss through erosion. During the operation phase, staff and maintenance personnel will access the development area to maintain the infrastructure and make repairs, where required. Biodegradable detergents and water will be used to clean the panels, however this is not expected to result in impacts from an agricultural perspective.

Table 7-260: SPH6 Impact significance of soil loss through erosion during the operation phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	<i>Operation Phase</i>			
DIRECT IMPACT	<i>Areas where soil surfaces will remain bare such as access routes and between PV arrays, will remain at risk of soil erosion.</i>			
INDIRECT IMPACT	<i>Eroded areas can expand into nearby areas and result in land degradation.</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil erosion.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite

IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>The development area, including internal access routes, as well as areas bordering on the development area, must regularly be monitored to detect early signs of soil erosion on-set.</i>				
<i>If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-6	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-261: SPH6 Impact significance of soil pollution during the operation phase

SOIL POLLUTION				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Soil pollution caused by oil and fuel spills or maintenance materials and domestic waste left on site. The replacement of electrolyte of the redox flow batteries, also pose soil pollution risk.</i>			
INDIRECT IMPACT	<i>Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil pollution</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-14	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills.</i>				

<i>No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area.</i>				
<i>Regularly monitor the BESS area for any signs of oil, grease and fuel spillage or the presence of waste.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(b) Aquatic Impact

During the operation phase, the solar arrays will operate largely unattended and with low maintenance required for more than 20 years. The hard surfaces created by the development may lead to increased runoff. This may lead to increased erosion and sedimentation of the downslope areas. A localised long-term impact (more than 20 years) of low intensity (depending on the distance between the solar arrays and the freshwater features) could be expected that would have a very low overall significance post-mitigation in terms of its impact on the identified aquatic ecosystems in the area.

The only potentially toxic or hazardous materials which would be present in relatively small amounts would be of lubricating oils and hydraulic and insulating fluids. Therefore, contamination of surface or groundwater or soils is highly unlikely.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low. The impacts are rated the same for the battery technology alternatives for the BESS.

Table 7-262: SPH6 Operational phase aquatic ecosystem impacts

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it will affects the area in which the proposed</i>		

		<i>activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Any disturbance during the operation phase should be limited to the approved development footprints and should avoid disturbance of the soil and natural vegetation cover.</i>				
<i>Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.</i>				
<i>Stormwater run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving developed areas.</i>				
<i>Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider. In a scenario where services are installed, these systems need to be adequately installed and maintained to prevent any potential contamination of the water resources on site.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it will affect the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

(c) Avifaunal Impact

(i) Bird fatality at PV facility

Bird fatalities could occur at the site through a number of mechanisms, including collision with PV panels, entanglement in perimeter fence (less likely since developer has chosen to use mesh panel fencing which has a tight weave and birds are less likely to become entangled), electrocution in substations/electrical compounds and others. The battery technology options for the BESS are rated the same and are both covered in the same table.

Table 7-263: SPH6 bird fatality during operational phase

BIRD FATALITY AT PV FACILITY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Birds killed through various interaction with facility infrastructure</i>			
INDIRECT IMPACT	<i>--</i>			
CUMULATIVE IMPACT	<i>More projects will result in overall higher fatality rates in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD

PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any fatalities this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. Operational phase bird monitoring should be conducted for at least one year as per the best practice guidelines – see Section 8.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(ii) Nesting & other use of facility infrastructure by birds

Certain species, in particular doves, pigeons, weavers and crows, are likely to use some of the facility infrastructure for nesting, perching and roosting. At face value this is a positive impact for birds and has been rated as VERY LOW POSITIVE significance both pre and post mitigation. However, where nesting interferes with the operation of the facility this could cause conflict and require management. Nesting on infrastructure also increases the likelihood of bird fatalities occurring through the various mechanism, particularly of young inexperienced birds. No mitigation is required for the impact of the facility on birds through nesting. For the impact of the birds nesting on the facility, the specialist recommends nest management on a case by case basis under the supervision of an avifaunal specialist, and in conformance with all relevant national and provincial legislation. The impact is rated the same for the both battery technology alternatives for the BESS.

Table 7-264: SPH6 impact of bird nesting and other use of facility infrastructure by birds

BIRD NESTING, PERCHING & ROOSTING AT PV FACILITY

PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Birds use infrastructure to perch, roost or nest on</i>			
CUMULATIVE IMPACT	<i>More projects in the area will probably diminish the likelihood of this happening as perch availability will increase</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	7	very low positive		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any nesting which interferes with operations this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. All nest management measures should only be undertaken in compliance with national and provincial environmental legislation in this regard.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	7	very low positive		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

Day to day operation and maintenance of the facility may result in disturbance and displacement of bats. The impact is rated the same for both battery technology options for the BESS.

Table 7-265: SPH6 disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS	
PROJECT PHASE	<i>Operational phase</i>
DIRECT IMPACT	<i>Disturbance of bats during operational activities</i>
INDIRECT IMPACT	<i>Displacement</i>
CUMULATIVE IMPACT	<i>Unavailability of suitable foraging resources in the broader environment for displaced individuals</i>

DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	very low negative		
PROPOSED MITIGATION MEASURES				
Limit operational and maintenance activities to daylight hours, as far as possible, and minimise lighting at night.				
All lighting should preferably use low pressure sodium and warm white LED lights.				
Operational and maintenance activities should be limited to the immediate project footprint only.				
Site access should be strictly controlled, to avoid unnecessary disturbance.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-266: SPH6 bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during operational activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-7	<i>Low negative</i>		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMPr				
<i>All lighting should preferably use low pressure sodium and warm white LED lights.</i>				
<i>During operational and maintenance activities, avoid all movement and noise around medium sensitivity areas.</i>				
<i>Operational and maintenance activities should be limited to the immediate project area.</i>				
<i>Site access should be strictly controlled, to avoid unnecessary disturbance.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-7	<i>very low negative</i>		
CONFIDENCE LEVEL				
<i>Medium</i>				

(e) Botanical Impacts

Maintenance activities will require management of vegetation which may result in loss of natural vegetation. The impact is rated the same for both battery technology options for the BESS.

Table 7-267: SPH6 loss of Western Free State Grassland during operational phase

LOSS OF VEGETATION				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Direct impact</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>Loss of Western Free State Clay Grasslands</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is the footprint as it only affects the area in which the proposed activity will occur.</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>When and where possible, vegetation clearing should be undertaken during the dry season.</i>				
<i>Only clear vegetation where absolutely necessary; and</i>				
<i>Stockpile areas for cleared vegetation will be decided and approved by the Project Manager and appointed ECO before construction commences on site and should not be located within drainage lines.</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-2	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(f) Groundwater Impact

Similar to the construction phase, the operational phase of the SPH6 will require approximately 2,000 m³/a (0.03 L/s). This does not exceed the regionally mapped yield of the underling aquifer (0.5 – 2.0 L/s). It is not currently planned to use groundwater for the operational phase of this project however if this changes a water use licence will need to be applied for and the potential impacts and mitigation measures are presented in **Table 7-268**.

The principal risks for groundwater contamination that have been identified are the use of cleaning agents for cleaning of PV panels and for dust suppression of internal roads. If required, it is encouraged that water alone is used to conduct these tasks. Alternatively, the PV cleaning agents and dust suppression mixes must be environmentally friendly and should breakdown naturally without causing ingress of harmful chemicals into the environment. The risks and status of groundwater contamination occurring during the operational phase of SPH4 is presented in **Table 7-269**.

The proposed development will require a BESS. Currently two different technologies are being considered, i.e. either Solid State Lithium Batteries (SSLB) or Vanadium Redox Flow Battery Energy Storage Systems (VRFB). Both of these two BESS systems require an electrolyte. The SSLB contain an ethylene carbonate or di-ethyl carbonate electrolyte and the VRFB system will require that an estimate of 3 000 m³ of sulfuric acid solution with vanadium ions electrolyte is stored on site for each Springhaas Facility. The BESS systems will also require cooling systems and these systems could potentially either be water based or it may be refrigerant based systems which used chemicals such as ethylene glycol- based coolants.

The containers that the BESS systems are held in are equipped with a “Clean agent” which is a fires suppression systems that can release a powder/gas into the container to snuff fires. These systems usually leave a residue on the equipment that will need to be cleaned off. With any chemical storage there is always a risk of chemical fires that will need to be put out with water or foam and the waste water from these activities could contain contaminants that should not be let to run off into the environment.

The fire safety systems, refrigerants, electrolyte solutions and the waste products produced from these systems could contaminate the soil and groundwater and all measures should be taken to prevent leaks or spills on the ground. The risks and mitigations for the BESS are presented in **Table 7-270**.

The impact on groundwater levels is rated the same for both battery technology alternatives for the BESS.

Table 7-268 SPH6: Impact of lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place)

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Lowering of groundwater level due to over abstraction</i>			
INDIRECT IMPACT	<i>Drying of springs in the area</i>			
CUMULATIVE IMPACT	<i>Permanent damage to the aquifer system in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected</i>	Moderately	Likely

		<i>environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Detrimental	
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	<i>low – negative</i>		
PROPOSED MITIGATION MEASURES				
<i>If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring.</i>				
<i>Adhere to the borehole’s safe yield and to monitor water levels and flow.</i>				
<i>Groundwater abstraction volumes must be monitored.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-269: SPH6 Impact of contamination of groundwater as a result of cleaning agents used for cleaning the solar panels

Potential impact on groundwater as a result of cleaning agents used for cleaning the solar panels.				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Contamination of groundwater</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long-term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Use environmentally safe cleaning agents that breakdown naturally (biodegradable detergents/green soaps) and that will not cause adverse effects.</i>				

POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
Medium				

Redox flow batteries contain electrolyte solution which needs to be replaced approximately every 15 to 20 years. During replacement of electrolyte there is a risk of leaks or spills. This impact is only applicable to the redox flow batteries as lithium-ion batteries are solid state batteries.

Table 7-270: SPH6 Impact table for contamination of groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)

Potential impact on groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Contamination of groundwater</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long-term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or Communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Ensure that all electrolyte or chemicals stored or used on site have secondary containments systems in place with reliable leak detection, annunciation in place. Ensure that all chemicals are handled on concrete bunded surfaces and not on bare soil.</i>				
<i>Any waste products produced from the BESS systems should be removed and disposed of appropriately.</i>				

<i>Waste water produced by fire hydrants should not be allowed to runoff into the environment.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to the cultural landscape

Because any physical impacts to the landscape would already have occurred during the construction phase, landscape impacts during operation of SPH6 relate only to the presence of the facility in what is otherwise a rural landscape. Impacts to the cultural landscape will occur during the operation phase and last as long as the lifetime of the facility. Because of the flat terrain, the impacts would not be experienced over great distances because intervening vegetation and buildings would offer partial screening. Nonetheless, the immediately surrounding area will experience a degree of change in landscape character and sense of place. The impact significance is rated to low negative before mitigation. The impacts are the same for both technology options for the batteries for the BESS.

Table 7-271: SPH6: Assessment of operation phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Operation Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the presence of a solar energy facility</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being present</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Keep all maintenance work within the authorised footprint.</i>				

<i>Minimise night-time light pollution in the area (visual recommendations to be followed to achieve this).</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(h) Socio-Economic Impact

(i) Stimulation of the Local Economy during operations

The operational period of SPH6 is a minimum of 20 years. Of the money spent annually during the operations period, a significant portion will likely comprise of salaries and wages of the Springhaas employees. The operations of the facility will make some contribution towards the growth of the local economy, as it will increase the size of the local electricity sector, as well as stimulate the demand for other sectors' services and goods such as water, transportation, and trade.

No differentiate can be made between battery technology alternatives for the BESS. The technology alternatives are considered in **Table 7-218** and **Table 7-219**.

Table 7-272: SPH6: Assessment of Economic stimulation during operations

STIMULATION OF THE LOCAL ECONOMY DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Long-term increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				
<i>Where feasible, procure goods and services required for the operation of the plant from the local economy</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	16	3
EXTENT	4	The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries		
SEVERITY	2	The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected	Moderately Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	48	moderate positive		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Creation of Employment and increased household income during operations

The operation of SPH6 will require functional and maintenance employees. It is envisaged that about 16 direct jobs per facility will be created during the operations phase, which will occur for a duration of 20 years. About 70% of these jobs are to be filled by people from the local communities as they will be low-skilled employment opportunities. Employment of the eight individuals for the entire operational period will increase their household income, improve their standard of living and benefit their families.

SPH6 will create the same number of employment opportunities, regardless of its location on the site; thus, layout alternatives are equally preferred. The type of battery used in the BESS will also not significantly affect employment alternatives, thus both technology alternatives are equally preferred.

Table 7-273: SPH6 Assessment of employment during operations

CREATION OF EMPLOYMENT AND INCREASED HOUSEHOLD INCOME DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Creation of permanent employment opportunities in the local and regional economy</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of permanent employment opportunities in the region</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	8	3

EXTENT	4	The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries		
SEVERITY	1	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				
Where feasible, aim to fill all the positions by labour from the local community				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	8	3
EXTENT	4	The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries		
SEVERITY	1	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	24	low positive		
CONFIDENCE LEVEL				
High				

(iii) Improved municipal service delivery

SPH6 will have a capacity of up to 250MWac and will be connected to the national grid through Eskom substation and generated electricity will be sold nationwide. The proposed project, albeit relatively small, will contribute towards improving National electricity availability; thus, improving the government service delivery, and could potentially also aid in growing the local economy by increasing the overall supply of electricity in the local economy. Furthermore, due to the taxes and rates that will be paid by the project to the municipality, the revenue of the latter will be increased, thus allowing it to improve the service delivery in other areas.

The layout alternatives and BESS technology alternatives will not affect the capacity of the solar facility; thus all alternatives are equally preferred.

Table 7-274: SPH6: Assessment of service delivery improvement

IMPROVED MUNICIPAL SERVICE DELIVERY	
PROJECT PHASE	<i>Operational phase</i>
DIRECT IMPACT	<i>It will likely Improve the local electricity supply if fed to the grid</i>
INDIRECT IMPACT	<i>Improved standard of living within the region</i>
CUMULATIVE IMPACT	<i>Improved electricity availability</i>

DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	16	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Moderately Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	48	<i>moderate positive</i>		
PROPOSED MITIGATION MEASURES				
<i>No mitigations proposed</i>				

(iv) Reduction of Land Area available for productive farming

The proposed site of SPH6 and surrounding land is currently used for small-scale livestock. The farmers with livestock on the land proposed for the facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH6 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant's footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project's construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH6.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant differentiation among site layout alternatives can be made. The different battery technology alternatives will not affect the impact ratings.

Table 7-275: SPH6: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(i) Terrestrial Biodiversity and Animal Species

(i) Direct Impacts – Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death.

Regarding the technology alternative for the type of battery used in the BESS for SPH6, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place.

Table 7-276: SPH6 Injury or death to fauna

ALL FACILITIES				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Injury or death to fauna</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-32	low negative		
PROPOSED MITIGATION MEASURES				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by maintenance staff</i>				
<i>To prevent possible collisions with animals, drivers of maintenance vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				
<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>Adequate fire prevention and safety measures must be in place. A fire emergency management plan must be in place</i>				
<i>All electrical equipment must be maintained on a regular basis to minimise the risk of fire</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Indirect Impacts – Pollution and contamination of natural areas

During operations, release of grey water into the environment can cause contamination by detergents. Grey water from cleaning of the solar panels has the potential to contaminate soils and ground water and be washed into the nearby natural pans during high rainfall events. This

includes biodegradable detergents used for cleaning the panels, which can accumulate in the soil and be washed into the nearby pans before they break down. Biodegradable detergents can alter the balance of freshwater ecosystems as they promote bacterial growth and lower oxygen levels. The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-277: SPH6 Pollution and contamination of natural areas including pans and wetland

POLLUTION AND CONTAMINATION OF NATURAL AREAS INCLUDING PANS AND WETLANDS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas – including nearby pans or wetlands</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-21	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee operational phase activities at a minimum every 6 months for the first 5 years and then yearly for the rest of the life of the facility</i>				
<i>If possible, panels should be cleaned using water that is clear of detergents only (e.g. potable water or borehole water). The use of grey water should be avoided. Should the need arise to clean the panels with detergents, then biodegradable detergents are preferred. Care must be taken not to allow the detergents to accumulate in the soil</i>				
<i>All maintenance vehicles must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by maintenance staff must be prohibited</i>				
<i>Appropriate solid waste disposal and ablution facilities must be provided for operational staff</i>				
<i>Adequate prevention and safety measures must be in place to avoid leaks to batteries. This includes regular maintenance and replacement of batteries in a timeous manner. Measures must be in place to prevent chemicals leaking into the soil, should damage to the battery occur</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive</i>	Slightly Detrimental	Likely

		<i>or vulnerable systems or communities are negatively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-24	Low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts – Disturbance and displacement of fauna

Security lights for SPH6 during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland adjacent to the facility, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-278: SPH6 Disturbance and displacement of fauna – natural grassland and rocky outcrops

DISTURBANCE AND DISPLACEMENT OF FAUNA – NATURAL GRASSLAND				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Disturbance to and displacement of fauna – natural grassland and rocky outcrops</i>			
CUMULATIVE IMPACT	<i>Displacement of fauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-48	Moderate negative		
PROPOSED MITIGATION MEASURES				
<i>Operations during the night must be avoided to minimise the need for artificial lighting and to reduce the impact of light and noise on nocturnal animals</i>				
<i>Lighting during operations should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects, such as low-pressure sodium lamps, is preferred</i>				
<i>Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1

EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(j) Traffic Impact

During the operational phase there will be approximately 8 full time employees on site. Vehicles would access the site for daily operations and maintenance as and when required. The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-279 SPH6: Traffic impacts during operation phase

TRAFFIC IMPACTS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Traffic congestion due to the trips generated by the operation of the facility</i>			
INDIRECT IMPACT	<i>The associated noise and dust pollution</i>			
CUMULATIVE IMPACT	<i>Traffic delays on the surrounding road network</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Staff and maintenance trips should occur outside of peak traffic periods; and</i>				
<i>Client/Facility Manager is to ensure that regular maintenance of gravel roads (located within the site boundary, including the access road to the site) occurs during operation phase to minimise/mitigate dust pollution.</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

7.7.5 Decommissioning Phase

Upon completion of the operational phase of the project which will last in excess of 20 years the facilities may be decommissioned. Decommissioning activities would entail removal of infrastructure from site and return of the site to a state similar to the pre-construction condition. The decommissioning impacts would not vary significantly between facilities and so all seven facilities are covered **Section 7.7**.

7.7.6 No-Go Alternative

The no-go alternative refers to the option of not developing the facility. The impact assessment for the no-go alternative is the same for all 7 facilities and is covered in **Section 7.8**.

7.7.7 Cumulative Impacts

The cumulative impact considers the development of all seven Springhaas solar PV facilities in addition to the other projects which are proposed within 30km of the facility.

The cumulative impacts were rated the same for each of the 7 solar PV facilities. The cumulative impact assessment is available in **Section 7.9**.

Table 7-280: SPH6 impact summary

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Design/Planning/Pre-Construction Phase			
No impacts identified			
Construction Phase			
Agricultural impacts			
Land use change from livestock farming to energy generation	Negative	Moderate	Low
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance and water quality impacts	Negative	Moderate	Low
Avifaunal impacts			
Destruction of bird habitat during construction	Negative	Moderate	Low
Disturbance of birds during construction	Negative	Very low	Very low
Bat impacts			
Bat habitat modification	Negative	Very low	Very low
Disturbance and displacement of bats	Negative	Very low	Very low
Possible roost disturbance	Negative	Low	Very low
Bat roost destruction	Negative	Low	Very low
Botanical impacts			
Loss of vegetation	Negative	Medium	Low

Groundwater impacts			
Lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place)	Negative	Low	Very low
Contamination of groundwater as a result of accidental oil spillages or fuel leakages	Negative	Very low	Very low
Heritage impacts			
Impact on archaeological sites	Negative	Very low	Very low
Impact on graves	Negative	Low	Very low
Impact on cultural landscape	Negative	Low	Low
Palaeontological impacts			
Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-economic impacts			
Stimulation of the economy during construction	Positive	Low	Low
Employment opportunities	Positive	Low	Low
Reduction in land available for productive farming	Negative	Very low	Very low
Loss of property	Negative	Low	Very low
Terrestrial biodiversity and animal species (faunal) impacts			
Destruction of faunal habitat	Negative	High	Low
Injury or death to fauna	Negative	Moderate	Very low
Disturbance and displacement of fauna	Negative	Low	Very low
Pollution and contamination of natural areas	Negative	Moderate	Very low
Increased potential of invasion by alien vegetation	Negative	Moderate	Very low
Traffic impacts			
Traffic congestion	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Moderate	Low
Industrialisation of the landscape as seen from local roads	Negative	Low	Very low
Industrialisation of the landscape as seen from local homesteads	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
Operational Phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Soil pollution	Negative	Very low	Very low
Aquatic impacts			
Increased run-off, pollution	Negative	Very low	Very low
Aquatic			
Disturbance of aquatic habitat; water quality impacts	Negative	Very low	Very low
Avifauna impacts			
Bird fatality through interaction with infrastructure	Negative	Very low	Very low
Nesting and use of other infrastructure by birds	Positive	Very low	Very low
Bat impacts			
Disturbance and displacement	Negative	Very low	Very low

Roost disturbance	Negative	Low	Very low
Botanical impacts			
Loss of vegetation	Negative	Very low	Very low
Groundwater impacts			
Lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place).	Negative	Low	Very low
Contamination of groundwater from use of cleaning agents	Negative	Low	Very low
Contamination of groundwater from leaks or spills from BESS	Negative	Low	Very low
Heritage impacts			
Impact on cultural landscape	Negative	Low	Low
Socio-economic impacts			
Economic stimulation during operations	Positive	Low	Moderate
Employment opportunities	Positive	Low	Low
Improved service delivery	Positive	Moderate	Moderate
Reduction in land available for productive farming	Negative	Very low	Very low
Terrestrial biodiversity and animal species			
Injury or death of fauna	Negative	Low	Very low
Pollution and contamination of natural areas including pans and wetlands	Negative	High	Low
Disturbance and displacement of fauna –natural grassland and rocky outcrops	Negative	Moderate	Very low
Traffic impact			
Traffic congestion	Negative	Very low	Very low
Palaeontological impacts			
Destruction of fossils	NA	NA	NA
Decommissioning phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance of aquatic habitat, water quality impacts	Negative	Very low	Very low
Avifaunal impacts			
Disturbance of birds	Negative	Very low	Very low
Bat impacts			
Disturbance and displacements	Negative	Very low	Very low
Botanical impacts			
Loss of vegetation	Negative	Low	Low
Groundwater			
Contamination from construction activities	Negative	Very low	Very low
Heritage impacts			
Alteration of the rural landscape character through the presence of construction equipment and vehicles and all the associated activities on site	Negative	Low	Very low
Palaeontological impacts			

Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-Economic impacts			
Impact on the economy	Positive	Very low	Very low
Creation of temporary employment opportunities in the local and regional economy	Positive	Very low	Very low
Terrestrial biodiversity and animal species			
Destruction of novel ⁷ faunal habitat (i.e. grassed areas under the panels where fauna may recolonise after construction)	Negative	Moderate	Very low
Injury or death to animals (due to collisions with construction vehicles or destruction of burrows that have established under the panels)	Negative	Moderate	Very low
Pollution and contamination of natural areas including pans and wetlands	Negative	High	Very low
Disturbance to and displacement to fauna and edge effects – natural grassland	Negative	Low	Very Low
Increased potential of invasion by alien vegetation	Negative	Moderate	Very low
Reestablishment of movement corridors through the landscape due to removal of fences and return to open grassland	Negative	Very low	Low positive
Traffic impacts			
Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads	Negative	Very low	Very low
Industrialisation of the landscape as seen from local homesteads	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
No-Go Alternative			
Agricultural	Negative	Very low	Very low
Aquatic	Negative	-	Very low-negligible
Avifauna	Negative	Very low	Very low
Bats	Negative	Very low	Very low
Botanical	Negative	Low	Low
Heritage	Negative	Very low	Very low
Transport- Traffic congestion	Negative	Very Low	Very Low
Terrestrial biodiversity and animal species	Negative/ positive	Low negative	Very low positive
Socio-economic	NA- no impact, forgone + impacts	NA	NA
Destruction of fossils	NA	NA	NA
Landscape and Visual	Negligible	No impact/NA	No impact/NA
Groundwater Impacts	Negligible	NA	NA
Cumulative impacts			

⁷ Novel habitats are human-built, modified, or engineered niches in places that have been altered in structure and function by human activity

Agricultural	Negative	Very low	Very low
Aquatic	Negative	Low	Low
Avi-fauna	Negative	Moderate	Moderate
Bats	Negative	Low	Low
Botanical	Negative	Very low	Very low
Heritage	Negative	Moderate	Low
Socio-economic - Impact on the economy- construction	Positive	-	Moderate
Socio-economic -Creation of employment during construction	Positive	-	Moderate
Socio-economic -Reduction in land available for productive farming	Negative	-	Low
Socio-economic -Stimulation of the economy – operations	Positive	-	Moderate
Socio-economic -Employment - operations	Positive	-	Moderate
Socio-economic -Improved municipal service delivery	Positive	-	Moderate
Socio-economic -Loss of property	Negative	-	Low
Socio-economic - Stimulation of economy - decommissioning	Positive	-	Very low
Terrestrial biodiversity	Negative	High	Moderate
Transport	Negative	Low	Very Low
Landscape and visual	Negative	-	Low
Destruction of fossils	NA	NA	NA
Groundwater: Aquifer system and water quality	Negative	Low- Very Low	Low – Very Low

7.8 Springhaas 8 Detailed Impact Assessment

7.8.1 Alternatives Considered

(a) Technology Alternatives

Two technology alternatives namely lithium-ion and redox flow batteries were considered for the BESS.

(b) No-Go Alternative

The no-go alternative was considered for all seven of the proposed facilities. The impact of the no-go alternative was rated as the same for all seven facilities. The no-go alternative is assessed in **Section 7.8**.

7.8.2 Pre-construction phase

No significant impacts for the pre-construction phase have been identified by any specialist studies or by the EAP for SPH8.

7.8.3 Construction Phase

(a) Agricultural Impact

The most significant agricultural impacts associated with the development of SPH8 will occur during the construction phase when the site is fenced off, vegetation is removed and the soil surface is prepared for the installation of infrastructure.

The majority of the footprint of SPH8 is classified as low sensitivity from an agricultural perspective. There is one small patch of medium sensitivity land on the eastern edge of the site.

SPH8 was also classified in terms of agricultural potential. The majority of the site is classified as low to very low potential. There are two patches of low- moderate potential land and one sections of moderate potential land. As these patches of low- moderate and moderate potential agricultural land are isolated from larger patches of moderate sensitivity land they are not viable from a production perspective.

Tables 7-173 – 7-176 cover the two technology options for the BESS. There was no difference in the alternatives proposed from an agricultural perspective.

Table 7-281: SPH8: Impact of land use change from livestock farming to renewable energy generation

LAND USE CHANGE FROM LIVESTOCK FARMING TO ENERGY GENERATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Construction of boundary fence and PV infrastructure will change land use from livestock farming to renewable energy generation</i>			
INDIRECT IMPACT	<i>Intensification of agriculture in other areas or otherwise reduction of livestock produced in the area</i>			
CUMULATIVE IMPACT	<i>Increase in areas where agriculture is converted into other land uses</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Springhaas Solar Facility 3 (Pty) Ltd must provide market-related compensation that will allow the current land users to have the same or better ability to sustain their livelihood.</i>				

<i>Ensure that the final infrastructure layout remains within the fenced off area of the development footprint.</i>				
<i>Prior arrangements must be made with the landowners to ensure that livestock and game animals are moved to areas where they cannot be injured by vehicles traversing the area.</i>				
<i>The use of main access routes by construction vehicles and equipment must do so with consideration of nearby agricultural land users who use the same access routes for farming activities.</i>				
<i>All left-over construction material must be removed from site once construction on a land portion is completed.</i>				
<i>No materials removed from development area must be allowed to be dumped in nearby livestock farming areas.</i>				
<i>No boundary fence must be opened without the landowners' permission.</i>				
<i>No open fires made by the construction teams are allowable during the construction phase.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21 low - negative			
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-282: SPH8: Impact significance of soil loss through erosion during the construction phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Loss of soil particles from areas where construction activities result in the removal of vegetation from the surface.</i>			
INDIRECT IMPACT	<i>Sparse to no vegetation growth in eroded areas.</i>			
CUMULATIVE IMPACT	<i>Increase in areas exposed to soil erosion</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-18	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or</i>	Moderately Detrimental	Definite

		communities are substantially affected.		
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Limit vegetation removal from the soil surface to the areas of infrastructure development such as access routes as well as around the foundations of the PV arrays and buildings.</i>				
<i>Vegetation clearance must only be undertaken immediately prior to construction activities and only within the development footprint</i>				
<i>Once construction of an area has been completed, level any remaining soil removed from excavation pits (where the PV arrays will be mounted) that remained on the surface, instead of allowing small stockpiles of soil to remain on the surface where it is exposed to rain and wind. This is applicable to all construction areas, except where topsoil stockpiles must remain for site rehabilitation of specific areas.</i>				
<i>Stormwater channels on site must be designed to minimise the soil erosion risk that results from surface water runoff.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season.</i>				
POST-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-5	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-283: SPH8: Impact significance of impaired soil functionality caused by compaction

IMPAIRED SOIL FUNCTIONALITY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>The weight and movement of vehicles and equipment over the surface will result in soil compaction.</i>			
INDIRECT IMPACT	<i>Compacted soil have reduced pore space and water infiltration rate. Compacted soil surfaces increase the rate of surface water runoff, especially after a rainfall event.</i>			
CUMULATIVE IMPACT	<i>Increase in areas affected by soil compaction.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-18	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-3	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable	Moderately Detrimental	Definite

		systems or communities are substantially affected.		
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Only allow vehicles and equipment to travel on designated access routes and not anywhere else within the development area.</i>				
<i>Use existing main access routes and internal farm roads where possible and avoid using other areas in the site as temporary access routes.</i>				
<i>Vehicles and equipment must park in designated parking areas.</i>				
<i>Materials must be off-loaded and stored in designated laydown area.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season as wet soil compacts easily as opposed to dry soil.</i>				
POST-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-5	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-284: SPH8: Impact significance of impaired soil health as a result of soil pollution

IMPAIRED SOIL HEALTH				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Soil pollution can be caused by oil and fuel spills from vehicles and equipment as well as domestic and material waste on site. Should the vanadium redox flow batteries be used for the BESS, spillage of corrosive and environmentally toxic electrolyte is possible. In the case that lithium solid state containerised batteries are used, there is a possibility of thermal runaway that will result in the release of toxic and flammable gasses.</i>			
INDIRECT IMPACT	<i>Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health.</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil pollution.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-21	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-3	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable	Highly detrimental	Definite

		systems or communities are substantially affected.		
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>Maintenance must be undertaken regularly on all vehicles and construction equipment to prevent hydrocarbon spills.</i>				
<i>Any waste generated during construction must be stored into designated containers and removed from the site by the construction teams.</i>				
<i>Any left-over construction materials must be removed from the development area.</i>				
<i>The development area must be monitored by the Environmental Control Officer (ECO) to detect any early signs of fuel and oil spills and waste dumping. The ECO must also report any spills from batteries.</i>				
<i>Ensure battery transport and installation is undertaken by accredited staff and contractors.</i>				
<i>Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.</i>				
POST-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-5	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(b) Aquatic Impact

Construction phase activities would result in disturbance of soil and clearing of vegetation. Water quality impacts may occur from batching of concrete on site, hydrocarbon spills and other construction activities.

There is no difference in impacts between the two battery technology options for BESS, the impact assessment table covers both alternatives.

Table 7-285: SPH8: Impact of aquatic ecosystems during the construction phase

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long term	-14	3
EXTENT	3	The extent of the impact is rated as Local as it affects only the development area and adjacent properties		

SEVERITY	-2	<i>The severity of the impact is rated as Moderate as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	Moderate negative		
PROPOSED MITIGATION MEASURES				
<i>A buffer of at least 250 m between the significant aquatic ecosystems (larger pans) and all the proposed project activities should be maintained (noting that this is already honoured in the proposed layout for all facilities).</i>				
<i>Clearing of indigenous vegetation should not take place within the aquatic features and the recommended buffers, while retaining the topography and cover vegetation within the wider drainage areas through the site is preferred to reduce the potential modification to the way in which water drains through these areas.</i>				
<i>The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance.</i>				
<i>During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills. The solar panels will be washed with water and a biodegradable/ greendetergent.</i>				
<i>Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.</i>				
<i>Development within the drainage areas, where located within a proposed facility, will however need to consider stormwater management measures and should avoid impacting on the movement of water through the more seasonally wet areas. Minimal disturbance to the topography and cover vegetation in these areas is recommended.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-12	2
EXTENT	2	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.</i>	Slightly Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-24	low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(c) Avifaunal Impact

(i) Habitat destruction associated with the construction of the facility

Habitat destruction and alteration will occur during the construction phase of SPH8. The majority of the development footprint would be transformed from its current state to a renewable energy facility. SPH8 will transform approximately 253ha of habitat. Most of this

is in a fairly natural state currently, or in the case of arable lands is still accessible and useable for birds foraging.

Table 7-286: SPH8: Formal rating of destruction of bird habitat during construction

DESTRUCTION OF BIRD HABITAT DURING CONSTRUCTION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Transformation of natural habitat into PV facility</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Yes - Larger area transformed from natural habitat</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	moderate – negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required. Impact avoidance has already been implemented in the design phase through the adherence to no-go buffers around pans.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Disturbance of birds & displacement effects

Disturbance of avifauna during the construction (and thereafter during maintenance and operational and decommissioning) of the facility and all development alternatives and associated infrastructure is likely to occur. Disturbance of breeding birds is typically of

greatest concern. In this regard any breeding sites of sensitive bird species would be the most important. It is noted that no breeding sites have been identified on site at this stage.

There is no difference between the location and technology options in terms of disturbance and displacement of birds.

Table 7-287: SPH8: Formal rating of disturbance of birds during construction

PROJECT PHASE	<i>Construction phase & operations phase to lesser extent</i>			
DIRECT IMPACT	<i>Birds disturbed from their normal activities through the increased noise and activity levels associated with construction</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>More projects will result in overall higher disturbance levels</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required as there are no particularly sensitive features identified (such as breeding sites). General good environmental practice should be implemented during construction in terms of control of vehicles, staff, minimising the impact on the receiving environment as much as possible.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

The facility boundary for SPH8 overlaps one medium sensitivity areas from a bat perspective. During the construction of SPH8 habitat modification would occur, disturbance and displacement of bats may occur and bat roosts may be disturbed or destroyed.

Two technology options are under consideration for the BESS. For bat impacts the type of technology used for the BESS is not considered relevant. Both technology options are considered equally acceptable.

Table 7-288: SPH8: Bat habitat modification

IMPACT ON POSSIBLE HABITAT MODIFICATION				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Modification of habitat through the removal of vegetation cover and water sources</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Loss of foraging resources for local bat population</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
PROPOSED MITIGATION MEASURES				
<i>This impact may be reduced by limiting the removal of vegetation and available water sources, as far as possible.</i>				
<i>Avoid all high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should any changes or expansion take place to the boundary of the facility a bat specialist must provide input to confirm that these changes are acceptable in terms of the avoidance of high sensitivity areas.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential additional sensitive habitats, to confirm the baseline environment, if construction does not take place within 5 years of the initial bat study.</i>				
<i>Following construction, rehabilitation of all disturbed areas, inclusive of that beyond permanent infrastructure footprints, (e.g. temporary access tracks and laydown areas) must be undertaken.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-289: SPH8: Disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS

PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Disturbance of bats during construction activities</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable foraging resources in the broader environment for displaced individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Limit construction activities to daylight hours only and minimise lighting at night, as far as possible.</i>				
<i>Avoid high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should any changes or expansion take place to the boundaries, a bat specialist must provide input to confirm that these changes are acceptable in terms of avoidance of high sensitivity areas.</i>				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-290: SPH8: Bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during construction activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected.</i>	Negligible	Unlikely

IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	low negative		
PROPOSED MITIGATION MEASURES				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.</i>				
<i>If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.</i>				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
Medium				

Table 7-291: SPH8: Bat Roost destruction

IMPACT OF POSSIBLE ROOST DESTRUCTION				
PROJECT PHASE	Construction phase			
DIRECT IMPACT	Destruction of potential bat roosting features			
INDIRECT IMPACT	Reduction of available roosting sites and/or Mortality			
CUMULATIVE IMPACT	Insufficient roosting resources to support the local population and potential increased bat mortality			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	Low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMPr				
<i>Avoid the destruction or removal of existing farmsteads and trees, as far as possible.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.</i>				
<i>If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.</i>				
<i>All construction activities should be limited to the assessed project footprint only.</i>				

POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-4	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-8	very low negative		
CONFIDENCE LEVEL				
Medium				

(e) Botanical Impacts

The development of SPH8 would result in extensive but localized loss of relatively undisturbed (unploughed but grazed) Western Free State Clay Grasslands.

The shade effect of the panels on the grassland vegetation is not known and it not easily predicted. There will be space under the panels for grass and other plants to grow. However, the microclimate is likely to be different to that of open grassland, so a different suite of plant species is likely to colonize the space under the solar panels.

Two technology options are proposed for the BESS. The technology alternatives will make no difference on the botanical impact assessment and as such these alternatives are covered in the **Table 7-19**.

Table 7-292: SPH8: Impact of loss of Western Free State Clay Grassland

LOSS OF VEGETATION				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Removal of natural vegetation: Western Free State Clay Grasslands			
INDIRECT IMPACT	None determined			
CUMULATIVE IMPACT	Loss of Western Free State Clay Grasslands			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term.	-15	3
EXTENT	3	The impacts will be localized to the designated target areas.		
SEVERITY	-2	The severity of the potential impact will be moderate negative.	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-45	medium - negative		
PROPOSED MITIGATION MEASURES				

The first mitigation measures necessary would be the relocation of **Ammocharis coronica** bulbs if they cannot be avoided. Ideally the bulb should be lifted when they are dormant (winter) but that would mean traversing the entire area of the SPH sites in the preceding summer and marking every occurrence of these plants. A more practical approach would be to unearth the bulbs during the construction phase and relocating and planting them soon after removal.

Secondly, all areas that are disturbed during construction and that are not needed during the operational phase should be rehabilitated, using natural grasses that occur in the area. It would be possible for some grasses and forbs to survive under the panels, but it is difficult to predict the extent of such growth, nor which plant species would grow effectively under the panels.

POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last at least 5 years and therefore it is considered to be Long Term.	-5	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
High				

(f) Groundwater Impact

The water required during the construction phase of SPH8 is approximately 18,000m³ per year. The water requirement lies well within the yield potential of the underlying fractured rock aquifer (i.e. 0.5 – 2.0 L/s). It must be noted that at present the use of groundwater is not proposed however if this changes the potential impacts of groundwater abstraction are shown in **Table 7-185**.

Earthmoving plant and/or construction vehicles will be used on site during the construction phase. Use of vehicles presents a risk of groundwater contamination by fuel and oil leakage.

Two technology options (lithium-ion vs redox flow batteries) were considered for SPH8. The alternatives considered are equally preferred.

Table 7-293: SPH8: Impact table for the lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place).

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Lowering of groundwater level due to over abstraction			
INDIRECT IMPACT	Drying of springs in the area			
CUMULATIVE IMPACT	Permanent damage to the aquifer system in the area			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-14	2
EXTENT	3	The extent of the impact is rated as Local as it affects the development		

		<i>area and adjacent properties</i>		
<i>SEVERITY</i>	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
<i>IMPACT ON IRREPLACEBLE RESOURCES</i>	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-28	low - negative		
PROPOSED MITIGATION MEASURES				
<i>If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring. Adhere to the borehole’s safe yield and to monitor water levels and flow.</i>				
<i>Groundwater abstraction volumes must be monitored.</i>				
POST-MITIGATION				
<i>DURATION</i>	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	0	1
<i>EXTENT</i>	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
<i>SEVERITY</i>	0	<i>Negligible</i>	Negligible	Unlikely
<i>IMPACT ON IRREPLACEBLE RESOURCES</i>	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

The main risk associated with the construction phase is groundwater contamination from the use of construction vehicles and heavy machinery on-site.

Table 7-294: SPH8: Impact of contamination of groundwater as a result of accidental oil spillages or fuel leakages during the construction and decommissioning phases.

Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages				
PROJECT PHASE	<i>Construction and Decommissioning Phase</i>			
DIRECT IMPACT	<i>Groundwater contamination</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the</i>	Negligible	Likely

		<i>environment in such a way that natural, cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-10	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Vehicles must be maintained regularly and kept in a good working order. Dirty water should be captured, to be re-used where possible. No dirty water is allowed to be discharged into the surrounding environment.</i>				
<i>No heavy equipment or vehicles to be left in excavation area when not in use. Drip trays to be used under stationary vehicles and machinery where possible.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>		
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>	-4	1
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to archaeological resources

Impacts to archaeological resources at SHP4 are limited to the possible destruction of isolated background scatter artefacts which have very low to no cultural significance. Impacts will be direct and permanent but because of the low cultural significance the severity is very low negative.

Two technology alternatives were considered for the battery technology for the BESS. Both technology options are equally preferred.

Table 7-295: SPH8: Assessment of construction phase impacts to archaeological sites.

Archaeological impacts				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Destruction of isolated artefacts</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>None</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3

EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
None required as the ruin is in poor condition and does not have any special architectural qualities that need to be further recorded.				
No materials to be removed from any other ruins in the wider project area.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-6	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
High				

(ii) Impacts to graves

Impacts to graves for SPH8 are not expected because all identified graves have been avoided by the facility layout. There is still the chance of an unmarked grave being present, or even a marked grave that was not found during the survey. The chances are considered low, however. The impact on graves applies equally to both technology alternatives.

Table 7-296: SPH8: Assessment of construction phase impacts to graves

IMPACTS TO GRAVES				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Destruction of graves, including their coverings and possibly human remains			
INDIRECT IMPACT	None			
CUMULATIVE IMPACT	Destruction of graves, including their coverings and possibly human remains			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-18	2
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		

SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low – negative		
PROPOSED MITIGATION MEASURES				
<i>Farm-style wire fences should be erected around all known and unfenced graves (i.e. waypoints 362 & 404) within the farm portion affected by construction. Pedestrian access gates must be provided and the fences must be located a minimum of 5 m away from all graves.</i>				
<i>All graves to be treated as no-go areas with temporary signage as required.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-18	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Impacts to the cultural landscape SPH8

No landscape features such as hills and pans will be impacted by SPH8. The impact on cultural landscape is due to the construction activities (construction vehicles and equipment) on site which is a rural landscape.

Table 7-297: SPH8 Assessment of construction phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the introduction of construction equipment and vehicles and all the associated activities on site</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being constructed at once</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				

DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-10	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
Keep construction period as short as possible.				
Rehabilitate any areas not needed during operation as soon as possible.				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-10	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-30	low – negative		
CONFIDENCE LEVEL				
High				

(h) Palaeontological Impact

Palaeontological impacts would be the destruction of fossils from construction activities. The site as a whole is considered as low sensitivity in terms of palaeontology.

Table 7-298: SPH8: Assessment of the potential impacts to possible paleontological resources considers the criteria below

PALAEOLOGY IMPACTS				
PROJECT PHASE	Construction, Operational and de commissioning Phases			
DIRECT IMPACT	Destruction of fossils in the footprint			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Loss of fossil heritage and scientific knowledge			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				

DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-6	<i>Very Low Negative</i>		
PROPOSED MITIGATION MEASURES				
<i>If fossils are found once excavations for foundations and amenities have commenced then they should be photographed, removed and put in a safe place. Photographs should be sent to a palaeontologist to assess their scientific value. If the fossils are important the palaeontologist must obtain a permit from SAHRA, visit the site and remove the fossils for curation and storage in a recognised facility such as a museum or palaeontology department in a university</i>				
<i>If no fossils are found, no action will be required</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	2	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	6	<i>Very Low Positive</i>		
CONFIDENCE LEVEL				
<i>High</i>				

(i) Socio-Economic Impact

(i) Stimulation of the Economy during construction

The size of the Tokologo LM's economy was estimated at R2,170 million at current prices (2022) and primarily comprises of the agricultural and tertiary services sectors. Considering the small economic base of the municipality, the opportunities for the procurement of goods and services within the local economy will be very limited. That being said, it is likely that some of the local businesses will benefit from sub-contracting opportunities, consumer expenditure of the construction crew, and an increase in income of locals who are directly employed in the construction activities, or who benefit from the development of SPH8 through local procurement.

The stimulation of the economy will not be dependent on the technology options of the SPH8; thus, the battery technology alternatives are equally preferred.

Table 7-299: SPH8: Impact of Economic Stimulation during construction

IMPACT ON ECONOMY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Temporary increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
PROPOSED MITIGATION MEASURES				
<i>To optimise the stimulation of the local economy through direct, indirect and induced effects, the following should be applied where possible:</i>				
<i>Procure construction materials, goods, and products from local and domestic suppliers if feasible</i>				
<i>Employ local contractors where possible</i>				
<i>Note: The proposed mitigation measures will possibly increase the positive impact on the local economy; however, this will not affect the weighting thereof.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural, and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Creation of Employment during construction

The construction of SPH8 will require temporary employment of construction workers, foremen, and engineers On-site. Construction is expected to last twelve months where at the peak of construction about 150 people will be working on-site.

In addition to those benefitting from direct employment created at the project, various multiplier effects will assist in temporarily supporting existing jobs in the businesses offering services and goods that will be procured during construction activities. The increased temporary income earned by these businesses will in turn stimulate consumption spending, creating another round of multiplier effects.

SPH8 will create the same number of employment opportunities, regardless of its layout on the site; thus, layout alternatives are equally preferred.

Table 7-300: SPH8: Assessment of Employment during construction

IMPACT ON EMPLOYMENT				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Creation of temporary employment opportunities On-site</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of temporary employment opportunities in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
PROPOSED MITIGATION MEASURES				
<i>The following is recommended to increase the employment opportunities created in the local communities, where feasible:</i>				
<i>Employ labour intensive methods in construction, where feasible</i>				
<i>Employ local residents and communities, where possible</i>				
<i>Utilise local suppliers, where possible</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and</i>	Slightly Beneficial	Definite

		<i>processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>	
SIGNIFICANCE	30	low positive	
CONFIDENCE LEVEL			
<i>High</i>			

(iii) Reduction of Land Area available for productive farming

The proposed site of SPH8 and surrounding land is currently used for small-scale livestock. The agricultural assessment classified the majority of SPH8 comprised of low – very low and low - moderate potential land. The farmers with livestock on the land proposed for the facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH8 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant’s footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project’s construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH8.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant differentiation among site layout alternatives can be made. The footprint of the BESS will be the same regardless of which battery technology is used. There is therefore no difference in the impact between the two technology alternatives.

Table 7-301: SPH8: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Construction and Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural,</i>	Negligible	Definite

		<i>cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iv) Loss of Property

An influx of job seekers to the area during the construction phase may result in stock theft and burglaries. The number of workers and duration of construction will not be affected by the technology alternatives; thus, all alternatives are equally preferred.

Table 7-302: SPH8: Assessment of loss of property

IMPACT ON CRIME LEVELS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in crime associated with the influx of people</i>			
INDIRECT IMPACT	<i>Reduced level of security in and around the proposed facility</i>			
CUMULATIVE IMPACT	<i>No to negligible cumulative impact</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		

SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
<i>The following mitigations are advised to be instituted to minimise and possible eliminate the impact altogether:</i>				
<i>Ensure proper fencing and monitoring of the fencing is in place</i>				
<i>Maximise job creation and allocation to locals as far as practically possible. Recruitment of workers should be planned in advance and should not take place on-site. This will reduce the probability of work seekers loitering in the area surrounding the project sites</i>				
<i>Hire additional security personnel during the construction period</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(j) Terrestrial Biodiversity & Faunal Impact

(i) Direct Impact - Destruction of faunal habitat

Clearing or disturbance to natural vegetation for the construction of SPH8 will remove up to 428ha of natural grassland habitat. This includes the burrows of many fossorial species as well as termite mounds which provide a source of food for species such as aardvark and mongoose.

Two technology alternatives for the battery to be used in the BESS have been proposed. As the type of battery used will not alter the footprint of the BESS the alternatives are rated as equal for the impact of clearance of natural habitat.

Table 7-303: SPH8: Destruction of faunal habitat

DESTRUCTION OF FAUNAL HABITAT				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Destruction of faunal habitat</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>Loss of habitat and habitat connectivity</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-21	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or</i>	Highly detrimental	Definite

		<i>social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays. Only indigenous grasses found in the area must be used for rehabilitation</i>				
<i>Undertake vegetation clearing during the dry season, and outside of the breeding season of burrowing fauna</i>				
<i>If possible, the movement of animals through the sites must be permitted during operations. The use of fencing that will allow the movement of small to medium fauna through would help mitigate the effect of fences acting as barriers. This can be achieved by constructing a fence that has places for animals to crawl through and is not difficult for fleeing animals and birds to see. For example, black mesh panel fencing can be used where gaps of approximately 30 cm high and 50 cm wide and spaced at regular intervals are cut/installed. The tops of these gaps must be smoothed off to limit the chance of wildlife being injured when passing through. The use of barbed wire must be avoided</i>				
<i>The proposed activities must remain within the project footprint</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-10	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-30	low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(ii) Direct Impact - Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death. The clearing of ground for the foundations of the PV arrays will destroy burrows, potentially causing injury or death to burrowing animals. Furthermore, the presence of the construction site and personnel may result in negative interactions with fauna, such as hunting or killing animals perceived to be pests.

Regarding the technology alternative for the type of battery used in the BESS for all facilities, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread

into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place.

Table 7-304: SPH8: Injury or death to fauna

INJURY OR DEATH TO FAUNA				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Injury or death to fauna</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-18	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-54	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by construction workers</i>				
<i>To prevent possible collisions with animals, drivers of construction vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				
<i>Ideally construction should not continue at night so as to avoid potential collisions with nocturnal fauna</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>No wild animal may under any circumstance be hunted, snared, captured, injured or killed. This includes animals perceived to be vermin. Checks of the surrounding natural vegetation must be regularly undertaken to ensure no traps have been set. Any snares or traps found on or adjacent to the site must be removed and disposed of</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely

IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts – Disturbance and displacement of fauna

Construction activities have the potential to cause disturbance to fauna inhabiting the natural grassland through noise, vibrations, and light (if construction continues after dark). Security lights for the solar facilities during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The technology alternatives for the BESS will not change the ratings for this impact.

Table 7-305: SPH8: Disturbance and displacement of fauna

DISTURBANCE AND DISPLACEMENT OF FAUNA				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Disturbance to and displacement of fauna – natural grassland</i>			
CUMULATIVE IMPACT	<i>Displacement of fauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-18	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-36	low negative		
PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>Ideally construction activities should cease at night to minimise the need for artificial lighting and to reduce the impact of noise and vibrations on nocturnal animals</i>				
<i>Lighting during construction should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects, such as low-pressure sodium lamps, is preferred</i>				
<i>Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light</i>				
POST-MITIGATION				

DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-10	2
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-10	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(iv) Indirect Impacts – Pollution and contamination of natural areas

During construction, dust from exposed areas and roads, and litter from construction workers have the potential to pollute the surrounding natural vegetation. The use of dust suppressants, as well as hydrocarbons from vehicles and machinery, have the potential to contaminate soils and ground water, and be washed into the nearby natural pans during high rainfall events. The battery technology alternatives are rated the same and hence are covered in the same table.

Table 7-306: SPH8: Pollution and contamination of natural areas

POLLUTION AND CONTAMINATION OF NATURAL AREAS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-15	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-3	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-45	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities</i>				
<i>All vehicles and machinery must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>During construction, dust on construction roads must be suppressed using a water tanker</i>				

<i>Dumping of solid waste in natural areas, including cigarette butts and litter by construction workers must be prohibited</i>				
<i>Appropriate solid waste disposal facilities must be provided for workers during construction</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(v) Indirect Impacts – Increased potential of invasion by alien vegetation

During construction, the removal of natural vegetation and disturbance to the soil will increase the likelihood of invasion by alien plant species. Alien species establish easily and quickly on bare soil by colonisation or from seeds existing in the seed bank of the soil. Infestation by alien and invasive species will lead to degradation of the surrounding natural habitat and will increase the potential of spread into the greater landscape. In addition, the vehicles and equipment were likely used on various other sites and could introduce alien invasive plant seeds. This impact is relevant to all the proposed arrays equally and has therefore been assessed in one table for the construction phase.

The technology alternatives for the BESS will not change the ratings for this impact.

Table 7-307: SPH8: Increased potential of invasion by alien vegetation

INCREASED POTENTIAL OF INVASION BY ALIEN VEGETATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Increased potential of invasion by alien vegetation</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities monthly</i>				
<i>All areas cleared of natural vegetation must be rehabilitated. Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays and other cleared areas. Only indigenous grasses found in the area must be used for rehabilitation. This must be advised by the botanist</i>				
<i>An invasive alien plant species management and monitoring plan must be implemented during the construction phase. Monitoring should continue into the operational phase and through and for a period after decommissioning. This should be advised by the botanist</i>				
<i>All alien seedlings and saplings must be removed as they become evident for the duration of construction and during the operational phase. Manual / mechanical removal is preferred to chemical control</i>				
<i>All construction vehicles and equipment must be free of plant material before entering the site</i>				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-4	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(k) Transport Impact

Traffic impacts anticipated to occur during the construction phase of the project are construction related traffic and noise and dust pollution.

Two technology alternative for the BESS have been proposed. There is no difference in the impacts from a traffic perspective between the alternatives.

Table 7-308: SPH8: Traffic Impacts – Construction Phase

TRAFFIC IMPACT				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site</i>			
INDIRECT IMPACT	<i>Construction traffic on roads might generate dust and noise.</i>			
CUMULATIVE IMPACT	<i>Traffic delays on the surrounding road network.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-10	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the	Slightly Detrimental	Definite

		<i>affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES		<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low negative		
PROPOSED MITIGATION MEASURES				
<i>Stagger component delivery to site;</i>				
<i>Reduce the construction period (if possible);</i>				
<i>Dust suppression of gravel roads (internal roads and the access road to the site) during the construction phase, as required.</i>				
<i>Regular maintenance of gravel roads (internal roads and the access road to the site) by the Contractor during the construction phase.</i>				
<i>The use of mobile batching plants and quarries in close proximity to the site (if available and feasible); and Staff and general trips should occur outside of peak traffic periods.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(I) Landscape and Visual Impact

Four visual impacts were identified for SPH8 during the construction, operational phase and decommissioning phase

- Landscape change
- Impact on Protected Areas
- Impact on local roads
- Impact on homesteads
- Light pollution

These impacts would all occur during the construction, operation and decommissioning phase. Impacts would peak once the facility is constructed, remain relatively constant during the operational phase and then decrease during the decommissioning phase.

The type of battery technology used in the BESS would not impact on the assessment of visual impacts and so the tables below cover both technology options.

Table 7-309: SPH8 Landscape change

LANDSCAPE CHANGE				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Change of character due to industrialisation of a Natural Landscape</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of landscape industrialisation due to other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Plan to maintain the height of structures as low as possible relative to existing ground levels;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
<i>Monitor areas for vegetation cover post-decommissioning and implement remedial actions.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

NOTES
11. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.
12. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.

Table 7-310: SPH8 Industrialization of the landscape as seen from Nielsview NR

SPH8 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM NIELSVIEW NR				
PROJECT PHASE	Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.			
DIRECT IMPACT	Industrialisation of the view from Nielsview NR due to this project.			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Extension of industrialisation of views from Protected Areas due to this and other electrical infrastructure projects			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	Very low negative		
PROPOSED MITIGATION MEASURES				
Plan to maintain the height of structures as low as possible relative to existing ground levels;				
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;				
Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;				
Reinstate any areas of vegetation that have been disturbed during construction;				
Remove all temporary works;				
Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;				
Remove infrastructure not required for the post-decommissioning use of the site;				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Slightly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low negative		
CONFIDENCE LEVEL				
High				
NOTES				
11. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
12. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

Table 7-311: Industrialization of the landscape as seen from local roads, SPH8

INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL ROADS, SPH8				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases</i>			
DIRECT IMPACT	<i>Industrialisation of the view from local roads due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from local roads due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low negative		
PROPOSED MITIGATION MEASURES				
<i>Plan site levels to minimise earthworks to ensure that levels are not elevated;</i>				
<i>Plan to maintain the height of structures as low as possible;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Construct and/or plant a 2m high screen along the southern edge of the array cluster</i>				
<i>Plan to protect existing natural site features such as drainage pans;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long term</i>	0	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	0	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
<i>13. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				

14. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.

Table 7-312 SPH8: Industrialization of the landscape as seen from local homesteads

SPH8 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL HOMESTEADS				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Industrialisation of the view from local homesteads due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from local homesteads due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Plan to maintain the height of structures as low as possible;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Construct / grow 2m high screen along SW and E edges of solar cluster closest to affected homesteads;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months – 5 years and as such is rated as medium term</i>	-6	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		

SIGNIFICANCE	-18 very low negative
CONFIDENCE LEVEL	
<i>High</i>	
NOTES	
<p>11. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</p> <p>12. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</p>	

Table 7-313 SPH8 Light pollution

SPH8 LIGHT POLLUTION				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Light pollution from the project spoiling the night time environment and nuisance to neighbors.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of light pollution due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Use low key lighting around buildings and operational areas that is triggered only when people are present;</i>				
<i>Utilise infra-red security systems or motion sensor triggered security lighting;</i>				
<i>Ensure that lighting is focused on the development with no light spillage outside the site;</i>				
<i>No tall mast lighting should be used;</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	0	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				

11. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.
12. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.

7.8.4 Operational Phase

(a) Agricultural Impact

During the operational phase, areas that where vegetation will remain cleared such as access routes, will remain at risk of soil loss through erosion. During the operation phase, staff and maintenance personnel will access the development area to maintain the infrastructure and make repairs, where required. Biodegradable detergents and water will be used to clean the panels, however this is not expected to result in impacts from an agricultural perspective.

Table 7-314: SPH8 Impact significance of soil loss through erosion during the operation phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	<i>Operation Phase</i>			
DIRECT IMPACT	<i>Areas where soil surfaces will remain bare such as access routes and between PV arrays, will remain at risk of soil erosion.</i>			
INDIRECT IMPACT	<i>Eroded areas can expand into nearby areas and result in land degradation.</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil erosion.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>The development area, including internal access routes, as well as areas bordering on the development area, must regularly be monitored to detect early signs of soil erosion on-set.</i>				
<i>If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the</i>	Negligible	Definite

		<i>environment in such a way that natural, cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-315: SPH8 Impact significance of soil pollution during the operation phase

SOIL POLLUTION				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Soil pollution caused by oil and fuel spills or maintenance materials and domestic waste left on site. The replacement of electrolyte of the redox flow batteries, also pose soil pollution risk.</i>			
INDIRECT IMPACT	<i>Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil pollution</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-14	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills.</i>				
<i>No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area.</i>				
<i>Regularly monitor the BESS area for any signs of oil, grease and fuel spillage or the presence of waste.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-6	very low negative		

CONFIDENCE LEVEL
High

(b) Aquatic Impact

During the operation phase, the solar arrays will operate largely unattended and with low maintenance required for more than 20 years. The hard surfaces created by the development may lead to increased runoff. This may lead to increased erosion and sedimentation of the downslope areas. A localised long-term impact (more than 20 years) of low intensity (depending on the distance between the solar arrays and the freshwater features) could be expected that would have a very low overall significance post-mitigation in terms of its impact on the identified aquatic ecosystems in the area.

The only potentially toxic or hazardous materials which would be present in relatively small amounts would be of lubricating oils and hydraulic and insulating fluids. Therefore, contamination of surface or groundwater or soils is highly unlikely.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low. The impacts are rated the same for the battery technology alternatives for the BESS.

Table 7-316: SPH8 Operational phase aquatic ecosystem impacts

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION PRE-MITIGATION	CONSEQUENCE	LIKELIHOOD
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it will affect the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Likely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Any disturbance during the operation phase should be limited to the approved development footprints and should avoid disturbance of the soil and natural vegetation cover.</i>				
<i>Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.</i>				
<i>Stormwater run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving developed areas.</i>				
<i>Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider. In a scenario where services are installed, these systems need to be adequately installed and maintained to prevent any potential contamination of the water</i>				

<i>resources on site.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it will affect the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

(c) Avifaunal Impact

(i) Bird fatality at PV facility

Bird fatalities could occur at the site through a number of mechanisms, including collision with PV panels, entanglement in perimeter fence (less likely since developer has chosen to use mesh panel fencing which has a tight weave and birds are less likely to become entangled), electrocution in substations/electrical compounds and others. The battery technology options for the BESS are rated the same and are both covered in the same table.

Table 7-317: SPH8 bird fatality during operational phase

BIRD FATALITY AT PV FACILITY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Birds killed through various interaction with facility infrastructure</i>			
INDIRECT IMPACT	<i>--</i>			
CUMULATIVE IMPACT	<i>More projects will result in overall higher fatality rates in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any fatalities this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive</i>				

mitigation measures. Operational phase bird monitoring should be conducted for at least one year as per the best practice guidelines – see Section 8.

POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-8	1
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-8 very low negative			
CONFIDENCE LEVEL				
Medium				

(ii) Nesting & other use of facility infrastructure by birds

Certain species, in particular doves, pigeons, weavers and crows, are likely to use some of the facility infrastructure for nesting, perching and roosting. At face value this is a positive impact for birds and has been rated as VERY LOW POSITIVE significance both pre and post mitigation. However, where nesting interferes with the operation of the facility this could cause conflict and require management. Nesting on infrastructure also increases the likelihood of bird fatalities occurring through the various mechanism, particularly of young inexperienced birds. No mitigation is required for the impact of the facility on birds through nesting. For the impact of the birds nesting on the facility, the specialist recommends nest management on a case by case basis under the supervision of an avifaunal specialist, and in conformance with all relevant national and provincial legislation. The impact is rated the same for the both battery technology alternatives for the BESS.

Table 7-318: SPH8 impact of bird nesting and other use of facility infrastructure by birds

BIRD NESTING, PERCHING & ROOSTING AT PV FACILITY				
PROJECT PHASE	Operational phase			
DIRECT IMPACT				
INDIRECT IMPACT	Birds use infrastructure to perch, roost or nest on			
CUMULATIVE IMPACT	More projects in the area will probably diminish the likelihood of this happening as perch availability will increase			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	7	1
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	1	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved	Slightly Beneficial	Unlikely

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	7	very low positive		
PROPOSED MITIGATION MEASURES				
None required at this stage. Once operational, if facility staff identify any nesting which interferes with operations this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. All nest management measures should only be undertaken in compliance with national and provincial environmental legislation in this regard.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	7	1
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	1	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	7	very low positive		
CONFIDENCE LEVEL				
Medium				

(d) Bats Impact

Day to day operation and maintenance of the facility may result in disturbance and displacement of bats. The impact is rated the same for both battery technology options for the BESS.

Table 7-319: SPH8 disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS				
PROJECT PHASE	Operational phase			
DIRECT IMPACT	Disturbance of bats during operational activities			
INDIRECT IMPACT	Displacement			
CUMULATIVE IMPACT	Unavailability of suitable foraging resources in the broader environment for displaced individuals			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	very low negative		
PROPOSED MITIGATION MEASURES				
Limit operational and maintenance activities to daylight hours, as far as possible, and minimise lighting at night.				

All lighting should preferably use low pressure sodium and warm white LED lights.				
Operational and maintenance activities should be limited to the immediate project footprint only.				
Site access should be strictly controlled, to avoid unnecessary disturbance.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	<i>Slightly detrimental</i>	<i>Unlikely</i>
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7 very low negative			
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-320: SPH8 bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during operational activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-7	Low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMPr				
<i>All lighting should preferably use low pressure sodium and warm white LED lights.</i>				
<i>During operational and maintenance activities, avoid all movement and noise around medium sensitivity areas.</i>				
<i>Operational and maintenance activities should be limited to the immediate project area.</i>				
<i>Site access should be strictly controlled, to avoid unnecessary disturbance.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(e) Botanical Impacts

Maintenance activities will require management of vegetation which may result in loss of natural vegetation. The impact is rated the same for both battery technology options for the BESS.

Table 7-321: SPH8 loss of Western Free State Grassland during operational phase

LOSS OF VEGETATION				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Direct impact</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>Loss of Western Free State Clay Grasslands</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is the footprint as it only affects the area in which the proposed activity will occur.</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>When and where possible, vegetation clearing should be undertaken during the dry season.</i>				
<i>Only clear vegetation where absolutely necessary; and</i>				
<i>Stockpile areas for cleared vegetation will be decided and approved by the Project Manager and appointed ECO before construction commences on site and should not be located within drainage lines.</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-2	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(f) Groundwater Impact

Similar to the construction phase, the operational phase of the SPH8 will require approximately 1,000 m³/a (0.03 L/s). This does not exceed the regionally mapped yield of the underling aquifer (0.5 – 2.0 L/s). It is not currently planned to use groundwater for the operational phase of this project however if this changes a water use licence will need to be applied.

The principal risks for groundwater contamination that have been identified are the use of cleaning agents for cleaning of PV panels and for dust suppression of internal roads. If required, it is encouraged that water alone is used to conduct these tasks. Alternatively, the PV cleaning

agents and dust suppression mixes must be environmentally friendly and should breakdown naturally without causing ingress of harmful chemicals into the environment.

The proposed development will require a BESS. Currently two different technologies are being considered, i.e. either Solid State Lithium Batteries (SSLB) or Vanadium Redox Flow Battery Energy Storage Systems (VRFB). Both of these two BESS systems require an electrolyte. The SSLB contain an ethylene carbonate or di-ethyl carbonate electrolyte and the VRFB system will require that an estimate of 3 000 m³ of sulfuric acid solution with vanadium ions electrolyte is stored on site for each Springhaas Facility. The BESS systems will also require cooling systems and these systems could potentially either be water based or it may be refrigerant based systems which used chemicals such as ethylene glycol- based coolants.

The containers that the BESS systems are held in are equipped with a “Clean agent” which is a fires suppression systems that can release a powder/gas into the container to snuff fires. These systems usually leave a residue on the equipment that will need to be cleaned off. With any chemical storage there is always a risk of chemical fires that will need to be put out with water or foam and the waste water from these activities could contain contaminants that should not be let to run off into the environment.

The fire safety systems, refrigerants, electrolyte solutions and the waste products produced from these systems could contaminate the soil and groundwater and all measures should be taken to prevent leaks or spills on the ground.

The impact on groundwater levels is rated the same for both battery technology alternatives for the BESS.

Table 7-322 SPH8: Impact of lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place)

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Lowering of groundwater level due to over abstraction</i>			
INDIRECT IMPACT	<i>Drying of springs in the area</i>			
CUMULATIVE IMPACT	<i>Permanent damage to the aquifer system in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		

SIGNIFICANCE	-32	<i>low – negative</i>		
PROPOSED MITIGATION MEASURES				
<i>If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring.</i>				
<i>Adhere to the borehole’s safe yield and to monitor water levels and flow.</i>				
<i>Groundwater abstraction volumes must be monitored.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-323: SPH8 Impact of contamination of groundwater as a result of cleaning agents used for cleaning the solar panels

Potential impact on groundwater as a result of cleaning agents used for cleaning the solar panels.				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Contamination of groundwater</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long-term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Use environmentally safe cleaning agents that breakdown naturally (biodegradable detergents/green soaps) and that will not cause adverse effects.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the</i>		

		<i>proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Redox flow batteries contain electrolyte solution which needs to be replaced approximately every 15 to 20 years. During replacement of electrolyte there is a risk of leaks or spills. This impact is only applicable to the redox flow batteries as lithium-ion batteries are solid state batteries.

Table 7-324: SPH8 Impact table for contamination of groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)

Potential impact on groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Contamination of groundwater</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long-term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or Communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	<i>low - negative</i>		
PROPOSED MITIGATION MEASURES				
<i>Ensure that all electrolyte or chemicals stored or used on site have secondary containments systems in place with reliable leak detection, annunciation in place. Ensure that all chemicals are handled on concrete banded surfaces and not on bare soil.</i>				
<i>Any waste products produced from the BESS systems should be removed and disposed of appropriately. Waste water produced by fire hydrants should not be allowed to runoff into the environment.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the</i>		

		<i>area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	<i>Negligible</i>	<i>Unlikely</i>
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to the cultural landscape

Because any physical impacts to the landscape would already have occurred during the construction phase, landscape impacts during operation of SPH8 relate only to the presence of the facility in what is otherwise a rural landscape. Impacts to the cultural landscape will occur during the operation phase and last as long as the lifetime of the facility. Because of the flat terrain, the impacts would not be experienced over great distances because intervening vegetation and buildings would offer partial screening. Nonetheless, the immediately surrounding area will experience a degree of change in landscape character and sense of place. The impact significance is rated to low negative before mitigation. The impacts are the same for both technology options for the batteries for the BESS.

Table 7-325: SPH8: Assessment of operation phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Operation Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the presence of a solar energy facility</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being present</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Keep all maintenance work within the authorised footprint.</i>				
<i>Minimise night-time light pollution in the area (visual recommendations to be followed to achieve this).</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3

EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(h) Socio-Economic Impact

(i) Stimulation of the Local Economy during operations

The operational period of SPH8 is a minimum of 20 years. Of the money spent annually during the operations period, a significant portion will likely comprise of salaries and wages of the Springhaas employees. The operations of the facility will make some contribution towards the growth of the local economy, as it will increase the size of the local electricity sector, as well as stimulate the demand for other sectors' services and goods such as water, transportation, and trade.

No differentiate can be made between battery technology alternatives for the BESS. The technology alternatives are considered in **Table 7-218** and **Table 7-219**.

Table 7-326: SPH8: Assessment of Economic stimulation during operations

STIMULATION OF THE LOCAL ECONOMY DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Long-term increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				

<i>Where feasible, procure goods and services required for the operation of the plant from the local economy</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	16	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Moderately Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	48	moderate positive		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Creation of Employment and increased household income during operations

The operation of SPH8 will require functional and maintenance employees. It is envisaged that about 8 direct jobs per facility will be created during the operations phase, which will occur for a duration of 20 years. About 70% of these jobs are to be filled by people from the local communities as they will be low-skilled employment opportunities. Employment of the eight individuals for the entire operational period will increase their household income, improve their standard of living and benefit their families.

SPH8 will create the same number of employment opportunities, regardless of its location on the site; thus, layout alternatives are equally preferred. The type of battery used in the BESS will also not significantly affect employment alternatives, thus both technology alternatives are equally preferred.

Table 7-327: SPH8 Assessment of employment during operations

CREATION OF EMPLOYMENT AND INCREASED HOUSEHOLD INCOME DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Creation of permanent employment opportunities in the local and regional economy</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of permanent employment opportunities in the region</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		

SEVERITY	1	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				
<i>Where feasible, aim to fill all the positions by labour from the local community</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	8	3
EXTENT	4	The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries		
SEVERITY	1	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	24	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Improved municipal service delivery

SPH8 will have a capacity of up to 150MWac and will be connected to the national grid through Eskom substation and generated electricity will be sold nationwide. The proposed project, albeit relatively small, will contribute towards improving National electricity availability; thus, improving the government service delivery, and could potentially also aid in growing the local economy by increasing the overall supply of electricity in the local economy. Furthermore, due to the taxes and rates that will be paid by the project to the municipality, the revenue of the latter will be increased, thus allowing it to improve the service delivery in other areas.

The layout alternatives and BESS technology alternatives will not affect the capacity of the solar facility; thus all alternatives are equally preferred.

Table 7-328: SPH8: Assessment of service delivery improvement

IMPROVED MUNICIPAL SERVICE DELIVERY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>It will likely improve the local electricity supply if fed to the grid</i>			
INDIRECT IMPACT	<i>Improved standard of living within the region</i>			
CUMULATIVE IMPACT	<i>Improved electricity availability</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				

DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	16	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Moderately Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	48	<i>moderate positive</i>		
PROPOSED MITIGATION MEASURES				
<i>No mitigations proposed</i>				

(iv) Reduction of Land Area available for productive farming

The proposed site of SPH8 and surrounding land is currently used for small-scale livestock. The farmers with livestock on the land proposed for the facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH8 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant's footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project's construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH8.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant differentiation among site layout alternatives can be made. The different battery technology alternatives will not affect the impact ratings.

Table 7-329: SPH8: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(i) Terrestrial Biodiversity and Animal Species

(i) Direct Impacts – Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death.

Regarding the technology alternative for the type of battery used in the BESS for SPH8, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place.

Table 7-330: SPH8 Injury or death to fauna

ALL FACILITIES				
PROJECT PHASE	Operational Phase			
DIRECT IMPACT	Injury or death to fauna			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-16	2
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-32	low negative		
PROPOSED MITIGATION MEASURES				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by maintenance staff</i>				
<i>To prevent possible collisions with animals, drivers of maintenance vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				
<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>Adequate fire prevention and safety measures must be in place. A fire emergency management plan must be in place</i>				
<i>All electrical equipment must be maintained on a regular basis to minimise the risk of fire</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-6	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
High				

(ii) Indirect Impacts – Pollution and contamination of natural areas

During operations, release of grey water into the environment can cause contamination by detergents. Grey water from cleaning of the solar panels has the potential to contaminate soils and ground water and be washed into the nearby natural pans during high rainfall events. This

includes biodegradable detergents used for cleaning the panels, which can accumulate in the soil and be washed into the nearby pans before they break down. Biodegradable detergents can alter the balance of freshwater ecosystems as they promote bacterial growth and lower oxygen levels. The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-331: SPH8 Pollution and contamination of natural areas including pans and wetland

POLLUTION AND CONTAMINATION OF NATURAL AREAS INCLUDING PANS AND WETLANDS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas – including nearby pans or wetlands</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-21	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee operational phase activities at a minimum every 6 months for the first 5 years and then yearly for the rest of the life of the facility</i>				
<i>If possible, panels should be cleaned using water that is clear of detergents only (e.g. potable water or borehole water). The use of grey water should be avoided. Should the need arise to clean the panels with detergents, then biodegradable detergents are preferred. Care must be taken not to allow the detergents to accumulate in the soil</i>				
<i>All maintenance vehicles must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by maintenance staff must be prohibited</i>				
<i>Appropriate solid waste disposal and ablution facilities must be provided for operational staff</i>				
<i>Adequate prevention and safety measures must be in place to avoid leaks to batteries. This includes regular maintenance and replacement of batteries in a timeous manner. Measures must be in place to prevent chemicals leaking into the soil, should damage to the battery occur</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive</i>	Slightly Detrimental	Likely

		<i>or vulnerable systems or communities are negatively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-24	low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts – Disturbance and displacement of fauna

Security lights for SPH8 during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland adjacent to the facility, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-332: SPH8 Disturbance and displacement of fauna – natural grassland

DISTURBANCE AND DISPLACEMENT OF FAUNA – NATURAL GRASSLAND				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Disturbance to and displacement of fauna – natural grassland</i>			
CUMULATIVE IMPACT	<i>Displacement of fauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-48	Moderate negative		
PROPOSED MITIGATION MEASURES				
<i>Operations during the night must be avoided to minimise the need for artificial lighting and to reduce the impact of light and noise on nocturnal animals</i>				
<i>Lighting during operations should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects, such as low-pressure sodium lamps, is preferred</i>				
<i>Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1

EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(j) Traffic Impact

During the operational phase there will be approximately 8 full time employees on site. Vehicles would access the site for daily operations and maintenance as and when required. The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-333 SPH8: Traffic impacts during operation phase

TRAFFIC IMPACTS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Traffic congestion due to the trips generated by the operation of the facility</i>			
INDIRECT IMPACT	<i>The associated noise and dust pollution</i>			
CUMULATIVE IMPACT	<i>Traffic delays on the surrounding road network</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Staff and maintenance trips should occur outside of peak traffic periods; and</i>				
<i>Client/Facility Manager is to ensure that regular maintenance of gravel roads (located within the site boundary, including the access road to the site) occurs during operation phase to minimise/mitigate dust pollution.</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

7.8.5 Decommissioning Phase

Upon completion of the operational phase of the project which will last in excess of 20 years the facilities may be decommissioned. Decommissioning activities would entail removal of infrastructure from site and return of the site to a state similar to the pre-construction condition. The decommissioning impacts would not vary significantly between facilities and so all seven facilities are covered **Section 7.7**.

7.8.6 No-Go Alternative

The no-go alternative refers to the option of not developing the facility. The impact assessment for the no-go alternative is the same for all 7 facilities and is covered in **Section 7.8**.

7.8.7 Cumulative Impacts

The cumulative impact considers the development of all seven Springhaas solar PV facilities in addition to the other projects which are proposed within 30km of the facility.

The cumulative impacts were rated the same for each of the 7 solar PV facilities. The cumulative impact assessment is available in **Section 7.9**.

Table 7-334: SPH8 impact summary

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Design/Planning/Pre-Construction Phase			
No impacts identified			
Construction Phase			
Agricultural impacts			
Land use change from livestock farming to energy generation	Negative	Moderate	Low
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance and water quality impacts	Negative	Moderate	Low
Avifaunal impacts			
Destruction of bird habitat during construction	Negative	Moderate	Low
Disturbance of birds during construction	Negative	Very low	Very low
Bat impacts			
Bat habitat modification	Negative	Very low	Very low
Disturbance and displacement of bats	Negative	Very low	Very low
Possible roost disturbance	Negative	Low	Very low
Bat roost destruction	Negative	Low	Very low
Botanical impacts			
Loss of vegetation	Negative	Medium	Low

Groundwater impacts			
Lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place)	Negative	Low	Very low
Contamination of groundwater as a result of accidental oil spillages or fuel leakages	Negative	Very low	Very low
Heritage impacts			
Impact on archaeological sites	Negative	Very low	Very low
Impact on graves	Negative	Low	Very low
Impact on cultural landscape	Negative	Low	Low
Palaeontological impacts			
Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-economic impacts			
Stimulation of the economy during construction	Positive	Low	Low
Employment opportunities	Positive	Low	Low
Reduction in land available for productive farming	Negative	Very low	Very low
Loss of property	Negative	Low	Very low
Terrestrial biodiversity and animal species (faunal) impacts			
Destruction of faunal habitat	Negative	High	Low
Injury or death to fauna	Negative	Moderate	Very low
Disturbance and displacement of fauna	Negative	Low	Very low
Pollution and contamination of natural areas	Negative	Moderate	Very low
Increased potential of invasion by alien vegetation	Negative	Moderate	Very low
Traffic impacts			
Traffic congestion	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Moderate	Low
Industrialisation of the landscape as seen from local roads	Negative	Low	Very low
Industrialisation of the landscape as seen from local homesteads	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
Operational Phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Soil pollution	Negative	Very low	Very low
Aquatic impacts			
Increased run-off, pollution	Negative	Very low	Very low
Aquatic			
Disturbance of aquatic habitat; water quality impacts	Negative	Very low	Very low
Avifauna impacts			
Bird fatality through interaction with infrastructure	Negative	Very low	Very low
Nesting and use of other infrastructure by birds	Positive	Very low	Very low
Bat impacts			
Disturbance and displacement	Negative	Very low	Very low

Roost disturbance	Negative	Low	Very low
Botanical impacts			
Loss of vegetation	Negative	Very low	Very low
Groundwater impacts			
Lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place).	Negative	Low	Very low
Contamination of groundwater from use of cleaning agents	Negative	Low	Very low
Contamination of groundwater from leaks or spills from BESS	Negative	Low	Very low
Heritage impacts			
Impact on cultural landscape	Negative	Low	Low
Socio-economic impacts			
Economic stimulation during operations	Positive	Low	Moderate
Employment opportunities	Positive	Low	Low
Improved service delivery	Positive	Moderate	Moderate
Reduction in land available for productive farming	Negative	Very low	Very low
Terrestrial biodiversity and animal species			
Injury or death of fauna	Negative	Low	Very low
Pollution and contamination of natural areas including pans and wetlands	Negative	High	Very low
Disturbance and displacement of fauna –natural grassland and rocky outcrops	Negative	Moderate	Very low
Traffic impact			
Traffic congestion	Negative	Very low	Very low
Palaeontological impacts			
Destruction of fossils	NA	NA	NA
Decommissioning phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance of aquatic habitat, water quality impacts	Negative	Very low	Very low
Avifaunal impacts			
Disturbance of birds	Negative	Very low	Very low
Bat impacts			
Disturbance and displacements	Negative	Very low	Very low
Botanical impacts			
Loss of vegetation	Negative	Low	Low
Groundwater			
Contamination from construction activities	Negative	Very low	Very low
Heritage impacts			
Alteration of the rural landscape character through the presence of construction equipment and vehicles and all the associated activities on site	Negative	Low	Very low
Palaeontological impacts			

Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-Economic impacts			
Impact on the economy	Positive	Very low	Very low
Creation of temporary employment opportunities in the local and regional economy	Positive	Very low	Very low
Terrestrial biodiversity and animal species			
Destruction of novel ⁸ faunal habitat (i.e. grassed areas under the panels where fauna may recolonise after construction)	Negative	Moderate	Very low
Injury or death to animals (due to collisions with construction vehicles or destruction of burrows that have established under the panels)	Negative	Moderate	Very low
Pollution and contamination of natural areas including pans and wetlands	Negative	High	Very low
Disturbance to and displacement to fauna and edge effects – natural grassland	Negative	Low	Very Low
Increased potential of invasion by alien vegetation	Negative	Moderate	Very low
Reestablishment of movement corridors through the landscape due to removal of fences and return to open grassland	Negative	Very low	Low positive
Traffic impacts			
Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads	Negative	Very low	Very low
Industrialisation of the landscape as seen from local homesteads	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
No-Go Alternative			
Agricultural	Negative	Very low	Very low
Aquatic	Negative	-	Very low-negligible
Avifauna	Negative	Very low	Very low
Bats	Negative	Very low	Very low
Botanical	Negative	Low	Low
Heritage	Negative	Very low	Very low
Transport- Traffic congestion	Negative	Very Low	Very Low
Terrestrial biodiversity and animal species	Negative/ positive	Low negative	Very low positive
Socio-economic	NA- no impact, forgone + impacts	NA	NA
Destruction of fossils	NA	NA	NA
Landscape and Visual	Negligible	No impact/NA	No impact/NA
Groundwater Impacts	Negligible	NA	NA
Cumulative impacts			

⁸ Novel habitats are human-built, modified, or engineered niches in places that have been altered in structure and function by human activity

Agricultural	Negative	Very low	Very low
Aquatic	Negative	Low	Low
Avi-fauna	Negative	Moderate	Moderate
Bats	Negative	Low	Low
Botanical	Negative	Very low	Very low
Heritage	Negative	Moderate	Low
Socio-economic - Impact on the economy- construction	Positive	-	Moderate
Socio-economic -Creation of employment during construction	Positive	-	Moderate
Socio-economic -Reduction in land available for productive farming	Negative	-	Low
Socio-economic -Stimulation of the economy – operations	Positive	-	Moderate
Socio-economic -Employment - operations	Positive	-	Moderate
Socio-economic -Improved municipal service delivery	Positive	-	Moderate
Socio-economic -Loss of property	Negative	-	Low
Socio-economic - Stimulation of economy - decommissioning	Positive	-	Very low
Terrestrial biodiversity	Negative	High	Moderate
Transport	Negative	Low	Very Low
Landscape and visual	Negative	-	Low
Destruction of fossils	NA	NA	NA
Groundwater: Aquifer system and water quality	Negative	Low- Very Low	Low – Very Low

7.9 Springhaas 9 Detailed Impact Assessment

7.9.1 Alternatives Considered

(a) Technology Alternatives

Two technology alternatives namely lithium-ion and redox flow batteries were considered for the BESS.

(b) No-Go Alternative

The no-go alternative was considered for all seven of the proposed facilities. The impact of the no-go alternative was rated as the same for all seven facilities. The no-go alternative is assessed in **Section 7.8**.

7.9.2 Pre-construction phase

No significant impacts for the pre-construction phase have been identified by any specialist studies or by the EAP for SPH9.

7.9.3 Construction Phase

(a) Agricultural Impact

The most significant agricultural impacts associated with the development of SPH9 will occur during the construction phase when the site is fenced off, vegetation is removed and the soil surface is prepared for the installation of infrastructure.

The entire footprint of SPH9 is classified as low sensitivity from an agricultural perspective.

SPH9 was also classified in terms of agricultural potential. The entire site is classified as low to very low potential.

Tables 7-173 – 7-176 Two BESS technology options are under consideration. From an agricultural perspective there is no difference in impacts between the technology options.

Table 7-335: SPH9: Impact of land use change from livestock farming to renewable energy generation

LAND USE CHANGE FROM LIVESTOCK FARMING TO ENERGY GENERATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Construction of boundary fence and PV infrastructure will change land use from livestock farming to renewable energy generation</i>			
INDIRECT IMPACT	<i>Intensification of agriculture in other areas or otherwise reduction of livestock produced in the area</i>			
CUMULATIVE IMPACT	<i>Increase in areas where agriculture is converted into other land uses</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Springhaas Solar Facility 3 (Pty) Ltd must provide market-related compensation that will allow the current land users to have the same or better ability to sustain their livelihood.</i>				
<i>Ensure that the final infrastructure layout remains within the fenced off area of the development footprint.</i>				
<i>Prior arrangements must be made with the landowners to ensure that livestock and game animals are moved to areas where they cannot be injured by vehicles traversing the area.</i>				
<i>The use of main access routes by construction vehicles and equipment must do so with consideration of nearby agricultural land users who use the same access routes for farming activities.</i>				
<i>All left-over construction material must be removed from site once construction on a land portion is completed.</i>				

<i>No materials removed from development area must be allowed to be dumped in nearby livestock farming areas.</i>				
<i>No boundary fence must be opened without the landowners' permission.</i>				
<i>No open fires made by the construction teams are allowable during the construction phase.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-336: SPH9: Impact significance of soil loss through erosion during the construction phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Loss of soil particles from areas where construction activities result in the removal of vegetation from the surface.</i>			
INDIRECT IMPACT	<i>Sparse to no vegetation growth in eroded areas.</i>			
CUMULATIVE IMPACT	<i>Increase in areas exposed to soil erosion</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-18	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				

<i>Limit vegetation removal from the soil surface to the areas of infrastructure development such as access routes as well as around the foundations of the PV arrays and buildings.</i>				
<i>Vegetation clearance must only be undertaken immediately prior to construction activities and only within the development footprint</i>				
<i>Once construction of an area has been completed, level any remaining soil removed from excavation pits (where the PV arrays will be mounted) that remained on the surface, instead of allowing small stockpiles of soil to remain on the surface where it is exposed to rain and wind. This is applicable to all construction areas, except where topsoil stockpiles must remain for site rehabilitation of specific areas.</i>				
<i>Stormwater channels on site must be designed to minimise the soil erosion risk that results from surface water runoff.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-337: SPH9: Impact significance of impaired soil functionality caused by compaction

IMPAIRED SOIL FUNCTIONALITY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>The weight and movement of vehicles and equipment over the surface will result in soil compaction.</i>			
INDIRECT IMPACT	<i>Compacted soil have reduced pore space and water infiltration rate. Compacted soil surfaces increase the rate of surface water runoff, especially after a rainfall event.</i>			
CUMULATIVE IMPACT	<i>Increase in areas affected by soil compaction.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-18	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	moderate - negative		
PROPOSED MITIGATION MEASURES				

<i>Only allow vehicles and equipment to travel on designated access routes and not anywhere else within the development area.</i>				
<i>Use existing main access routes and internal farm roads where possible and avoid using other areas in the site as temporary access routes.</i>				
<i>Vehicles and equipment must park in designated parking areas.</i>				
<i>Materials must be off-loaded and stored in designated laydown area.</i>				
<i>Where possible, conduct the construction activities outside of the rainy season as wet soil compacts easily as opposed to dry soil.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-338: SPH9: Impact significance of impaired soil health as a result of soil pollution

IMPAIRED SOIL HEALTH				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Soil pollution can be caused by oil and fuel spills from vehicles and equipment as well as domestic and material waste on site. Should the vanadium redox flow batteries be used for the BESS, spillage of corrosive and environmentally toxic electrolyte is possible. In the case that lithium solid state containerised batteries are used, there is a possibility of thermal runaway that will result in the release of toxic and flammable gasses.</i>			
INDIRECT IMPACT	<i>Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health.</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil pollution.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-21	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>Maintenance must be undertaken regularly on all vehicles and construction equipment to prevent hydrocarbon spills.</i>				

<i>Any waste generated during construction must be stored into designated containers and removed from the site by the construction teams.</i>				
<i>Any left-over construction materials must be removed from the development area.</i>				
<i>The development area must be monitored by the Environmental Control Officer (ECO) to detect any early signs of fuel and oil spills and waste dumping. The ECO must also report any spills from batteries.</i>				
<i>Ensure battery transport and installation is undertaken by accredited staff and contractors.</i>				
<i>Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-5	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(b) Aquatic Impact

Construction phase activities would result in disturbance of soil and clearing of vegetation. Water quality impacts may occur from batching of concrete on site, hydrocarbon spills and other construction activities.

There is no difference in impacts between the two battery technology options for BESS, the impact assessment table covers both alternatives.

Table 7-339: SPH9: Impact of aquatic ecosystems during the construction phase

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects only the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.</i>	Moderately Detrimental	Definite
IMPACT ON	0	<i>No irreplaceable resources will be impacted.</i>		

IRREPLACEBLE RESOURCES				
SIGNIFICANCE	-42	Moderate negative		
PROPOSED MITIGATION MEASURES				
<i>A buffer of at least 250 m between the significant aquatic ecosystems (larger pans) and all the proposed project activities should be maintained (noting that this is already honoured in the proposed layout for all facilities).</i>				
<i>Clearing of indigenous vegetation should not take place within the aquatic features and the recommended buffers, while retaining the topography and cover vegetation within the wider drainage areas through the site is preferred to reduce the potential modification to the way in which water drains through these areas.</i>				
<i>The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance.</i>				
<i>During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills. The solar panels will be washed with water and a biodegradable/ greendetergent.</i>				
<i>Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.</i>				
<i>Development within the drainage areas, where located within a proposed facility, will however need to consider stormwater management measures and should avoid impacting on the movement of water through the more seasonally wet areas. Minimal disturbance to the topography and cover vegetation in these areas is recommended.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-12	2
EXTENT	2	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.</i>	Slightly Detrimental	Likely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-24	low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(c) Avifaunal Impact

(i) Habitat destruction associated with the construction of the facility

Habitat destruction and alteration will occur during the construction phase of SPH9. The majority of the development footprint would be transformed from its current state to a renewable energy facility. SPH9 will transform approximately 207ha of habitat. Most of this is in a fairly natural state currently, or in the case of arable lands is still accessible and useable for birds foraging.

Table 7-340: SPH9: Formal rating of destruction of bird habitat during construction

DESTRUCTION OF BIRD HABITAT DURING CONSTRUCTION	
PROJECT PHASE	<i>Construction phase</i>
DIRECT IMPACT	<i>Transformation of natural habitat into PV facility</i>
INDIRECT IMPACT	

CUMULATIVE IMPACT		<i>Yes - Larger area transformed from natural habitat</i>		
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	moderate – negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required. Impact avoidance has already been implemented in the design phase through the adherence to no-go buffers around pans.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Disturbance of birds & displacement effects

Disturbance of avifauna during the construction (and thereafter during maintenance and operational and decommissioning) of the facility and all development alternatives and associated infrastructure is likely to occur. Disturbance of breeding birds is typically of greatest concern. In this regard any breeding sites of sensitive bird species would be the most important. It is noted that no breeding sites have been identified on site at this stage.

There is no difference between the location and technology options in terms of disturbance and displacement of birds.

Table 7-341: SPH9: Formal rating of disturbance of birds during construction

PROJECT PHASE	<i>Construction phase & operations phase to lesser extent</i>
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DIRECT IMPACT	<i>Birds disturbed from their normal activities through the increased noise and activity levels associated with construction</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>More projects will result in overall higher disturbance levels</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>There is no specific mitigation required as there are no particularly sensitive features identified (such as breeding sites). General good environmental practice should be implemented during construction in terms of control of vehicles, staff, minimising the impact on the receiving environment as much as possible.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

The facility boundary for SPH9 overlaps one medium sensitivity areas from a bat perspective. During the construction of SPH9 habitat modification would occur, disturbance and displacement of bats may occur and bat roosts may be disturbed or destroyed.

Two technology options are under consideration for the BESS. For bat impacts the type of technology used for the BESS is not considered relevant. Both technology options are considered equally acceptable.

Table 7-342: SPH9: Bat habitat modification

IMPACT ON POSSIBLE HABITAT MODIFICATION	
PROJECT PHASE	<i>Construction phase</i>
DIRECT IMPACT	<i>Modification of habitat through the removal of vegetation cover and water sources</i>
INDIRECT IMPACT	<i>Displacement</i>

CUMULATIVE IMPACT		<i>Loss of foraging resources for local bat population</i>		
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
PROPOSED MITIGATION MEASURES				
<i>This impact may be reduced by limiting the removal of vegetation and available water sources, as far as possible.</i>				
<i>All construction activities should be limited to the assessed footprint only.</i>				
<i>Avoid all high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should any changes or expansion take place to the boundary of the facility a bat specialist must provide input to confirm that these changes are acceptable in terms of the avoidance of high sensitivity areas.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential additional sensitive habitats, to confirm the baseline environment, if construction does not take place within 5 years of the initial bat study.</i>				
<i>Following construction, rehabilitation of all disturbed areas, inclusive of that beyond permanent infrastructure footprints, (e.g. temporary access tracks and laydown areas) must be undertaken.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-343: SPH9: Disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Disturbance of bats during construction activities</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable foraging resources in the broader environment for displaced individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term</i>	-5	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		

SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Limit construction activities to daylight hours only and minimise lighting at night, as far as possible.</i>				
<i>Avoid high sensitive areas completely. With the layouts currently assessed, this has been achieved. Should any changes or expansion take place to the boundaries, a bat specialist must provide input to confirm that these changes are acceptable in terms of avoidance of high sensitivity areas.</i>				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-344: SPH9: Bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during construction activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected.	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	low negative		
PROPOSED MITIGATION MEASURES				
<i>All construction activities should be limited to the assessed project footprint only.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.</i>				
<i>If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.</i>				
POST-MITIGATION				

DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
Medium				

Table 7-345: SPH9: Bat Roost destruction

IMPACT OF POSSIBLE ROOST DESTRUCTION				
PROJECT PHASE	Construction phase			
DIRECT IMPACT	Destruction of potential bat roosting features			
INDIRECT IMPACT	Reduction of available roosting sites and/or Mortality			
CUMULATIVE IMPACT	Insufficient roosting resources to support the local population and potential increased bat mortality			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-5	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-5	Low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMP				
Avoid the destruction or removal of existing farmsteads and trees, as far as possible.				
Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential occupied roosts, if construction does not take place within 5 years of the initial bat study.				
If occupied roosts are confirmed (after the 5-year period, as described above), then these should be buffered according to best practice.				
All construction activities should be limited to the assessed project footprint only.				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6 to 18 months and as such is rated as Short term	-4	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely

IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(e) Botanical Impacts

The development of SPH9 would result in extensive but localized loss of relatively undisturbed (unploughed but grazed) Western Free State Clay Grasslands.

The shade effect of the panels on the grassland vegetation is not known and it not easily predicted. There will be space under the panels for grass and other plants to grow. However, the microclimate is likely to be different to that of open grassland, so a different suite of plant species is likely to colonize the space under the solar panels.

Two technology options are proposed for the BESS. The technology alternatives will make no difference on the botanical impact assessment and as such these alternatives are covered in the **Table 7-19**.

Table 7-346: SPH9: Impact of loss of Western Free State Clay Grassland

LOSS OF VEGETATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Removal of natural vegetation: Western Free State Clay Grasslands</i>			
INDIRECT IMPACT	<i>None determined</i>			
CUMULATIVE IMPACT	<i>Loss of Western Free State Clay Grasslands</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term.</i>	-15	3
EXTENT	3	<i>The impacts will be localized to the designated target areas.</i>		
SEVERITY	-2	<i>The severity of the potential impact will be moderate negative.</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-45	medium - negative		
PROPOSED MITIGATION MEASURES				
<i>The first mitigation measures necessary would be the relocation of Ammocharis coranica bulbs if they cannot be avoided. Ideally the bulb should be lifted when they area dormant (winter) but that would mean traversing the entire area of the SPH sites in the preceding summer and marking every occurrence of these plants. A more practical approach would be to unearth the bulbs during the construction phase and relocating and planting them soon after removal.</i>				
<i>Secondly, all areas that are disturbed during construction and that are not needed during the operational phase should be rehabilitated, using natural grasses that occur in the area. It would be possible for some grasses and forbs to survive under the panels, but it is difficult to predict the extent of such growth, nor which plant species would grow effectively under the panels.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last at least 5 years and therefore it is considered to be Long Term.</i>	-5	3

EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(f) Groundwater Impact

The water required during the construction phase of SPH9 is approximately 18,000m³ per year. The water requirement lies well within the yield potential of the underlying fractured rock aquifer (i.e. 0.5 – 2.0 L/s). It must be noted that at present the use of groundwater is not proposed however if this changes the potential impacts of groundwater abstraction are shown in **Table 7-185**.

Earthmoving plant and/or construction vehicles will be used on site during the construction phase. Use of vehicles presents a risk of groundwater contamination by fuel and oil leakage.

Two technology options (lithium-ion vs redox flow batteries) were considered for SPH9. The alternatives considered are equally preferred.

Table 7-347: SPH9: Impact table for the lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place).

Potential impact on groundwater level due to over abstraction				
<i>PROJECT PHASE</i>	<i>Construction Phase</i>			
<i>DIRECT IMPACT</i>	<i>Lowering of groundwater level due to over abstraction</i>			
<i>INDIRECT IMPACT</i>	<i>Drying of springs in the area</i>			
<i>CUMULATIVE IMPACT</i>	<i>Permanent damage to the aquifer system in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
<i>DURATION</i>	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-14	2
<i>EXTENT</i>	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
<i>SEVERITY</i>	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
<i>IMPACT ON</i>	1	<i>Irreplaceable resources will be</i>		

IRREPLACEBLE RESOURCES		impacted.		
SIGNIFICANCE	-28	low - negative		
PROPOSED MITIGATION MEASURES				
If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring. Adhere to the borehole’s safe yield and to monitor water levels and flow.				
Groundwater abstraction volumes must be monitored.				
POST-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	0	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	0	Negligible	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
Medium				

The main risk associated with the construction phase is groundwater contamination from the use of construction vehicles and heavy machinery on-site.

Table 7-348: SPH9: Impact of contamination of groundwater as a result of accidental oil spillages or fuel leakages during the construction and decommissioning phases.

Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages				
PROJECT PHASE	Construction and Decommissioning Phase			
DIRECT IMPACT	Groundwater contamination			
INDIRECT IMPACT	Damage to the vegetation or ecosystem in the area			
CUMULATIVE IMPACT	Long term reduced groundwater quality			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term	-5	2
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Likely
IMPACT ON IRREPLACEBLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-10	very low negative		
PROPOSED MITIGATION MEASURES				
Vehicles must be maintained regularly and kept in a good working order. Dirty water should be captured, to be re-used where possible. No dirty water is allowed to be discharged into the surrounding environment.				

<i>No heavy equipment or vehicles to be left in excavation area when not in use. Drip trays to be used under stationary vehicles and machinery where possible.</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term</i>	-	4
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to archaeological resources

Impacts to archaeological resources at SHP4 are limited to the possible destruction of isolated background scatter artefacts which have very low to no cultural significance. Impacts will be direct and permanent but because of the low cultural significance the severity is very low negative.

Two technology alternatives were considered for the battery technology for the BESS. Both technology options are equally preferred.

Table 7-349: SPH9: Assessment of construction phase impacts to archaeological sites.

Archaeological impacts				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Destruction of isolated artefacts</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>None</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		

PROPOSED MITIGATION MEASURES				
<i>None required as the ruin is in poor condition and does not have any special architectural qualities that need to be further recorded.</i>				
<i>No materials to be removed from any other ruins in the wider project area.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Impacts to graves

Impacts to graves for SPH9 are not expected because all identified graves have been avoided by the facility layout. There is still the chance of an unmarked grave being present, or even a marked grave that was not found during the survey. The chances are considered low, however. The impact on graves applies equally to both technology alternatives.

Table 7-350: SPH9: Assessment of construction phase impacts to graves

IMPACTS TO GRAVES				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Destruction of graves, including their coverings and possibly human remains</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Destruction of graves, including their coverings and possibly human remains</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-18	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-36	low – negative		

PROPOSED MITIGATION MEASURES				
<i>Farm-style wire fences should be erected around all known and unfenced graves (i.e. waypoints 362 & 404) within the farm portion affected by construction. Pedestrian access gates must be provided and the fences must be located a minimum of 5 m away from all graves.</i>				
<i>All graves to be treated as no-go areas with temporary signage as required.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-18	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Impacts to the cultural landscape SPH9

No landscape features such as hills and pans will be impacted by SPH9. The impact on cultural landscape is due to the construction activities (construction vehicles and equipment) on site which is a rural landscape.

Table 7-351: SPH9 Assessment of construction phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the introduction of construction equipment and vehicles and all the associated activities on site</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being constructed at once</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
Keep construction period as short as possible.				
Rehabilitate any areas not needed during operation as soon as possible.				
POST-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-10	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-30	low – negative		
CONFIDENCE LEVEL				
High				

(h) Palaeontological Impact

Palaeontological impacts would be the destruction of fossils from construction activities. The site as a whole is considered as low sensitivity in terms of palaeontology.

Table 7-352: SPH9: Assessment of the potential impacts to possible paleontological resources considers the criteria below

PALAEONTOLOGY IMPACTS				
PROJECT PHASE	Construction, Operational and de commissioning Phases			
DIRECT IMPACT	Destruction of fossils in the footprint			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Loss of fossil heritage and scientific knowledge			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	1	The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary	-2	3
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-6	Very Low Negative		

PROPOSED MITIGATION MEASURES				
<i>If fossils are found once excavations for foundations and amenities have commenced then they should be photographed, removed and put in a safe place. Photographs should be sent to a palaeontologist to assess their scientific value. If the fossils are important the palaeontologist must obtain a permit from SAHRA, visit the site and remove the fossils for curation and storage in a recognised facility such as a museum or palaeontology department in a university</i>				
<i>If no fossils are found, no action will be required</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	2	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	6	Very Low Positive		
CONFIDENCE LEVEL				
<i>High</i>				

(i) Socio-Economic Impact

(i) Stimulation of the Economy during construction

The size of the Tokologo LM's economy was estimated at R2,170 million at current prices (2022) and primarily comprises of the agricultural and tertiary services sectors. Considering the small economic base of the municipality, the opportunities for the procurement of goods and services within the local economy will be very limited. That being said, it is likely that some of the local businesses will benefit from sub-contracting opportunities, consumer expenditure of the construction crew, and an increase in income of locals who are directly employed in the construction activities, or who benefit from the development of SPH9 through local procurement.

The stimulation of the economy will not be dependent on the technology options of the SPH9; thus, the battery technology alternatives are equally preferred.

Table 7-353: SPH9: Impact of Economic Stimulation during construction

IMPACT ON ECONOMY				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Temporary increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		

SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
PROPOSED MITIGATION MEASURES				
<i>To optimise the stimulation of the local economy through direct, indirect and induced effects, the following should be applied where possible:</i>				
<i>Procure construction materials, goods, and products from local and domestic suppliers if feasible</i>				
<i>Employ local contractors where possible</i>				
<i>Note: The proposed mitigation measures will possibly increase the positive impact on the local economy; however, this will not affect the weighting thereof.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural, and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Creation of Employment during construction

The construction of SPH9 will require temporary employment of construction workers, foremen, and engineers On-site. Construction is expected to last twelve months where at the peak of construction about 150 people will be working on-site.

In addition to those benefitting from direct employment created at the project, various multiplier effects will assist in temporarily supporting existing jobs in the businesses offering services and goods that will be procured during construction activities. The increased temporary income earned by these businesses will in turn stimulate consumption spending, creating another round of multiplier effects.

SPH9 will create the same number of employment opportunities, regardless of its layout on the site; thus, layout alternatives are equally preferred.

Table 7-354: SPH9: Assessment of Employment during construction

IMPACT ON EMPLOYMENT				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Creation of temporary employment opportunities On-site</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of temporary employment opportunities in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
PROPOSED MITIGATION MEASURES				
<i>The following is recommended to increase the employment opportunities created in the local communities, where feasible:</i>				
<i>Employ labour intensive methods in construction, where feasible</i>				
<i>Employ local residents and communities, where possible</i>				
<i>Utilise local suppliers, where possible</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as short term</i>	10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	30	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Reduction of Land Area available for productive farming

The proposed site of SPH9 and surrounding land is currently used for small-scale livestock. The agricultural assessment classified the whole of SPH9 as being of low – very low and low agricultural potential. The farmers with livestock on the land proposed for the facilities will

simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH9 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant's footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project's construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH9.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant differentiation among site layout alternatives can be made. The footprint of the BESS will be the same regardless of which battery technology is used. There is therefore no difference in the impact between the two technology alternatives.

Table 7-355: SPH9: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Construction and Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the</i>	Negligible	Definite

		<i>environment in such a way that natural, cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iv) Loss of Property

An influx of job seekers to the area during the construction phase may result in stock theft and burglaries. The number of workers and duration of construction will not be affected by the technology alternatives; thus, all alternatives are equally preferred.

Table 7-356: SPH9: Assessment of loss of property

IMPACT ON CRIME LEVELS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT	<i>Temporary increase in crime associated with the influx of people</i>			
INDIRECT IMPACT	<i>Reduced level of security in and around the proposed facility</i>			
CUMULATIVE IMPACT	<i>No to negligible cumulative impact</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
<i>The following mitigations are advised to be instituted to minimise and possible eliminate the impact altogether:</i>				
<i>Ensure proper fencing and monitoring of the fencing is in place</i>				
<i>Maximise job creation and allocation to locals as far as practically possible. Recruitment of workers should be planned in advance and should not take place on-site. This will reduce the probability of work seekers loitering in the area surrounding the project sites</i>				
<i>Hire additional security personnel during the construction period</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural,</i>	Negligible	Definite

		<i>cultural and social functions and processes are minimally affected</i>	
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>	
SIGNIFICANCE	-15	very low negative	
CONFIDENCE LEVEL			
<i>High</i>			

(j) Terrestrial Biodiversity & Faunal Impact

(i) Direct Impact - Destruction of faunal habitat

Clearing or disturbance to natural vegetation for the construction of SPH9 will remove up to 428ha of natural grassland habitat. This includes the burrows of many fossorial species as well as termite mounds which provide a source of food for species such as aardvark and mongoose.

Two technology alternatives for the battery to be used in the BESS have been proposed. As the type of battery used will not alter the footprint of the BESS the alternatives are rated as equal for the impact of clearance of natural habitat.

Table 7-357: SPH9: Destruction of faunal habitat

DESTRUCTION OF FAUNAL HABITAT				
PROJECT PHASE	<i>Construction phase</i>			
DIRECT IMPACT	<i>Destruction of faunal habitat</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>Loss of habitat and habitat connectivity</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-21	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays. Only indigenous grasses found in the area must be used for rehabilitation</i>				
<i>Undertake vegetation clearing during the dry season, and outside of the breeding season of burrowing fauna</i>				
<i>If possible, the movement of animals through the sites must be permitted during operations. The use of fencing that will allow the movement of small to medium fauna through would help mitigate the effect of fences acting as barriers. This can be achieved by constructing a fence that has places for animals to crawl through and is not difficult for fleeing animals and birds to see. For example, black mesh panel fencing can be used where gaps of approximately 30 cm high and 50 cm wide</i>				

<i>and spaced at regular intervals are cut/installed. The tops of these gaps must be smoothed off to limit the chance of wildlife being injured when passing through. The use of barbed wire must be avoided</i>				
<i>The proposed activities must remain within the project footprint</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-10	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-30	low negative		
CONFIDENCE LEVEL				
Medium				

(ii) Direct Impact - Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death. The clearing of ground for the foundations of the PV arrays will destroy burrows, potentially causing injury or death to burrowing animals. Furthermore, the presence of the construction site and personnel may result in negative interactions with fauna, such as hunting or killing animals perceived to be pests.

Regarding the technology alternative for the type of battery used in the BESS for all facilities, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place.

Table 7-358: SPH9: Injury or death to fauna

INJURY OR DEATH TO FAUNA				
PROJECT PHASE	Construction Phase			
DIRECT IMPACT	Injury or death to fauna			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-18	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		

SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-54	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by construction workers</i>				
<i>To prevent possible collisions with animals, drivers of construction vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				
<i>Ideally construction should not continue at night so as to avoid potential collisions with nocturnal fauna</i>				
<i>Just prior to construction, the sites must be searched for large active burrows of species such as Aardvark, or communal burrows of species such as Ground Squirrel. If active / occupied burrows are found, the animals must be evacuated or relocated in an ecologically appropriate manner, just prior to vegetation clearing commences. This must be undertaken by a suitably qualified zoologist and all necessary permits must be in place</i>				
<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>No wild animal may under any circumstance be hunted, snared, captured, injured or killed. This includes animals perceived to be vermin. Checks of the surrounding natural vegetation must be regularly undertaken to ensure no traps have been set. Any snares or traps found on or adjacent to the site must be removed and disposed of</i>				
<i>All mitigation measures prescribed by the avifaunal specialist must be strictly adhered to</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts – Disturbance and displacement of fauna

Construction activities have the potential to cause disturbance to fauna inhabiting the natural grassland through noise, vibrations, and light (if construction continues after dark). Security lights for the solar facilities during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The technology alternatives for the BESS will not change the ratings for this impact.

Table 7-359: SPH9: Disturbance and displacement of fauna

DISTURBANCE AND DISPLACEMENT OF FAUNA				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Disturbance to and displacement of fauna – natural grassland</i>			
CUMULATIVE IMPACT	<i>Displacement of fauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-18	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-36	low negative		
PROPOSED MITIGATION MEASURES				
<i>Wherever possible, construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species</i>				
<i>Ideally construction activities should cease at night to minimise the need for artificial lighting and to reduce the impact of noise and vibrations on nocturnal animals</i>				
<i>Lighting during construction should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects, such as low-pressure sodium lamps, is preferred</i>				
<i>Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-10	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(iv) Indirect Impacts – Pollution and contamination of natural areas

During construction, dust from exposed areas and roads, and litter from construction workers have the potential to pollute the surrounding natural vegetation. The use of dust suppressants, as well as hydrocarbons from vehicles and machinery, have the potential to contaminate soils and ground water, and be washed into the nearby natural pans during high rainfall events. The battery technology alternatives are rated the same and hence are covered in the same table.

Table 7-360: SPH9: Pollution and contamination of natural areas

POLLUTION AND CONTAMINATION OF NATURAL AREAS				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-15	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-45	moderate negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities</i>				
<i>All vehicles and machinery must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>During construction, dust on construction roads must be suppressed using a water tanker</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by construction workers must be prohibited</i>				
<i>Appropriate solid waste disposal facilities must be provided for workers during construction</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(v) Indirect Impacts – Increased potential of invasion by alien vegetation

During construction, the removal of natural vegetation and disturbance to the soil will increase the likelihood of invasion by alien plant species. Alien species establish easily and quickly on bare soil by colonisation or from seeds existing in the seed bank of the soil. Infestation by alien and invasive species will lead to degradation of the surrounding natural habitat and will increase the potential of spread into the greater landscape. In addition, the vehicles and equipment were likely used on various other sites and could introduce alien invasive plant seeds. This impact is relevant to all the proposed arrays equally and has therefore been assessed in one table for the construction phase.

The technology alternatives for the BESS will not change the ratings for this impact.

Table 7-361: SPH9: Increased potential of invasion by alien vegetation

INCREASED POTENTIAL OF INVASION BY ALIEN VEGETATION				
PROJECT PHASE	<i>Construction Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Increased potential of invasion by alien vegetation</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee all construction activities monthly</i>				
<i>All areas cleared of natural vegetation must be rehabilitated. Avoid complete clearance of natural vegetation, and only clear vegetation where absolutely necessary. As much of the natural grassland as possible must be retained under the panels. Where clearing takes place, topsoil must be retained and used to rehabilitate underneath the arrays and other cleared areas. Only indigenous grasses found in the area must be used for rehabilitation. This must be advised by the botanist</i>				
<i>An invasive alien plant species management and monitoring plan must be implemented during the construction phase. Monitoring should continue into the operational phase and through and for a period after decommissioning. This should be advised by the botanist</i>				
<i>All alien seedlings and saplings must be removed as they become evident for the duration of construction and during the operational phase. Manual / mechanical removal is preferred to chemical control</i>				
<i>All construction vehicles and equipment must be free of plant material before entering the site</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1

EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted		
SIGNIFICANCE	-4	very low negative		
CONFIDENCE LEVEL				
High				

(k) Transport Impact

Traffic impacts anticipated to occur during the construction phase of the project are construction related traffic and noise and dust pollution.

Two technology alternative for the BESS have been proposed. There is no difference in the impacts from a traffic perspective between the alternatives.

Table 7-362: SPH9: Traffic Impacts – Construction Phase

TRAFFIC IMPACT				
PROJECT PHASE	Construction phase			
DIRECT IMPACT	Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site			
INDIRECT IMPACT	Construction traffic on roads might generate dust and noise.			
CUMULATIVE IMPACT	Traffic delays on the surrounding road network.			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	-10	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES		No irreplaceable resources will be impacted.		
SIGNIFICANCE	-30	low negative		
PROPOSED MITIGATION MEASURES				
Stagger component delivery to site;				
Reduce the construction period (if possible);				
Dust suppression of gravel roads (internal roads and the access road to the site) during the construction phase, as required.				
Regular maintenance of gravel roads (internal roads and the access road to the site) by the Contractor during the construction phase.				
The use of mobile batching plants and quarries in close proximity to the site (if available and feasible); and Staff and general trips should occur outside of peak traffic periods.				
POST-MITIGATION				

DURATION	2	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term	5	1
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-15 very low negative			
CONFIDENCE LEVEL				
Medium				

(I) Landscape and Visual Impact

Four visual impacts were identified for SPH9 during the construction, operational phase and decommissioning phase

- Landscape change
- Impact on Protected Areas
- Impact on local roads
- Impact on homesteads
- Light pollution

These impacts would all occur during the construction, operation and decommissioning phase. Impacts would peak once the facility is constructed, remain relatively constant during the operational phase and then decrease during the decommissioning phase.

The type of battery technology used in the BESS would not impact on the assessment of visual impacts and so the tables below cover both technology options.

Table 7-363: SPH9 Landscape change

LANDSCAPE CHANGE				
PROJECT PHASE	Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.			
DIRECT IMPACT	Change of character due to industrialisation of a Natural Landscape			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Extension of landscape industrialisation due to other electrical infrastructure projects			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-14	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		

SEVERITY	-2	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
Plan to maintain the height of structures as low as possible relative to existing ground levels;				
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;				
Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;				
Reinstate any areas of vegetation that have been disturbed during construction;				
Remove all temporary works;				
Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;				
Remove infrastructure not required for the post-decommissioning use of the site;				
Monitor areas for vegetation cover post-decommissioning and implement remedial actions.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
High				
NOTES				
13. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
14. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

Table 7-364: SPH9 Industrialization of the landscape as seen from Nielsview NR

SPH9 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM NIELSVIEW NR				
PROJECT PHASE	Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.			
DIRECT IMPACT	Industrialisation of the view from Nielsview NR due to this project.			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Extension of industrialisation of views from Protected Areas due to this and other electrical infrastructure projects			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD

PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	Very low negative		
PROPOSED MITIGATION MEASURES				
Plan to maintain the height of structures as low as possible relative to existing ground levels;				
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;				
Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;				
Reinstate any areas of vegetation that have been disturbed during construction;				
Remove all temporary works;				
Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;				
Remove infrastructure not required for the post-decommissioning use of the site;				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Slightly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-21	low negative		
CONFIDENCE LEVEL				
High				
NOTES				
13. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.				
14. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.				

Table 7-365: Industrialization of the landscape as seen from local roads, SPH9

INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL ROADS, SPH9				
PROJECT PHASE	Construction, Operational & Decommissioning Phases			
DIRECT IMPACT	Industrialisation of the view from local roads due to this project.			
INDIRECT IMPACT				
CUMULATIVE IMPACT	Extension of industrialisation of views from local roads due to this and other electrical infrastructure projects			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last	0	3

		<i>more than 5 years and as such is rated as Long Term</i>		
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE		Very low negative		
PROPOSED MITIGATION MEASURES				
<i>Plan site levels to minimise earthworks to ensure that levels are not elevated;</i>				
<i>Plan to maintain the height of structures as low as possible;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Construct and/ or plant a 2m high screen along the southern edge of the array cluster</i>				
<i>Plan to protect existing natural site features such as drainage pans;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long term</i>	0	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	0	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
<i>15. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				
<i>16. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i>				

Table 7-366 SPH9: Industrialization of the landscape as seen from local homesteads

SPH9 INDUSTRIALISATION OF THE LANDSCAPE AS SEEN FROM LOCAL HOMESTEADS				
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>			
DIRECT IMPACT	<i>Industrialisation of the view from local homesteads due to this project.</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT	<i>Extension of industrialisation of views from local homesteads due to this and other electrical infrastructure projects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last</i>	-14	3

		<i>more than 5 years and as such is rated as Long Term</i>		
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Plan to maintain the height of structures as low as possible;</i>				
<i>Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;</i>				
<i>Construct / grow 2m high screen along SW and E edges of solar cluster closest to affected homesteads;</i>				
<i>Plan to protect existing natural site features such as drainage pans. it is noted that this has largely been achieved in layout planning, however ongoing monitoring and restriction of access to these areas is necessary;</i>				
<i>Reinstate any areas of vegetation that have been disturbed during construction;</i>				
<i>Remove all temporary works;</i>				
<i>Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;</i>				
<i>Remove infrastructure not required for the post-decommissioning use of the site;</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months – 5 years and as such is rated as medium term</i>	-6	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
<i>13. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				
<i>14. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i>				

Table 7-367 SPH9 Light pollution

SPH9 LIGHT POLLUTION	
PROJECT PHASE	<i>Construction, Operational & Decommissioning Phases. Impacts will increase to peak level on completion of construction, be relatively constant during operation and decrease again from peak levels during decommissioning.</i>
DIRECT IMPACT	<i>Light pollution from the project spoiling the night time environment and nuisance to neighbors.</i>
INDIRECT IMPACT	

CUMULATIVE IMPACT		<i>Extension of light pollution due to this and other electrical infrastructure projects</i>		
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Use low key lighting around buildings and operational areas that is triggered only when people are present;</i>				
<i>Utilise infra-red security systems or motion sensor triggered security lighting;</i>				
<i>Ensure that lighting is focused on the development with no light spillage outside the site;</i>				
<i>No tall mast lighting should be used;</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	0	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				
NOTES				
<i>13. The alternative battery technologies have no influence on visual impact as both alternatives are likely to be enclosed in similar structures.</i>				
<i>14. The No-Go alternative could result in a limited number of additional agricultural buildings being developed. However, this is likely to result in negligible landscape change or visual impact.</i>				

7.9.4 Operational Phase

(a) Agricultural Impact

During the operational phase, areas that where vegetation will remain cleared such as access routes, will remain at risk of soil loss through erosion. During the operation phase, staff and maintenance personnel will access the development area to maintain the infrastructure and make repairs, where required. Biodegradable detergents and water will be used to clean the panels, however this is not expected to result in impacts from an agricultural perspective.

Table 7-368: SPH9 Impact significance of soil loss through erosion during the operation phase

SOIL LOSS THROUGH EROSION				
PROJECT PHASE	<i>Operation Phase</i>			
DIRECT IMPACT	<i>Areas where soil surfaces will remain bare such as access routes and between PV arrays, will remain at risk of soil erosion.</i>			
INDIRECT IMPACT	<i>Eroded areas can expand into nearby areas and result in land degradation.</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil erosion.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-42	moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>The development area, including internal access routes, as well as areas bordering on the development area, must regularly be monitored to detect early signs of soil erosion on-set.</i>				
<i>If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

Table 7-369: SPH9 Impact significance of soil pollution during the operation phase

SOIL POLLUTION	
PROJECT PHASE	<i>Operational phase</i>
DIRECT IMPACT	<i>Soil pollution caused by oil and fuel spills or maintenance materials and domestic waste left on site. The replacement of electrolyte of the redox flow batteries, also pose soil pollution risk.</i>

INDIRECT IMPACT	<i>Increased risk of pollutant uptake by vegetation within the development area that can affect environmental and human health</i>			
CUMULATIVE IMPACT	<i>Increase in areas at risk of soil pollution</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-14	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-14	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills.</i>				
<i>No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area.</i>				
<i>Regularly monitor the BESS area for any signs of oil, grease and fuel spillage or the presence of waste.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(b) Aquatic Impact

During the operation phase, the solar arrays will operate largely unattended and with low maintenance required for more than 20 years. The hard surfaces created by the development may lead to increased runoff. This may lead to increased erosion and sedimentation of the downslope areas. A localised long-term impact (more than 20 years) of low intensity (depending on the distance between the solar arrays and the freshwater features) could be expected that would have a very low overall significance post-mitigation in terms of its impact on the identified aquatic ecosystems in the area.

The only potentially toxic or hazardous materials which would be present in relatively small amounts would be of lubricating oils and hydraulic and insulating fluids. Therefore, contamination of surface or groundwater or soils is highly unlikely.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low. The impacts are rated the same for the battery technology alternatives for the BESS.

Table 7-370: SPH9 Operational phase aquatic ecosystem impacts

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Modification of flow and alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly detrimental	Likely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-24	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Any disturbance during the operation phase should be limited to the approved development footprints and should avoid disturbance of the soil and natural vegetation cover.</i>				
<i>Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.</i>				
<i>Stormwater run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving developed areas.</i>				
<i>Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider. In a scenario where services are installed, these systems need to be adequately installed and maintained to prevent any potential contamination of the water resources on site.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it will affect the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		

SIGNIFICANCE	-5 very low negative		
CONFIDENCE LEVEL			
<i>Medium</i>			

(c) Avifaunal Impact

(i) Bird fatality at PV facility

Bird fatalities could occur at the site through a number of mechanisms, including collision with PV panels, entanglement in perimeter fence (less likely since developer has chosen to use mesh panel fencing which has a tight weave and birds are less likely to become entangled), electrocution in substations/electrical compounds and others. The battery technology options for the BESS are rated the same and are both covered in the same table.

Table 7-371: SPH9 bird fatality during operational phase

BIRD FATALITY AT PV FACILITY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>Birds killed through various interaction with facility infrastructure</i>			
INDIRECT IMPACT	<i>--</i>			
CUMULATIVE IMPACT	<i>More projects will result in overall higher fatality rates in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any fatalities this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. Operational phase bird monitoring should be conducted for at least one year as per the best practice guidelines – see Section 8.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8	very low negative		

CONFIDENCE LEVEL
<i>Medium</i>

(ii) Nesting & other use of facility infrastructure by birds

Certain species, in particular doves, pigeons, weavers and crows, are likely to use some of the facility infrastructure for nesting, perching and roosting. At face value this is a positive impact for birds and has been rated as VERY LOW POSITIVE significance both pre and post mitigation. However, where nesting interferes with the operation of the facility this could cause conflict and require management. Nesting on infrastructure also increases the likelihood of bird fatalities occurring through the various mechanism, particularly of young inexperienced birds. No mitigation is required for the impact of the facility on birds through nesting. For the impact of the birds nesting on the facility, the specialist recommends nest management on a case by case basis under the supervision of an avifaunal specialist, and in conformance with all relevant national and provincial legislation. The impact is rated the same for the both battery technology alternatives for the BESS.

Table 7-372: SPH9 impact of bird nesting and other use of facility infrastructure by birds

BIRD NESTING, PERCHING & ROOSTING AT PV FACILITY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Birds use infrastructure to perch, roost or nest on</i>			
CUMULATIVE IMPACT	<i>More projects in the area will probably diminish the likelihood of this happening as perch availability will increase</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	7	very low positive		
PROPOSED MITIGATION MEASURES				
<i>None required at this stage. Once operational, if facility staff identify any nesting which interferes with operations this should be reported on fully through the sites incident reporting system. A suitably qualified ornithologist should be consulted for any case specific reactive mitigation measures. All nest management measures should only be undertaken in compliance with national and provincial environmental legislation in this regard.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		

SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	7	very low positive		
CONFIDENCE LEVEL				
<i>Medium</i>				

(d) Bats Impact

Day to day operation and maintenance of the facility may result in disturbance and displacement of bats. The impact is rated the same for both battery technology options for the BESS.

Table 7-373: SPH9 disturbance and displacement effects for bats

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	Disturbance of bats during operational activities			
INDIRECT IMPACT	Displacement			
CUMULATIVE IMPACT	Unavailability of suitable foraging resources in the broader environment for displaced individuals			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	very low negative		
PROPOSED MITIGATION MEASURES				
Limit operational and maintenance activities to daylight hours, as far as possible, and minimise lighting at night.				
All lighting should preferably use low pressure sodium and warm white LED lights.				
Operational and maintenance activities should be limited to the immediate project footprint only.				
Site access should be strictly controlled, to avoid unnecessary disturbance.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly detrimental	Unlikely

IMPACT IRREPLACEBLE RESOURCES	ON	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE		-7	very low negative		
CONFIDENCE LEVEL					
<i>Medium</i>					

Table 7-374: SPH9 bat roost disturbance

IMPACT ON POSSIBLE ROOST DISTURBANCE				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Disturbance of roosting bats during operational activities</i>			
INDIRECT IMPACT	<i>Roost abandonment</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable roosting resources in the broader environment for abandoned individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-7	Low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMPr				
<i>All lighting should preferably use low pressure sodium and warm white LED lights.</i>				
<i>During operational and maintenance activities, avoid all movement and noise around medium sensitivity areas.</i>				
<i>Operational and maintenance activities should be limited to the immediate project area.</i>				
<i>Site access should be strictly controlled, to avoid unnecessary disturbance.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last morethan 5 years and as such is rated as Long Term</i>	-14	1
EXTENT	2	<i>The extent of the impactis rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resourceswill be impacted.</i>		
SIGNIFICANCE	-28	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(e) Botanical Impacts

Maintenance activities will require management of vegetation which may result in loss of natural vegetation. The impact is rated the same for both battery technology options for the BESS.

Table 7-375: SPH9 loss of Western Free State Grassland during operational phase

LOSS OF VEGETATION				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Direct impact</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	<i>Loss of Western Free State Clay Grasslands</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-5	1
EXTENT	1	<i>The extent of the impact is the footprint as it only affects the area in which the proposed activity will occur.</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
PROPOSED MITIGATION MEASURES				
<i>When and where possible, vegetation clearing should be undertaken during the dry season.</i>				
<i>Only clear vegetation where absolutely necessary; and</i>				
<i>Stockpile areas for cleared vegetation will be decided and approved by the Project Manager and appointed ECO before construction commences on site and should not be located within drainage lines.</i>				
POST-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-2	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(f) Groundwater Impact

Similar to the construction phase, the operational phase of the SPH9 will require approximately 1,000 m³/a (0.03 L/s). This does not exceed the regionally mapped yield of the underling aquifer (0.5 – 2.0 L/s). It is not currently planned to use groundwater for the operational phase of this project however if this changes a water use licence will need to be applied.

The principal risks for groundwater contamination that have been identified are the use of cleaning agents for cleaning of PV panels and for dust suppression of internal roads. If required, it is encouraged that water alone is used to conduct these tasks. Alternatively, the PV cleaning

agents and dust suppression mixes must be environmentally friendly and should breakdown naturally without causing ingress of harmful chemicals into the environment.

The proposed development will require a BESS. Currently two different technologies are being considered, i.e. either Solid State Lithium Batteries (SSLB) or Vanadium Redox Flow Battery Energy Storage Systems (VRFB). Both of these two BESS systems require an electrolyte. The SSLB contain an ethylene carbonate or di-ethyl carbonate electrolyte and the VRFB system will require that an estimate of 3 000 m³ of sulfuric acid solution with vanadium ions electrolyte is stored on site for each Springhaas Facility. The BESS systems will also require cooling systems and these systems could potentially either be water based or it may be refrigerant based systems which used chemicals such as ethylene glycol- based coolants.

The containers that the BESS systems are held in are equipped with a “Clean agent” which is a fires suppression systems that can release a powder/gas into the container to snuff fires. These systems usually leave a residue on the equipment that will need to be cleaned off. With any chemical storage there is always a risk of chemical fires that will need to be put out with water or foam and the waste water from these activities could contain contaminants that should not be let to run off into the environment.

The fire safety systems, refrigerants, electrolyte solutions and the waste products produced from these systems could contaminate the soil and groundwater and all measures should be taken to prevent leaks or spills on the ground.

The impact on groundwater levels is rated the same for both battery technology alternatives for the BESS.

Table 7-376 SPH9: Impact of lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place)

Potential impact on groundwater level due to over abstraction				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Lowering of groundwater level due to over abstraction</i>			
INDIRECT IMPACT	<i>Drying of springs in the area</i>			
CUMULATIVE IMPACT	<i>Permanent damage to the aquifer system in the area</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		

SIGNIFICANCE	-32	<i>low – negative</i>		
PROPOSED MITIGATION MEASURES				
<i>If boreholes are used it must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring.</i>				
<i>Adhere to the borehole’s safe yield and to monitor water levels and flow.</i>				
<i>Groundwater abstraction volumes must be monitored.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Table 7-377: SPH9 Impact of contamination of groundwater as a result of cleaning agents used for cleaning the solar panels

Potential impact on groundwater as a result of cleaning agents used for cleaning the solar panels.				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Contamination of groundwater</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long-term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	<i>low - negative</i>		
PROPOSED MITIGATION MEASURES				
<i>Use environmentally safe cleaning agents that breakdown naturally (biodegradable detergents/green soaps) and that will not cause adverse effects.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the</i>		

		<i>proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

Redox flow batteries contain electrolyte solution which needs to be replaced approximately every 15 to 20 years. During replacement of electrolyte there is a risk of leaks or spills. This impact is only applicable to the redox flow batteries as lithium-ion batteries are solid state batteries.

Table 7-378: SPH9 Impact table for contamination of groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)

Potential impact on groundwater quality as a result of leaking or spills from the electrolyte solution from the battery energy storage system (BESS)				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Contamination of groundwater</i>			
INDIRECT IMPACT	<i>Damage to the vegetation or ecosystem in the area</i>			
CUMULATIVE IMPACT	<i>Long-term reduced groundwater quality</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or Communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-32	<i>low - negative</i>		
PROPOSED MITIGATION MEASURES				
<i>Ensure that all electrolyte or chemicals stored or used on site have secondary containments systems in place with reliable leak detection, annunciation in place. Ensure that all chemicals are handled on concrete banded surfaces and not on bare soil.</i>				
<i>Any waste products produced from the BESS systems should be removed and disposed of appropriately. Waste water produced by fire hydrants should not be allowed to runoff into the environment.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the</i>		

		<i>area in which the proposed activity will occur</i>		
SEVERITY	0	<i>Negligible</i>	<i>Negligible</i>	<i>Unlikely</i>
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(g) Heritage Impact

(i) Impacts to the cultural landscape

Because any physical impacts to the landscape would already have occurred during the construction phase, landscape impacts during operation of SPH9 relate only to the presence of the facility in what is otherwise a rural landscape. Impacts to the cultural landscape will occur during the operation phase and last as long as the lifetime of the facility. Because of the flat terrain, the impacts would not be experienced over great distances because intervening vegetation and buildings would offer partial screening. Nonetheless, the immediately surrounding area will experience a degree of change in landscape character and sense of place. The impact significance is rated to low negative before mitigation. The impacts are the same for both technology options for the batteries for the BESS.

Table 7-379: SPH9: Assessment of operation phase impacts to the cultural landscape

CULTURAL LANDSCAPE IMPACTS				
PROJECT PHASE	<i>Operation Phase</i>			
DIRECT IMPACT	<i>Alteration of the rural landscape character through the presence of a solar energy facility</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being present</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Keep all maintenance work within the authorised footprint.</i>				
<i>Minimise night-time light pollution in the area (visual recommendations to be followed to achieve this).</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3

EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-21	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

(h) Socio-Economic Impact

(i) Stimulation of the Local Economy during operations

The operational period of SPH9 is a minimum of 20 years. Of the money spent annually during the operations period, a significant portion will likely comprise of salaries and wages of the Springhaas employees. The operations of the facility will make some contribution towards the growth of the local economy, as it will increase the size of the local electricity sector, as well as stimulate the demand for other sectors' services and goods such as water, transportation, and trade.

No differentiate can be made between battery technology alternatives for the BESS. The technology alternatives are considered in **Table 7-218** and **Table 7-219**.

Table 7-380: SPH9: Assessment of Economic stimulation during operations

STIMULATION OF THE LOCAL ECONOMY DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Long-term increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				

<i>Where feasible, procure goods and services required for the operation of the plant from the local economy</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	16	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Moderately Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	48	moderate positive		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Creation of Employment and increased household income during operations

The operation of SPH9 will require functional and maintenance employees. It is envisaged that about 8 direct jobs per facility will be created during the operations phase, which will occur for a duration of 20 years. About 70% of these jobs are to be filled by people from the local communities as they will be low-skilled employment opportunities. Employment of the eight individuals for the entire operational period will increase their household income, improve their standard of living and benefit their families.

SPH9 will create the same number of employment opportunities, regardless of its location on the site; thus, layout alternatives are equally preferred. The type of battery used in the BESS will also not significantly affect employment alternatives, thus both technology alternatives are equally preferred.

Table 7-381: SPH9 Assessment of employment during operations

CREATION OF EMPLOYMENT AND INCREASED HOUSEHOLD INCOME DURING OPERATIONS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Creation of permanent employment opportunities in the local and regional economy</i>			
INDIRECT IMPACT	<i>Improved income of households whose members are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of permanent employment opportunities in the region</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	8	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		

SEVERITY	1	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	24	low positive		
PROPOSED MITIGATION MEASURES				
<i>Where feasible, aim to fill all the positions by labour from the local community</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	8	3
EXTENT	4	The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries		
SEVERITY	1	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved	Slightly Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	24	low positive		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Improved municipal service delivery

SPH9 will have a capacity of up to 150MWac and will be connected to the national grid through Eskom substation and generated electricity will be sold nationwide. The proposed project, albeit relatively small, will contribute towards improving National electricity availability; thus, improving the government service delivery, and could potentially also aid in growing the local economy by increasing the overall supply of electricity in the local economy. Furthermore, due to the taxes and rates that will be paid by the project to the municipality, the revenue of the latter will be increased, thus allowing it to improve the service delivery in other areas.

The layout alternatives and BESS technology alternatives will not affect the capacity of the solar facility; thus all alternatives are equally preferred.

Table 7-382: SPH9: Assessment of service delivery improvement

IMPROVED MUNICIPAL SERVICE DELIVERY				
PROJECT PHASE	<i>Operational phase</i>			
DIRECT IMPACT	<i>It will likely improve the local electricity supply if fed to the grid</i>			
INDIRECT IMPACT	<i>Improved standard of living within the region</i>			
CUMULATIVE IMPACT	<i>Improved electricity availability</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				

DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	16	3
EXTENT	4	<i>The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries</i>		
SEVERITY	2	<i>The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected</i>	Moderately Beneficial	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	48	<i>moderate positive</i>		
PROPOSED MITIGATION MEASURES				
<i>No mitigations proposed</i>				

(iv) Reduction of Land Area available for productive farming

The proposed site of SPH9 and surrounding land is currently used for small-scale livestock. The farmers with livestock on the land proposed for the facilities will simply relocate their livestock to land nearby, thus not having an impact on the agricultural production within the area. The area where SPH9 is located will be sterilised for the duration of construction and operation, i.e., any activity that is currently taking place on the site that will be affected by the plant's footprint will be stopped. However, all of the affected landowners have indicated their willingness to relocate their livestock and other activities. Thus, loss of agricultural activity and income will not occur.

The nature of the activities taking place on the farms adjacent to the proposed facilities is also not expected to be sensitive to the proposed project's construction or operation; therefore, no negative effects on the current activities observed in the surrounding area are expected due to visual or noise effects that may be created by the development of SPH9.

The proposed facilities will have the same electricity capacity per layout and are expected to have largely a similar footprint with negligible size difference; thus, no significant differentiation among site layout alternatives can be made. The different battery technology alternatives will not affect the impact ratings.

Table 7-383: SPH9: Assessment of Impact on agricultural production

Reduction of Land Area available for Productive Farming				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Loss of agricultural production within the footprint due to land sterilisation</i>			
INDIRECT IMPACT	<i>Negligible to no indirect impact</i>			
CUMULATIVE IMPACT	<i>Negligible to no cumulative effects</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for livestock farming after the closure of the project.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	6	3
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-18	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(i) Terrestrial Biodiversity and Animal Species

(i) Direct Impacts – Injury or death to fauna

The movement of large construction vehicles and maintenance vehicles during the operational phase will pose the threat of collisions with fauna causing injury or death.

Regarding the technology alternative for the type of battery used in the BESS for SPH9, the SSL battery has a higher risk of explosion or fire than the VRF battery. Fire could spread into the surround natural grassland and put fauna at risk of injury or death if adequate prevention and safety measures are not in place.

Table 7-384: SPH9 Injury or death to fauna

ALL FACILITIES				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Injury or death to fauna</i>			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	--			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-32	low negative		
PROPOSED MITIGATION MEASURES				
<i>No wild animal may under any circumstance be handled, removed or be interfered with by maintenance staff</i>				
<i>To prevent possible collisions with animals, drivers of maintenance vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to (recommended 40 km/h)</i>				
<i>All food should be securely stored away to prevent attraction of faunal species to human areas. Bins that are scavenger proof must be used, and all rubbish must be disposed of in the most appropriate way to prevent faunal species raiding the bins and becoming habituated to humans</i>				
<i>Adequate fire prevention and safety measures must be in place. A fire emergency management plan must be in place</i>				
<i>All electrical equipment must be maintained on a regular basis to minimise the risk of fire</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-6	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-6	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(ii) Indirect Impacts – Pollution and contamination of natural areas

During operations, release of grey water into the environment can cause contamination by detergents. Grey water from cleaning of the solar panels has the potential to contaminate soils and ground water and be washed into the nearby natural pans during high rainfall events. This

includes biodegradable detergents used for cleaning the panels, which can accumulate in the soil and be washed into the nearby pans before they break down. Biodegradable detergents can alter the balance of freshwater ecosystems as they promote bacterial growth and lower oxygen levels. The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-385: SPH9 Pollution and contamination of natural areas including pans and wetland

POLLUTION AND CONTAMINATION OF NATURAL AREAS INCLUDING PANS AND WETLANDS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Pollution and contamination of natural areas – including nearby pans or wetlands</i>			
CUMULATIVE IMPACT	<i>Habitat degradation</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-21	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected</i>	Highly detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-63	high negative		
PROPOSED MITIGATION MEASURES				
<i>An independent Environmental Control Officer (ECO) must be appointed to oversee operational phase activities at a minimum every 6 months for the first 5 years and then yearly for the rest of the life of the facility</i>				
<i>If possible, panels should be cleaned using water that is clear of detergents only (e.g. potable water or borehole water). The use of grey water should be avoided. Should the need arise to clean the panels with detergents, then biodegradable detergents are preferred. Care must be taken not to allow the detergents to accumulate in the soil</i>				
<i>All maintenance vehicles must be checked for leaks and serviced on a regular basis</i>				
<i>Any spillage must be dealt with rapidly and in the most appropriate manner</i>				
<i>No washing of vehicles must take place on site</i>				
<i>Dumping of solid waste in natural areas, including cigarette butts and litter by maintenance staff must be prohibited</i>				
<i>Appropriate solid waste disposal and ablution facilities must be provided for operational staff</i>				
<i>Adequate prevention and safety measures must be in place to avoid leaks to batteries. This includes regular maintenance and replacement of batteries in a timeous manner. Measures must be in place to prevent chemicals leaking into the soil, should damage to the battery occur</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-12	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive</i>	Slightly Detrimental	Likely

		<i>or vulnerable systems or communities are negatively affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-24	low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(iii) Indirect Impacts – Disturbance and displacement of fauna

Security lights for SPH9 during the operational phase will result in an increase in artificial lighting. This will disturb the fauna utilising the surrounding grassland adjacent to the facility, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance.

The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-386: SPH9 Disturbance and displacement of fauna – natural grassland

DISTURBANCE AND DISPLACEMENT OF FAUNA – NATURAL GRASSLAND				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Disturbance to and displacement of fauna – natural grassland</i>			
CUMULATIVE IMPACT	<i>Displacement of fauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	2
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-32	Moderate negative		
PROPOSED MITIGATION MEASURES				
<i>Operations during the night must be avoided to minimise the need for artificial lighting and to reduce the impact of light and noise on nocturnal animals</i>				
<i>Lighting during operations should be avoided as far as possible. Where required, lighting must not include those that fall within the white spectrum or emit ultra-violet light such as high-pressure sodium or mercury lamps. Light that is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects, such as low-pressure sodium lamps, is preferred</i>				
<i>Upward lighting must be avoided to minimise light pollution. Light can be restricted by fitting shields that direct the light below the horizontal plane, at preferably an angle less than 70 degrees. Limiting the height of lighting columns and directing light at a low level reduces the ecological impact of the light</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1

EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(j) Traffic Impact

During the operational phase there will be approximately 8 full time employees on site. Vehicles would access the site for daily operations and maintenance as and when required. The impacts are rated the same for both battery technology alternatives for the BESS.

Table 7-387 SPH9: Traffic impacts during operation phase

TRAFFIC IMPACTS				
PROJECT PHASE	<i>Operational Phase</i>			
DIRECT IMPACT	<i>Traffic congestion due to the trips generated by the operation of the facility</i>			
INDIRECT IMPACT	<i>The associated noise and dust pollution</i>			
CUMULATIVE IMPACT	<i>Traffic delays on the surrounding road network</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Staff and maintenance trips should occur outside of peak traffic periods; and</i>				
<i>Client/Facility Manager is to ensure that regular maintenance of gravel roads (located within the site boundary, including the access road to the site) occurs during operation phase to minimise/mitigate dust pollution.</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

7.9.5 Decommissioning Phase

Upon completion of the operational phase of the project which will last in excess of 20 years the facilities may be decommissioned. Decommissioning activities would entail removal of infrastructure from site and return of the site to a state similar to the pre-construction condition. The decommissioning impacts would not vary significantly between facilities and so all seven facilities are covered **Section 7.7**.

7.9.6 No-Go Alternative

The no-go alternative refers to the option of not developing the facility. The impact assessment for the no-go alternative is the same for all 7 facilities and is covered in **Section 7.8**.

7.9.7 Cumulative Impacts

The cumulative impact considers the development of all seven Springhaas solar PV facilities in addition to the other projects which are proposed within 30km of the facility.

The cumulative impacts were rated the same for each of the 7 solar PV facilities. The cumulative impact assessment is available in **Section 7.9**.

Table 7-388: SPH9 impact summary

Impact	Nature	Rating pre-mitigation	Rating post mitigation
Design/Planning/Pre-Construction Phase			
No impacts identified			
Construction Phase			
Agricultural impacts			
Land use change from livestock farming to energy generation	Negative	Moderate	Low
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance and water quality impacts	Negative	Moderate	Low
Avifaunal impacts			
Destruction of bird habitat during construction	Negative	Moderate	Low
Disturbance of birds during construction	Negative	Very low	Very low
Bat impacts			
Bat habitat modification	Negative	Very low	Very low
Disturbance and displacement of bats	Negative	Very low	Very low
Possible roost disturbance	Negative	Low	Very low
Bat roost destruction	Negative	Low	Very low
Botanical impacts			
Loss of vegetation	Negative	Medium	Low

Groundwater impacts			
Lowering of the groundwater level due to over abstraction for construction phase (only applicable if abstraction takes place)	Negative	Low	Very low
Contamination of groundwater as a result of accidental oil spillages or fuel leakages	Negative	Very low	Very low
Heritage impacts			
Impact on archaeological sites	Negative	Very low	Very low
Impact on graves	Negative	Low	Very low
Impact on cultural landscape	Negative	Low	Low
Palaeontological impacts			
Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-economic impacts			
Stimulation of the economy during construction	Positive	Low	Low
Employment opportunities	Positive	Low	Low
Reduction in land available for productive farming	Negative	Very low	Very low
Loss of property	Negative	Low	Very low
Terrestrial biodiversity and animal species (faunal) impacts			
Destruction of faunal habitat	Negative	High	Low
Injury or death to fauna	Negative	Moderate	Very low
Disturbance and displacement of fauna	Negative	Low	Very low
Pollution and contamination of natural areas	Negative	Moderate	Very low
Increased potential of invasion by alien vegetation	Negative	Moderate	Very low
Traffic impacts			
Traffic congestion	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Moderate	Low
Industrialisation of the landscape as seen from local roads	Negative	Very low	Very low
Industrialisation of the landscape as seen from local homesteads	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
Operational Phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Low
Soil pollution	Negative	Very low	Very low
Aquatic impacts			
Increased run-off, pollution	Negative	Very low	Very low
Aquatic			
Disturbance of aquatic habitat; water quality impacts	Negative	Very low	Very low
Avifauna impacts			
Bird fatality through interaction with infrastructure	Negative	Very low	Very low
Nesting and use of other infrastructure by birds	Positive	Very low	Very low
Bat impacts			
Disturbance and displacement	Negative	Very low	Very low

Roost disturbance	Negative	Low	Very low
Botanical impacts			
Loss of vegetation	Negative	Very low	Very low
Groundwater impacts			
Lowering of the groundwater level due to over abstraction for operational phase (only applicable if abstraction takes place).	Negative	Low	Very low
Contamination of groundwater from use of cleaning agents	Negative	Low	Very low
Contamination of groundwater from leaks or spills from BESS	Negative	Low	Very low
Heritage impacts			
Impact on cultural landscape	Negative	Low	Low
Socio-economic impacts			
Economic stimulation during operations	Positive	Low	Moderate
Employment opportunities	Positive	Low	Low
Improved service delivery	Positive	Moderate	Moderate
Reduction in land available for productive farming	Negative	Very low	Very low
Terrestrial biodiversity and animal species			
Injury or death of fauna	Negative	Low	Very low
Pollution and contamination of natural areas including pans and wetlands	Negative	High	Low
Disturbance and displacement of fauna –natural grassland and rocky outcrops	Negative	Moderate	Very low
Traffic impact			
Traffic congestion	Negative	Very low	Very low
Palaeontological impacts			
Destruction of fossils	NA	NA	NA
Decommissioning phase			
Agricultural impacts			
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result of soil pollution	Negative	High	Very low
Aquatic impacts			
Disturbance of aquatic habitat, water quality impacts	Negative	Very low	Very low
Avifaunal impacts			
Disturbance of birds	Negative	Very low	Very low
Bat impacts			
Disturbance and displacements	Negative	Very low	Very low
Botanical impacts			
Loss of vegetation	Negative	Low	Low
Groundwater			
Contamination from construction activities	Negative	Very low	Very low
Heritage impacts			
Alteration of the rural landscape character through the presence of construction equipment and vehicles and all the associated activities on site	Negative	Low	Very low
Palaeontological impacts			

Destruction of fossils	Negative/ Positive	Very low (negative)	Very low (positive)
Socio-Economic impacts			
Impact on the economy	Positive	Very low	Very low
Creation of temporary employment opportunities in the local and regional economy	Positive	Very low	Very low
Terrestrial biodiversity and animal species			
Destruction of novel ⁹ faunal habitat (i.e. grassed areas under the panels where fauna may recolonise after construction)	Negative	Moderate	Very low
Injury or death to animals (due to collisions with construction vehicles or destruction of burrows that have established under the panels)	Negative	Moderate	Very low
Pollution and contamination of natural areas including pans and wetlands	Negative	High	Very low
Disturbance to and displacement to fauna and edge effects – natural grassland	Negative	Low	Very Low
Increased potential of invasion by alien vegetation	Negative	Moderate	Very low
Reestablishment of movement corridors through the landscape due to removal of fences and return to open grassland	Negative	Very low	Low positive
Traffic impacts			
Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site	Negative	Very low	Very low
Landscape and visual impacts			
Landscape change	Negative	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	Very low	Very low
Industrialisation of the landscape as seen from local roads	Negative	Very low	Very low
Industrialisation of the landscape as seen from local homesteads	Negative	Moderate	Very low
Light pollution	Negative	Moderate	Very low
No-Go Alternative			
Agricultural	Negative	Very low	Very low
Aquatic	Negative	-	Very low-negligible
Avifauna	Negative	Very low	Very low
Bats	Negative	Very low	Very low
Botanical	Negative	Low	Low
Heritage	Negative	Very low	Very low
Transport- Traffic congestion	Negative	Very Low	Very Low
Terrestrial biodiversity and animal species	Negative/ positive	Low negative	Very low positive
Socio-economic	NA- no impact, forgone + impacts	NA	NA
Destruction of fossils	NA	NA	NA
Landscape and Visual	Negligible	No impact/NA	No impact/NA
Groundwater Impacts	Negligible	NA	NA
Cumulative impacts			

⁹ Novel habitats are human-built, modified, or engineered niches in places that have been altered in structure and function by human activity

Agricultural	Negative	Very low	Very low
Aquatic	Negative	Low	Low
Avi-fauna	Negative	Moderate	Moderate
Bats	Negative	Low	Low
Botanical	Negative	Very low	Very low
Heritage	Negative	Moderate	Low
Socio-economic - Impact on the economy- construction	Positive	-	Moderate
Socio-economic -Creation of employment during construction	Positive	-	Moderate
Socio-economic -Reduction in land available for productive farming	Negative	-	Low
Socio-economic -Stimulation of the economy – operations	Positive	-	Moderate
Socio-economic -Employment - operations	Positive	-	Moderate
Socio-economic -Improved municipal service delivery	Positive	-	Moderate
Socio-economic -Loss of property	Negative	-	Low
Socio-economic - Stimulation of economy - decommissioning	Positive	-	Very low
Terrestrial biodiversity	Negative	High	Moderate
Transport	Negative	Low	Very Low
Landscape and visual	Negative	-	Low
Destruction of fossils	NA	NA	NA
Groundwater: Aquifer system and water quality	Negative	Low- Very Low	Low – Very Low

7.10 Decommissioning Phase

Upon completion of the operational phase of the project which will last in excess of 20 years the facilities may be decommissioned. Decommissioning activities would entail removal of infrastructure from site and return of the site to a state similar to the pre-construction condition. The decommissioning impacts would not vary significantly between facilities and so all seven facilities are covered by the impact ratings in this section unless specified otherwise.

(a) Agricultural Impacts

Potential impacts to agriculture during the decommissioning phase would be similar to those in the construction phase namely, soil loss due to erosion, impaired soil functionality and health from compaction and soil pollution. The impacts are rated the same for both location alternatives for the electrical infrastructure compound and the battery technology alternatives for the BESS.

Table 7-389: Impact of decommissioning phase activities on agriculture

Impact	Nature	Pre-mitigation significance	Post mitigation significant
Soil loss through erosion	Negative	Moderate	Very low
Impaired soil functionality caused by compaction	Negative	Moderate	Very low
Impaired soil health as a result	Negative	High	Very low

of soil pollution			
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(b) Aquatic Impact

Potential impacts of aquatic ecology during the decommissioning phase would be similar to those in the construction phase. Water quality and flow related risks would be lower than those experienced during the construction phase. The impacts are rated the same for both location alternatives for the electrical infrastructure compound and the battery technology alternatives for the BESS.

Table 7-390 SPH1 Aquatic ecology impacts during decommissioning phase

AQUATIC ECOSYSTEM IMPACTS				
PROJECT PHASE	<i>Decommission Phase</i>			
DIRECT IMPACT	<i>Disturbance of aquatic habitat; water quality impacts</i>			
INDIRECT IMPACT	<i>Alien vegetation invasion in aquatic features</i>			
CUMULATIVE IMPACT	<i>Degradation of the ecological condition of aquatic ecosystems</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-4	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-4	very low negative		
PROPOSED MITIGATION MEASURES				
<i>The decommissioning activities should be limited to existing disturbed areas.</i>				
<i>Disturbed areas may need to be rehabilitated and revegetated</i>				
<i>Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.</i>				
<i>During the decommission phase, site management must be undertaken and should specifically address prevention of pollution measures from any potential pollution sources such as hydrocarbon spills.</i>				
<i>Any stormwater that does arise during decommissioning must be handled appropriately to trap sediments and reduce flow velocities where necessary.</i>				
<i>Minimal disturbance to the topography and cover vegetation in these areas is recommended.</i>				
<i>All waste materials arising from the decommissioning of the facilities should be removed to a suitable disposal site.</i>				
AQUATIC ECOSYSTEM IMPACTS				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	-2	1
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and</i>	Negligible	Unlikely

		<i>processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-2 very low negative			
CONFIDENCE LEVEL				
<i>High</i>				

(c) Avifaunal Impact

The impacts during the decommissioning of SPH1 will only be that of disturbance of birds, already assessed. The impacts of decommissioning will have the same rating as disturbance during the construction (**Table 7-14**) and are not repeated here. The same mitigation measures would be applied during the decommissioning phase. The impact is rated as very low negative pre and post mitigation.

(d) Bats Impact

The impacts to bats during this phase are likely to be restricted to disturbance and displacement effects. Provided decommissioning activities are restricted to daylight hours, the impact to bats should be very low.

Table 7-391 SPH1: Impacts on possible disturbance & displacement effects during decommissioning

IMPACT ON POSSIBLE DISTURBANCE & DISPLACEMENT EFFECTS				
PROJECT PHASE	<i>Decommissioning phase</i>			
DIRECT IMPACT	<i>Disturbance of bats during decommissioning activities</i>			
INDIRECT IMPACT	<i>Displacement</i>			
CUMULATIVE IMPACT	<i>Unavailability of suitable foraging resources in the broader environment for displaced individuals</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months to 5 years and as such is rated as Medium term</i>	-6	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-6	Very low negative		
PROPOSED MITIGATION MEASURES TO BE INCLUDED IN THE EMPr				
<i>Limit decommissioning activities to daylight hours only and minimise lighting at night, as far as possible</i>				
POST-MITIGATION				
DURATION	3	<i>The duration of the activity associated with the impact will last 18 months to 5 years and as such is rated as Medium term</i>	-6	1
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural,</i>	Negligible	Unlikely

			<i>cultural and social functions and processes are minimally affected</i>	
IMPACT ON IRREPLACEABLE RESOURCES	1		<i>Irreplaceable resources will be impacted.</i>	
SIGNIFICANCE	-6	Very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(e) Botanical Impacts

Botanical impacts during the decommissioning phase mainly relate to vehicular traffic on site but it is not anticipated that the decommissioning phase impact would be higher than the construction phase impact. The decommissioning phase impacts would not be affected by any of the proposed the layout alternatives or technology alternative for the BESS. Decommissioning phase impacts are rated as low negative pre and post mitigation.

(f) Groundwater Impact

The main risk associated with groundwater contamination during the decommissioning phase of the proposed SPH1 lies with construction vehicles and heavy machinery which may be required on-site. Therefore the decommissioning phase has the same risks and mitigation measures as the construction phase (**Table 7-21**). The impact is rated as very low negative pre and post mitigation.

(g) Heritage Impact

(i) Impacts to the cultural landscape

Decommissioning phase impacts relate to the presence in the rural landscape of construction equipment and vehicles, as well as to all the expected activity. Impacts to the cultural landscape will occur during the decommissioning phase and last as long as decommissioning lasts (anticipated to be up to about 12 months). Because of the flat terrain, the impacts would not be experienced over great distances because intervening vegetation and buildings would offer partial screening. Nonetheless, the immediately surrounding area will experience a considerable change in landscape character and sense of place. The impact significance is rated to low negative before mitigation. Mitigation measures essentially only involve best practice measures such as minimising decommissioning duration and ensuring that full and effective rehabilitation takes place with the present land use being reinstated. Because of the return to the current rural landscape, these measures are expected to lower the significance to very low negative after mitigation (**Error! Reference source not found.**). There are no cumulative impact concerns. There are no fatal flaws in decommissioning phase terms of impacts to the landscape.

Table 7-392: Assessment of decommissioning phase impacts to the cultural landscape for

CULTURAL LANDSCAPE IMPACTS	
PROJECT PHASE	<i>Decommissioning Phase</i>

DIRECT IMPACT	<i>Alteration of the rural landscape character through the presence of construction equipment and vehicles and all the associated activities on site</i>			
INDIRECT IMPACT	<i>None</i>			
CUMULATIVE IMPACT	<i>Impacts will be greater with multiple facilities being decommissioned at once</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-10	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-30	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Keep decommissioning period as short as possible.</i>				
<i>Remove all facilities and foundations and rehabilitate all areas on completion of decommissioning.</i>				
<i>Reinstate the present land use (grazing and/or agriculture).</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-15	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

(h) Palaeontological Impact

The palaeontological impacts during the decommissioning phase (**Table 7-25**) would be the same as those identified during the construction phase and relate to destruction of fossils. The impact is rated as very low negative pre-mitigation and very low positive post mitigation.

(i) Socio-Economics Impacts

The decommissioning of each of the Springhaas Solar PV facilities would generate a temporary increase in stimulation to the local economy through the creation of employment

opportunities. The proposed layout and technology alternatives would not impact on the rating of this impact.

Table 7-393: Assessment of impact on the economy during the decommissioning phase

IMPACT ON ECONOMY				
PROJECT PHASE	<i>Decommissioning Phase</i>			
DIRECT IMPACT	<i>Temporary increase in production and GDP in the local economy</i>			
INDIRECT IMPACT	<i>Improved household income and increased business sales in the local economy</i>			
CUMULATIVE IMPACT	<i>Temporary increase in production and GDP in the regional economy</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	4	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	12	very low positive		
PROPOSED MITIGATION MEASURES				
<i>No mitigations proposed</i>				

As no mitigation measures are proposed the impact would remain a very low positive impact.

Table 7-394: Assessment of impact on employment – decommissioning phase

CREATION OF EMPLOYMENT AND INCREASED HOUSEHOLD INCOME DURING DECOMMISSIONING				
PROJECT PHASE	<i>Decommissioning Phase</i>			
DIRECT IMPACT	<i>Creation of temporary employment opportunities in the local and regional economy</i>			
INDIRECT IMPACT	<i>Improved income of households whose member are employed on the project</i>			
CUMULATIVE IMPACT	<i>Creation of permanent employment opportunities in the region</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	1	<i>The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary</i>	4	3
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Negligible	Definite

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.	
SIGNIFICANCE	12	very low positive	
PROPOSED MITIGATION MEASURES			
No mitigations proposed			

As no mitigation measures are proposed the impact would remain a very low positive impact.

(j) Terrestrial Biodiversity

The impacts on terrestrial biodiversity during decommissioning would be similar to the construction phase impacts. A positive impact will be removal of fences and return of land back to open habitat (current condition/ land use).

Table 7-395: Possible impacts on terrestrial biodiversity from the decommissioning of the solar PV facility

Possible Impact	Applicable Facility	Significance Rating	
		Pre-mitigation	Post-mitigation
Destruction of novel ¹⁰ faunal habitat (i.e. grassed areas under the panels where fauna may recolonise after construction)	ALL	Moderate negative	Very low negative
Injury or death to animals (due to collisions with construction vehicles or destruction of burrows that have established under the panels)	ALL	Moderate negative	Very low negative
Pollution and contamination of natural areas including pans and wetlands	ALL	Moderate negative	Very low negative
Disturbance to and displacement to fauna and edge effects – natural grassland	SPH1, SPH3, SPH6, SPH8, SPH9	Low negative	Very low negative
Disturbance to and displacement to fauna and edge effects – natural grassland and rocky outcrops	SPH4, SPH5	Moderate negative	Low negative
Increased potential of invasion by alien vegetation	ALL	Moderate negative	Very low negative
Reestablishment of movement corridors through the landscape due to removal of fences and return to open grassland	ALL	Very low negative	Low positive

(k) Traffic Impact

The traffic impacts during the decommissioning phase would be similar in nature to those experienced during the construction phase and relate to increase in vehicles accessing the site.

¹⁰ Novel habitats are human-built, modified, or engineered niches in places that have been altered in structure and function by human activity

The traffic generated during the decommissioning phase will result in a negative impact on the surrounding road network. It must be noted that the impact will be less than the construction phase.

Table 7-396: SPH1 traffic Impact rating, decommissioning phase

TRAFFIC IMPACT				
PROJECT PHASE	<i>Decommissioning phase</i>			
DIRECT IMPACT	<i>Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site</i>			
INDIRECT IMPACT	<i>Construction traffic on roads might generate dust and noise.</i>			
CUMULATIVE IMPACT	<i>Traffic delays on the surrounding road network.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-1 0	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-10	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Stagger component delivery to site;</i>				
<i>Reduce the construction period (if possible);</i>				
<i>Dust suppression of gravel roads (internal gravel roads and the access road to the site) during the construction phase, as required.</i>				
<i>Regular maintenance of gravel roads (internal gravel roads and the access road to the site) by the Contractor during the construction phase.</i>				
<i>The use of mobile batching plants and quarries in close proximity to the site (if available and feasible); and Staff and general trips should occur outside of peak traffic periods.</i>				
POST-MITIGATION				
DURATION	2	<i>The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term</i>	-5	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-5	very low negative		
CONFIDENCE LEVEL				
<i>Medium</i>				

(l) Landscape and Visual

The impact of decommissioning would be similar to construction-phase and so the impact tables in section apply here and will not be duplicated. It should be noted that the impacts identified will all gradually increase from the current situation to the impact level indicated during the construction phase, be consistent at the impact levels indicated during the operational phase and decrease again from the levels indicated to close to the current situation during the decommissioning phase.

Possible Impact	Nature	Applicable Facility	Significance Rating	
			Pre-mitigation	Post-mitigation
Landscape change	Negative	SPH3	Moderate	Low
Industrialisation of the landscape as seen from Nielsview Nature Reserve	Negative	SPH3	Very low	Very low
Industrialisation of the landscape as seen from local roads	Negative	SPH3	Moderate	Very low
Industrialisation of the landscape as seen from local homesteads	Negative	SPH3	Moderate	Very low
Light pollution	Negative	SPH3	Moderate	Very low

7.11 No-Go Alternative

The no-go alternative refers to the option of not developing the facility. The impact assessment for the no-go alternative is the same for all 7 facilities. The No-go alternative has also been assessed, noting that the property does hold existing development rights and so, not developing the proposed solar PV facilities does not necessarily mean that there would be no changes or impacts on the site.

7.11.1 Agricultural Impact

The no-go option would mean that current agricultural activities continue on the site.

Table 7-397: Impact significance of the no-go alternative on the current land use (livestock farming)

NO CHANGE IN CURRENT LAND USE (LIVESTOCK FARMING)				
PROJECT PHASE	-			
DIRECT IMPACT	<i>Livestock farming will continue as it currently is.</i>			
INDIRECT IMPACT	<i>No indirect impacts.</i>			
CUMULATIVE IMPACT	<i>No cumulative impacts</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	0	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	0	<i>Negligible</i>	<i>Negligible</i>	<i>Definite</i>

IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
<i>No mitigation measures are required</i>				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	0	3
EXTENT	2	The extent of the impact is rated as site as it will affect only the development area		
SEVERITY	0	Negligible	Negligible	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
<i>High</i>				

7.11.2 Aquatic Impacts

The no-go impact on aquatic ecosystems is rated as very low to negligible.

7.11.3 Avifauna

The no-go alternative would not result in any new impacts on birds. The current agricultural activities on site do impact on avifauna but birds have evolved to co-exist and the site is not intensively being farmed.

Table 7-398: No-go impact on avifauna

HABITAT DESTRUCTION AND DISTURBANCE IMPACTS ON BIRDS THROUGH THE NO-GO ALTERNATIVE OR STATUS QUO - WHICH IS FARMING				
PROJECT PHASE	<i>Ongoing, operational</i>			
DIRECT IMPACT				
INDIRECT IMPACT	<i>Once arable lands are established, as is the case on this site, farming does not cause much habitat destruction. Minor disturbance is ongoing</i>			
CUMULATIVE IMPACT	<i>The broader area is farmed in the same way as the site, so farming cumulatively has a considerable influence on avifauna</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	very low negative		
PROPOSED MITIGATION MEASURES				
<i>None</i>				

POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	1
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	-7	very low negative		
CONFIDENCE LEVEL				
High				

7.11.4 Bats

The impact of the no-go alternative on bats would be a continuation of the status quo on sites and existing impacts would continue to affect bats.

Table 7-399: No-go alternative - bats

IMPACT OF POSSIBLE NO-GO ALTERNATIVE				
PROJECT PHASE	No project phase is applicable in the event that the facility is not constructed			
DIRECT IMPACT	No impacts are anticipated in the event that the facility is not constructed			
INDIRECT IMPACT	No impacts are anticipated in the event that the facility is not constructed			
CUMULATIVE IMPACT	No additional impacts are perceived to exist or contribute towards existing impacts from nearby projects			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	1	The duration of the activity associated with the impact will last 0-6 months and as such is temporary	0	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	0	Negligible	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
PROPOSED MITIGATION MEASURES				
No mitigation required in the event that the facility is not constructed.				
POST-MITIGATION				
DURATION	1	The duration of the activity associated with the impact will last 0-6 months and as such is temporary	0	1
EXTENT	1	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur		
SEVERITY	0	Negligible	Negligible	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	No irreplaceable resources will be impacted.		
SIGNIFICANCE	0	very low negative		
CONFIDENCE LEVEL				
High				

7.11.1 Botanical Impacts

The no-go alternative would result in no changes to the status quo. The land would remain in the same natural state and any changes to occur would be attributed to agriculture and external factors such as climate change. The no-go alternative is rated as low negative.

7.11.2 Heritage Impacts

Heritage impacts, destruction of archaeological sites and graves and alternation of the cultural landscape may occur during continuation of agricultural activities on site.

Table 7-400: Heritage no-go impact

IMPACT OF POSSIBLE NO-GO ALTERNAIVE				
PROJECT PHASE	N/A			
DIRECT IMPACT	<i>Destruction of archaeological sites and graves and alternation of the cultural landscape</i>			
INDIRECT IMPACT	None			
CUMULATIVE IMPACT	None expected			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as long term</i>	-6	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected.</i>	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-12	<i>very low negative</i>		
PROPOSED MITIGATION MEASURES				
<i>No mitigation required in the event that the facility is not constructed.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last 0-6 months and as such is temporary</i>	-6	2
EXTENT	1	<i>The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur</i>		
SEVERITY	-1	<i>The severity of the impact is rated as low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected.</i>	Negligible	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	12	<i>very low negative</i>		
CONFIDENCE LEVEL				
High				

Note that there would be no impact on palaeontology/ fossils associated with the no-go phase.

7.11.3 Socio-Economic

The no-go alternative option would mean that current farming activities would continue. No stimulation of the local economy in terms of GDP and employment opportunities would occur if the no-go option is chosen.

7.11.4 Terrestrial Biodiversity and Animal Species

Existing impacts in the study area include farm roads and tracks (which are sparsely distributed), fences, past ploughing (old fields), cultivated fields, grazing (moderate to low pressure), and areas where cattle tend to congregate, such as at water points, and trample the ground. Alien trees occur around the disturbed areas such as farm buildings. A few powerlines bisect the landscape and join a substation approximately 4 km to the north.

Table 7-401: No-go alternative on faunal and terrestrial biodiversity

NO-GO ALTERNATIVE				
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	3
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted</i>		
SIGNIFICANCE	-21	low - negative		
PROPOSED MITIGATION MEASURES				
<i>Farm roads must remain limited to existing tracks</i>				
<i>Grazing pressure must be carefully managed and overstocking of livestock avoided</i>				
<i>Cows must not be allowed to congregate in the natural pans</i>				
<i>Cultivation must remain within the currently or previously ploughed areas</i>				
<i>Invasive alien plants removed from the site and the further establishment and spread controlled</i>				
<i>All barbed wire on the lower rung of the fences should be removed or replaced with non-barbed wire to allow animals to move under without harm</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	7	2
EXTENT	2	<i>The extent of the impact is rated as site as it will affect only the development area</i>		
SEVERITY	1	<i>The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved</i>	Slightly Beneficial	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	14	very low positive		

CONFIDENCE LEVEL
<i>Medium</i>

7.11.1 Transport

The no-go alternative would mean that the negative impacts on the surrounding road network associated with the construction and decommissioning phases would not occur.

Table 7-402L No-go alternative impact on transport

TRAFFIC IMPACT				
PROJECT PHASE	N/A			
DIRECT IMPACT	<i>Traffic congestions</i>			
INDIRECT IMPACT	<i>Traffic on roads might generate dust and noise.</i>			
CUMULATIVE IMPACT	<i>Traffic delays on the surrounding road network.</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as long term</i>	-7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>	<i>Slightly detrimental</i>	<i>Unlikely</i>
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-7	<i>very low negative</i>		
PROPOSED MITIGATION MEASURES				
<i>None</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-7	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>	<i>Slightly detrimental</i>	<i>Unlikely</i>
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>		
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-7	<i>very low negative</i>		
CONFIDENCE LEVEL				
<i>Medium</i>				

7.11.2 Landscape and Visual

The no-go alternative could result in a limited number of additional agricultural buildings being developed. This is rated as negligible.

7.11.3 Groundwater

The no-go alternative would involve the continuation of farming activities on site. Groundwater extraction would continue for agricultural activities.

7.12 Cumulative Impacts

The cumulative impact considers the development of all seven Springhaas solar PV facilities in addition to the other projects which are proposed within 30km of the facility.

The cumulative impacts were rated the same for each of the 7 solar PV facilities. The impact assessment below therefore apply to all facilities. The proposed technology alternatives and location alternative do not affect the cumulative impact assessment.

7.12.1 Agricultural Impact

The cumulative impact on agriculture relates the cumulative conversion of agricultural land to other uses.

Table 7-403: Cumulative impact of conversion of grazing land to other land uses

CONVERSION OF GRAZING LAND INTO OTHER LAND USES				
PROJECT PHASE	<i>Construction Phase but continues through all project phases</i>			
CUMULATIVE IMPACT	<i>Increase in areas where agriculture is converted into other land uses</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-2	<i>The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</i>	Moderately Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-16	very low negative		
PROPOSED MITIGATION MEASURES				
<i>Each project must remain within the authorised development area.</i>				

Any future additions of infrastructure components must either be located within the development area boundaries or otherwise in very close proximity to existing projects' areas.

POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-8	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</i>	Slightly Detrimental	Unlikely
IMPACT ON IRREPLACEBLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-8 very low negative			
CONFIDENCE LEVEL				
<i>High</i>				

7.12.2 Aquatic Impacts

The cumulative impact on aquatic ecosystem is likely to be low if mitigated.

7.12.3 Avifauna

The cumulative impact of the solar PV facilities on avifauna of greatest concern is habitat destruction. The cumulative impact of habitat destruction is considered to be of moderate negative significance. The impact assessment methodology used provides an output of low negative. The avifauna specialist has however rated the impact as **moderate negative significance**.

7.12.4 Bats

Cumulative impacts on bats are difficult to predict but would most likely relate to modification of habitat, disturbance and displacement effects and roost disturbance and destruction.

Table 7-404: Cumulative impact on bats

CUMULATIVE IMPACT OF THE FACILITY ON BATS				
PROJECT PHASE	<i>Construction, operation and decommissioning phase</i>			
DIRECT IMPACT	<i>Modification of habitat, disturbance and displacement effects and roost disturbance and destruction</i>			
INDIRECT IMPACT	<i>Decreased availability of resources to support the regional bat population and potential mortality</i>			
CUMULATIVE IMPACT	<i>All direct and indirect impacts as listed above, in the broader region</i>			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-27	2
EXTENT	4	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Extremely detrimental	Likely
IMPACT ON IRREPLACEABLE RESOURCES	1	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-54	Moderate - negative		
PROPOSED MITIGATION MEASURES				
<i>Although impacts cannot be eliminated, they may potentially be able to be managed (or possibly reduced) by completely avoiding high sensitivity areas, as well as medium sensitivity areas (as far as possible). With current layouts under consideration no infrastructure is noted to overlap with high sensitivity areas. Should any changes or expansions take place to the boundaries of the relevant facilities, as indicated in the fence lines, a bat specialist must provide input to confirm that these changes are acceptable in terms of avoidance of high sensitivity areas. For SPH4 however, any changes to the layout would require input from a suitable bat specialist. Some medium sensitivity overlap is noted. These areas are recommended to be avoided as far as possible. However, if these areas are not avoidable, all movement and noise (as a result of construction, operation and maintenance activities) should be limited to daylight hours only.</i>				
<i>All relevant construction, operational, maintenance and decommissioning activities should be limited to the assessed project footprint only.</i>				
<i>All construction and decommissioning activities should be restricted to daylight hours.</i>				
<i>All lighting should be minimised at night, with low pressure sodium and warm white LED lights being used.</i>				
<i>Prior to construction (after preferred bidders status has been awarded), a bat specialist should conduct a site walkthrough to identify any potential additional sensitive habitats, to confirm the baseline environment, if construction does not take place within 5 years of the initial bat study.</i>				
<i>Following construction and decommissioning phases, rehabilitation of all disturbed areas must be undertaken and restored back to their present baseline state.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-27	1
EXTENT	3	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-3	<i>The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</i>	Extremely y detrimental	Likely

IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-54	Moderate - negative		
CONFIDENCE LEVEL				
High				

7.12.5 Botanical Impacts

The cumulative botanical impacts are rated as very low negative due to the wide range of the Dry Grassland Biome and the high receptor resilience. This impact is rated as Very Low Negative.

7.12.6 Heritage Impact

Table 7-405: Cumulative impacts on heritage resources

CUMULATIVE IMPACT ON HERITAGE RESOURCES				
PROJECT PHASE	All phases			
DIRECT IMPACT	Destruction of archaeological sites and graves and alteration of cultural landscape			
INDIRECT IMPACT				
CUMULATIVE IMPACT	With multiple development in a small area there is the potential to lose a larger number of heritage resources and for the landscape to be overwhelmingly altered.			
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-16	3
EXTENT	3	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-2	The severity of the impact is rated as moderate negative as the affected environment is altered but natural, cultural or social functions and processes continue albeit in a modified way; and valued important sensitive or vulnerable systems or communities are negatively affected.	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	1	Irreplaceable resources will be impacted.		
SIGNIFICANCE	-48	moderate- negative		
PROPOSED MITIGATION MEASURES				
Avoid or sample archaeological sites as needed.				
Avoid and protect graves.				
Minimise construction periods.				
Ensure effective rehabilitation of any areas not needed during operation and after decommissioning.				
POST-MITIGATION				
DURATION	4	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term	-7	3
EXTENT	2	The extent of the impact is rated as Local as it affects the development area and adjacent properties		
SEVERITY	-1	The severity of the impact is rated as moderate negative as the affected environment is altered but natural, cultural or	Slightly detrimental	Definite

			<i>social functions and processes continue albeit in a modified way; and valued important sensitive or vulnerable systems or communities are negatively affected.</i>	
IMPACT ON IRREPLACEABLE RESOURCES	ON	1	<i>Irreplaceable resources will be impacted.</i>	
SIGNIFICANCE		-21	low - negative	
CONFIDENCE LEVEL				
<i>High</i>				

Note that there would be no cumulative impacts in terms of paleontological resources.

7.12.7 Socio-Economic

The following cumulative impacts from a socio-economic perspective may occur.

Table 7-406: Socio-economic cumulative impacts

Impact	Nature	Significance
Impact on the economy- construction	Positive	Moderate
Creation of employment during construction	Positive	Moderate
Reduction in land available for productive farming	Negative	Low
Stimulation of the economy – operations	Positive	Moderate
Employment - operations	Positive	Moderate
Improved municipal service delivery	Positive	Moderate
Loss of property	Negative	Low
Stimulation of economy - decommissioning	Positive	Very low

7.12.8 Terrestrial Biodiversity and Animal Species

The cumulative impact relates to the destruction of a significant area of natural grassland. In addition to the loss of grassland there is the potential for disturbance and displacement of fauna from the local area.

Table 7-407: Cumulative impacts on terrestrial biodiversity and animal species

Possible Impact	Applicable Facility	Significance Rating	
		Pre-mitigation	Post-mitigation
Loss of large natural area, increased disturbance to natural areas, environmental degradation, and loss of habitat connectivity	Cluster development	High negative	Moderate negative

7.12.9 Transport

The construction and decommissioning phases are the only project stages where significant traffic is generated. If all projects were approved and constructed at the same time the roads authority would stagger application for abnormal loads to manage the impact.

Table 7-408: Cumulative impacts – transport

CUMULATIVE IMPACT ON TRANSPORT				
PROJECT PHASE				
DIRECT IMPACT	<i>Traffic congestion and associated dust and noise pollution on the surrounding road network</i>			
INDIRECT IMPACT				
CUMULATIVE IMPACT				
DIMENSION	RATING	MOTIVATION	CONSEQUENCE	LIKELIHOOD
PRE-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-16	3
EXTENT	4	<i>The extent of the impact is rated as regional as its effects of the impact extend beyond municipal boundaries</i>		
SEVERITY	-3	<i>The severity of the impact is rated as moderate negative as the affected environment is altered but natural, cultural or social functions and processes continue albeit in a modified way; and valued important sensitive or vulnerable systems or communities are negatively affected.</i>	Moderately detrimental	Definite
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>Irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-24	low- negative		
PROPOSED MITIGATION MEASURES				
<i>Avoid or sample archaeological sites as needed.</i>				
<i>Avoid and protect graves.</i>				
<i>Minimise construction periods.</i>				
<i>Ensure effective rehabilitation of any areas not needed during operation and after decommissioning.</i>				
POST-MITIGATION				
DURATION	4	<i>The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term</i>	-24	1
EXTENT	2	<i>The extent of the impact is rated as Local as it affects the development area and adjacent properties</i>		
SEVERITY	-1	<i>The severity of the impact is rated as high negative as the affected environment is altered but natural, cultural or social functions and processes are altered to the extent that natural processes will temporarily or permanently cease; and valued, important sensitive or vulnerable systems or communities are substantially affected.</i>	Highly detrimental	Unlikely
IMPACT ON IRREPLACEABLE RESOURCES	0	<i>No irreplaceable resources will be impacted.</i>		
SIGNIFICANCE	-24	low - negative		
CONFIDENCE LEVEL				
<i>High</i>				

7.12.10 Landscape and Visual

The visual impact of the Springhaas Solar PV facilities is low to very low. As such, the facilities are anticipated to have a low contribution to the overall cumulative impact.

7.12.11 Groundwater

The cumulative impact on groundwater would be related to aspects such as long-term reduced groundwater quality and damage to the aquifer system in the area. These impacts have been noted in the impact assessment and would be low to very low, negative.

7.13 High Level Safety Health and Environmental Risk Assessment

A High Level Safety Health and Environmental Risk Assessment was undertaken for the Springhaas Solar PV facilities (**Appendix 10**). The focus of the assessment was the BESS for each facility.

7.13.1 Technology Descriptions

Two different types of storage technologies have been considered for the Springhaas PV projects:

- Vanadium Redox Flow Batteries (VRFB), and
- Solid State Lithium Batteries (SSL)

Considering that both of these systems involve the use of chemicals and may impact the environment if incorrectly handled or operated, a specialist risk assessment was undertaken to determine and assess the associated risks. This section presents the summarised results of the risk assessment (iSHEcon, 2022). This risk assessment applies to all facilities.

(a) Vanadium Redox Flow Batteries (VRFB)

The vanadium redox battery (VRB), also known as the vanadium flow battery (VFB) or vanadium redox flow battery (VRFB), is a type of rechargeable flow battery that employs vanadium ions in different oxidation states to store chemical potential energy. Most vanadium batteries are currently used for grid energy storage and there are 100+ installations globally. Some of the issues associated with these batteries include the following:

- Corrosive: They have an inherent risk in that their electrolyte is a sulphuric acid-based solution and is corrosive, but, unlike normal car batteries, they do not include lead and hence do not have lead toxicity risks. Vanadium in different forms can have relatively high toxicity, but in the electrolyte the concentration levels of Vanadium are so low that the VRB is deemed non-toxic. In addition, VRBs have a lower concentration of sulfuric acid than traditional lead-acid batteries.
- Toxic off-gassing: Overheating could however lead to toxicity through off-gassing, and in fires these batteries may release toxic gases.
- Shocks: Other risks include electrical shocks through arc flashes or blasts if the energy system cannot be “turned off”. In terms of fire risk, the electrolyte has a non-flammable property, and it is unlikely for the battery to catch fire, and there is no “thermal runaway” risk compared to other batteries.

- Hydrogen: In the case of too high voltages hydrogen can be generated as an undesirable by product. In such cases however deviations from safe operating parameters will trigger the shutdown of the system and reduce H2 generation
- Purge waste: Depending on temperate and state of charge, vanadium ions may precipitate as solids, and should the concentration of undesirable components increase in the electrolyte, a part may need to be purged and replaced with fresh electrolyte. This generates a waste.
- Leaks: Leaks may develop in any such system however their impact can be controlled through secondary containment, reliable leak detection and annunciation.

(b) Solid State Lithium Batteries

Lithium-ion batteries are becoming one of the dominant battery technologies for utility systems, and are often referred to as solid state batteries because electrolyte liquid is not freely available in a form that can easily leak or be extracted. Lithium is a light and reactive metal elements and is highly reactive towards water and oxygen. Some of the issues associated with these batteries include the following:

- Thermal decomposition: “Thermal runaway” is a process whereby the lithium salts in the battery break down exothermically cause the battery to get hotter and hotter, faster and faster which eventually leads to the build up of pressure and ultimately the battery vents by releasing fumes which can accumulate and ignite causing fires or explosions. This vented gas will typically also contain toxic compounds like hydrogen fluoride, hydrogen cyanide, and VOCs.
- Propagation: A BESS consists of individual batteries combined into packs and hence thermal runaway in one battery could lead to the heating of an adjacent battery and thereby propagate a “chain reaction” over overheating through the entire system. Separation requirements between cells modules is therefore important. This could take the forms of physical spaces or insulation.
- Leaks: Leaks from solid state batteries are extremely unlikely, but should it occur, it would be potentially flammable, and highly corrosive (due to presence of hydrofluoric acid)

7.13.2 Risk Assessment

Methodology

The detailed risk assessment that was undertaken (iSHEcon, 2022) considered risks associated with the two different battery systems and used a numerical matrix system to determine is risks were low, medium, high, or excessive. The assessment also considered the different stage of the project. The table below presents the risk matrix approach used. The rating given were also based on the assumption that the recommended mitigation measures have been implemented.

Table 7-409: Interpretation of risk rating

Risk Rating	Risk Assessment	Risk Evaluation – Management response required
21 to 25	E – Excessive	Implement urgent and immediate corrective action
13 to 20	H – High	Implement corrective action
6 to 12	M – Medium	Review existing systems
1 to 5	L – Low	Maintain existing systems

Risk assessment	Risk evaluation – management response required
E- Excessive	Implement urgent and immediate corrective action
H - High	Implement corrective action
M - Medium	Review existing systems
L – Low	Maintain existing systems

Risk Assessment Rating

The table below present the risks identified for the BESS and indication is provided as to which project phase they would occur in and to which battery technology they would be applicable. Risks were evaluated as excessive (EC), high (H), medium (M) or low (L). The ratings given were also based on the assumption that the recommended mitigation measures have been implemented. The decommissioning phase impacts are not specially presented in the table but would be similar to those identified in the construction and operational phase, but with the addition of possible chronic chemical or biological toxic exposure which may occur when batteries/ electrolyte/ equipment has reached tend of life. This impact is rated as medium.

Table -7-410: Risk assessment summary. This table summarises the Risk Assessment undertaken by iSHEcon (2022). See full report for full details.

No.	Category	Consequences	Project phase	Battery technology	Mitigation measures	Rating
1.	HEALTH					
1.1	Chronic Chemical or Biological Toxic Exposure	Illness (from materials e.g. cement, paints, solvents, welding fumes etc.).	Construction	Both VRFB and SSL	Emergency plan in place prior to construction.	L
		Skin/lung irritation (vapours from compromised battery compartments).	Operations	Both VRFB and SSL	Possible detectors with alarms. Labelling equipment. Confined spaces procedures. Operational manuals. Maintenance schedules.	M
1.2	Noise	Hearing loss (drilling, piling, due to moving parts e.g. pumps, compressors etc).	Both, but more so during construction	Both VRFB and SSL	Noise monitoring, provision of hearing protection equipment, BESS located > 500m from residence.	L - M
1.3	Environmental	Heat stroke due to high ambient temperatures. Hypothermia due to low temperatures.	Both	Both VRFB and SSL. Night work likely for VRFB	Adequate potable water. PPE to be suitable for weather conditions.	L (const) – M (ops)
1.4	Psychological	Disturbance to small communities due to influx of temporary workers.	Construction	Both VRFB and SSL	Local community involvement. Use local labour as far as possible.	M
		Low performance and productivity due to isolation and repetitive work.	Operations	Both VRFB and SSL	Performance monitoring.	L
1.5	Ergonomics	Back and other injuries (from lifting heavy equipment).	Construction	Both VRFB and SSL	First aid provision.	M
		Working at heights.	Operations	Both VRFB and SSL	Working at heights procedure. Use correct ladders/harnesses as required.	M
2	SAFETY					
2.1	Fire	Injuries. Fatalities unlikely (not highly flammable).	Construction	Both VRFB and SSL	Firefighting equipment to be on site near fuel source (e.g. tanks). Emergency plan to be in place. Hot-work permit and management system required.	M
		Contaminated run-off. Damaged equipment. Fire burns vegetation and spreads offsite.	Operations	Both VRFB and SSL	Limit vegetation in the area. Emergency plan to be in place. Fire extinguishing equipment to be on site. Fire response plan required. Separate site diesel tank, transformers etc from battery packs. Lighting protection may be needed.	M
2.2	Explosion	No credible causes .	Construction	VRFB	n/a	n/a
		Explosion due to flammable gases generated by thermal run away.	Construction	SSL	Using only one transport route to site is preferable. Emergency response plan for this route to be developed.	M

No.	Category	Consequences	Project phase	Battery technology	Mitigation measures	Rating
		Explosion from transformers shorting or overheating.	Operational	VRFB	Emergency response plan and training.	M
		Potential fatalities and damage to equipment due to thermal run away and ignition on hot surfaces, static.	Operational	SSL	Emergency response plan and training.	M
2.3	Acute chemical /biological exposure	Illness due to human pathogens and disease.	Both but lower risk during operations (fewer workers on site)	Both VRFB and SSL	Policies and practices for dealing with known diseases e.g. HIV.	M
		Discomfort, or even fatalities, from insects, snakes, plants.	Both	Both VRFB and SSL	First aid kit on site. First responders to have access to anti-venom on site.	M
		Corrosive burns due to damaged batteries, fumes, leaked electrolyte (VRFB batteries) or due to thermal runaway (SSL batteries).	Operational	Both VRFB and SSL	Training of staff in hazard response. Refer to "Fire" above.	M
2.4	Acute physical impactor violent release of energy	Injury or possibly fatality due to moving construction equipment, heavy loads, elevated loads, working at heights. Damage to equipment.	Construction	Both VRFB and SSL	Emergency response plan to be in place before construction begins.	M
		Injury (or fatality in unlikely worst case) due to moving equipment, working at heights, traffic accidents, earthquakes.	Operations	Both VRFB and SSL	Emergency response plan. Procedures for working at heights, hot work permits, confined spaces etc. Design is to consider seismic activity.	M
2.5	Generation impact	Electrocution due to use of electrical machines.	Construction	Both VRFB and SSL	Maintain equipment. Ability to shut off power on site is required.	M
		Ignition and burns due to area static	Both	Both VRFB and SSL	Correct PPE. If decanting fuels, ensure installations are to standard with regards static.	M
		Lighting strike	Both	Both VRFB and SSL	Work outside to stop during storms. Lighting conductors may be needed.	M
3	ENVIRONMENTAL					
3.1	Emissions	Adverse health impacts on staff due to dust.	Construction	Both VRFB and SSL	Dust masks (as required). Possible dampening of roads.	M
		Pollution (if not contained) and high disposal costs due to cooling water blow down, lab waste, maintenance waste, kitchen waste, sewage.	Operations	Both	Waste management plan to be in place.	M
		Fatal event due to release and accumulation of refrigerant.	Operations	Both	Alarm system in confined space. Procedure for responding to gas leaks (e.g. gas test, ventilate, do not enter alone).	M
		Excessive disposal costs for VRFB electrolyte.	Operations	VRFB	Waste management plan to be in	L

No.	Category	Consequences	Project phase	Battery technology	Mitigation measures	Rating
					place.	
3.2	Pollution	Environmental damage, particularly to groundwater, due to spills of fuels, solvents and transformer oil, sewage, and wastewater.	Construction	Both	Spill clean-up procedures to be in place before commencing.	L
		Localised damage due to spills from batteries, coolant systems, trucks, transformers, parked vehicles, fire water runoff control.	Operation	Both	Spill clean-up procedures to be in place. Spill kits to be in place.	M
3.3	Waste of resource	Delays due to uncontrolled water use.	Construction	Both	Water management plan to be in place.	M
		Battery containers damaged.	Construction	SSL	End of Life plan needs to be in place before any battery containers enter the country as there may be damaged battery units from day 1.	M
		Excessive costs due to large volumes of hazardous waste due to periodic purging of VRFBs or disposal of SSL batteries at end of life	Operations	Both	End of Life plan to be in place e.g. consider if it can be returned to the supplier.	M
4	GENERAL RISKS					
4.1	Aesthetics	Irritation to community due to surface reflecting sunlight, and tall structure in flat areas.	Both	Both	Sheeting likely to be painted, not left as reflective steel. If containerised, keep as single storey (sufficient space is available). Confirm if BESS container colour is suitable.	L
4.2	Financial	Financial loss due to defective technology, or extreme project delays.	• Both	Both	Project insurance for construction phase. Designed by experience contractors.	Low
4.3	Security	Injury or loss of equipment due to theft on site, hi-jacking on route, strikes or civil unrest.	Construction	Both	Fencing around infrastructure, night lighting.	M
		Injury or loss of equipment due to theft.	Operations	Both	Consider motion detection lights and CCTV.	M
		Ransom of the National Electricity Grid due to cyber attacks.	Operations	Both	Cyber emergency procedures should be in place prior to commissioning.	M
4.4	Emergencies	Injuries or even fatalities due to fires, explosions, toxic smoke, traffic accidents equipment failure, structural collapse.	Both	Both	Emergency procedures need to be practiced prior to commencement of construction.	M
		Injuries or even fatalities due to fires, explosions, toxic smoke from thermal runaway.	Construction	SSL	Thermal runaway to be prevented by correct transportation and storage of SSL batteries. Clear handling procedures to be in place.	M
4.5	Legal Compliance	Unknown hazards manifest due to using "cheaper supplier or less developed technology".	Both	Both	Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing.	M

7.13.3 Conclusions

The majority of the risks identified were assessed as either Low or Medium post-mitigation i.e. on the assumption that the recommended mitigation measures have been implemented. No high risks were identified, and no fatal flaws were found with the proposed VRFB or Lithium Solid-state BESS installation options.

VRFB systems do not present significant fire and arcing hazards provided they are correctly operated and maintained. Spills of corrosive, toxic electrolyte is the most significant of the possible hazards (rated as medium) that may be associated with the VRFB system. There are however many preventative design measures that will be included to prevent this, including full secondary containment, level control in tanks and leak detection.

With the SSL system, the most significant hazard is the possibility of thermal runaway and the risk of release of toxic and flammable gas and possible resulting fire or explosions. There are however a number of modern-day design features that are included into such systems to reduce this risk, and due to the containerized approach, and the good practice of separation between containers, the main risks would be limited to areas close to the containers i.e. to transport drivers, employees at the facilities and first responders to incidents. The significant impact zone of a fire and explosion would be limited to within 10m of the container, with minor impacts up to 50m in the case of an explosion. The impacts from harmful gases from toxic smoke should be low provided the units are placed suitably far apart to prevent propagation of fire between units and external fires are prevented. Considering that all the proposed BESS installations are more than 500m from any farmhouses, impacts on surrounding houses would be negligible.

The above risk assessment showed that health and safety risks associated with VRFB systems are lower than those of SSL systems, particulate in terms of fire and explosion risk. VRFB systems pose a higher short-term risk from an environmental spill point of view. From a SHE point of view when considering alternative proposed locations, all are extremely isolated and none present high risks or fatal flaws. Those furthest from watercourses or farmhouses would be preferred.

7.13.4 Recommendations

The following recommendations are made:

- Neither technology presents any safety or health fatal flaws, and the risk assessment does not show a distinct lower overall risk technology option.
- State-of-the-art battery technology should be used with all the necessary protective features e.g. draining of cells during shutdown and standby-mode, full BMS with deviation monitoring and trips, leak detection systems.
- All the preventative measures presented in the specialist risk assessment (iSHEcon, 2022) should be included in the design.
- The overall design should be subject to a full Hazop prior to finalization of the design.

- For the VRFB systems, an end of life (and for possible periodic purging requirements) solution for the large quantities of hazardous electrolyte should be investigated, e.g. can it be returned to the supplier for re-conditioning.
- Prior to bringing any solid-state battery containers into the country an Emergency Response Plan and End of Life Plan should be developed.
- The site layout and spacing between lithium solid-state containers should be such that it mitigates the risk of a fire or explosion event spreading from one container to another.
- Under certain weather conditions, the noxious smoke from a fire in a lithium battery container could travel some distance from the unit. Location of the facilities needs to ensure a suitable separation distance from public facilities/residences etc.
- Where there is a choice of alternative locations for the BESS, i.e. SPH1, the one that is further from water courses would be preferred.
- While not essential, using one consistent battery technology systems for all the BESS installations associated with the seven (7) Springhaas solar PV facilities would allow for easier training, maintenance, and emergency response in a remote location.

8 Conclusion and Recommendations

Development of seven solar PV facilities are proposed within the Kimberley REDZ, REDZ 5 near Dealesville in the Free State Province. The Integrated Resources Plan identifies the need for South Africa to diversify the energy mix and sets a targets of 17.8GW from renewable sources by 2030. The development of the seven Springhaas solar PV facilities would contribute towards South Africa achieving this target. All of the Springhaas Solar PV facilities are well located, within a REDZ and close to existing substations.

The focus of this chapter is to summarise the predicted changes to the receiving environment from the development of seven Springhaas Solar PV facilities. The focus is furthermore to provide the CA with all relevant information to provide meaning to the assessment of significance made and the resultant consequences of the project.

8.1 Environmental Impact Statement

The environmental impact statement is based on the outcomes of the draft specialist reports and findings, review of applicable document and a site visit by the EAP.

8.1.1 Springhaas Facility 1

All of the negative direct and indirect impacts identified for SPH1 can be mitigation to low or very significance post mitigation. The positive impacts relate to employment opportunities during construction (moderate positive), employment opportunities during operation (low positive). Two very low positive impacts were identified, the first is the use of infrastructure for nesting by birds and the second is a positive impact related to recovery of fossils from site (should fossils be uncovered and can be collected).

Cumulative impacts were assessed for SPH1. The cumulative impact ratings were done on the assumption that all seven Springhaas Solar PV facilities are authorised and constructed along with the other 13 solar PV facilities located within a 30km radius of the site. In reality it is unlikely that all projects would receive preferred bidder status and move forward to construction. All of the negative cumulative impacts were rated as low or very low significance with the exception of:

- **Avifauna** – the cumulative impact of the loss of avifaunal habitat was rated as moderate negative
- **Terrestrial biodiversity and animal species**- the cumulative impact of loss of large natural area, increased disturbance to natural areas, environmental degradation, and loss of habitat connectivity was rated as moderate negative.

No fatal flaws were identified for SPH1 during the impact assessment phase and all impacts can be mitigated to acceptable limits.

The site sensitivity for SPH1 can be summarised as follows:

Table 8-1: SPH1 site sensitivity overview

Theme	Site sensitivity verification	Comment
Agricultural	Low	95% of the area is considered as low sensitivity. Small pockets of moderate sensitivity are located on the site but these are surrounded by low sensitivity land and as such are not deemed viable from a production perspective.
Animal species	Medium	The majority of the footprint of SPH1 comprises of natural grassland with a highly disturbed area where buildings and infrastructure has been established in the south west corner which is rated as very low sensitivity.
Aquatic biodiversity	Low	There are no pans or wetlands within the boundary of SPH1. One drainage feature of low sensitivity is located in western section of the site. A small pan, and its 250m buffer located to the north east of the facility has been avoided by the layout.
Archaeological and cultural heritage theme	Low	No sensitive archaeological resources were identified in the footprint of SPH1.
Avian	Low - Medium	All high sensitivity area (pans and wetlands) have been avoided by the layout. There is a small pan to the north east of the facility which is considered as high sensitivity from an avifaunal perspective a 250m buffer has been applied to this pan and the layout avoids the buffer.
Bats	Low	Low sensitivity rating identified by the Screening Tool is accurate.
Floodline	-	SPH1 is located outside of the 1:100 year floodline.
Geotechnical	-	The site is suitable for the development of a solar PV facility if the recommendation in the geotechnical investigation are implemented.
Landscape/ Visual	Medium	The greater site/study area was mapped as no-go (high sensitivity), sensitive (medium sensitivity) and not sensitive (low sensitivity). There are no high sensitivity areas in SPH1. The site has been classified as a mix of low and medium sensitivity areas. The tallest components of the development (substation in the electrical infrastructure compound) which would have the greatest visual impact are located in low sensitivity area.
Palaeontology	Low	The High sensitivity predicted by the Screening Tool was

Theme	Site sensitivity verification	Comment
		shown, in reality, to be a Low sensitivity.
Plant species	Low	Low sensitivity rating identified by the Screening Tool is accurate.
Risk assessment	-	No off-site risks would be present with the development of SPH 1.
Socio-economic	-	No socio-economic sensitivities were identified which would preclude the development of SPH1.
Terrestrial biodiversity	Medium	The Very High sensitivity predicted by the Screening Tool was shown, in reality, to be a Medium to Medium-High / High sensitivity.
Transport	-	No transport sensitivities were identified. There is an existing access road network which allows access to the site.
Groundwater	Low	The site has a low groundwater vulnerability classification.



Figure 8-1: No-go areas

As can be seen from Figure 8-1 SPH1 avoids all no-go areas.

Due to a high number of environmental sensitivities on site a combined environmental sensitivities map is of limited value. A series of maps have been developed to illustrate the different sensitivities across the greater site/study area.

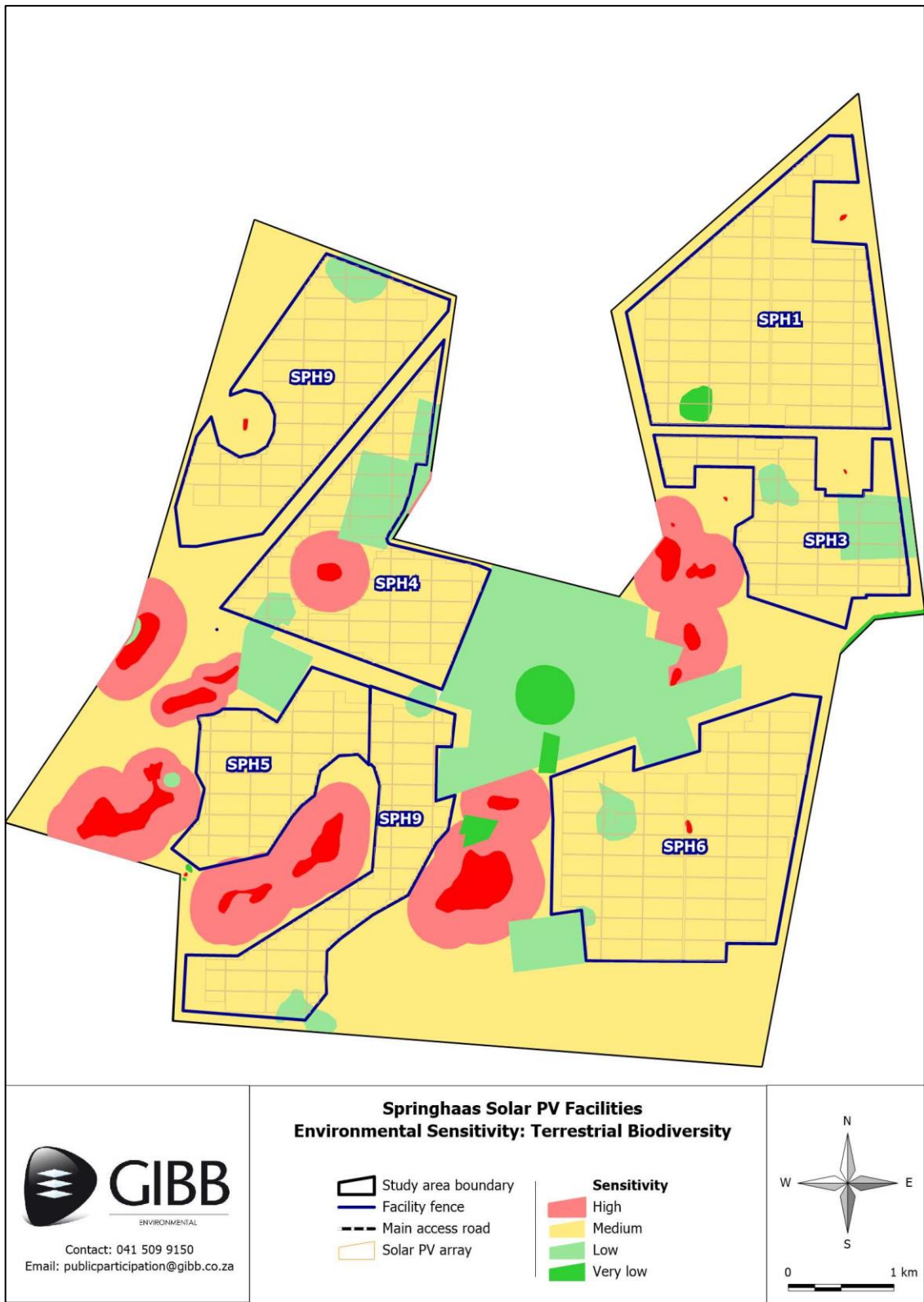


Figure 8-2: Terrestrial biodiversity sensitivity map (data source, Cossypha)

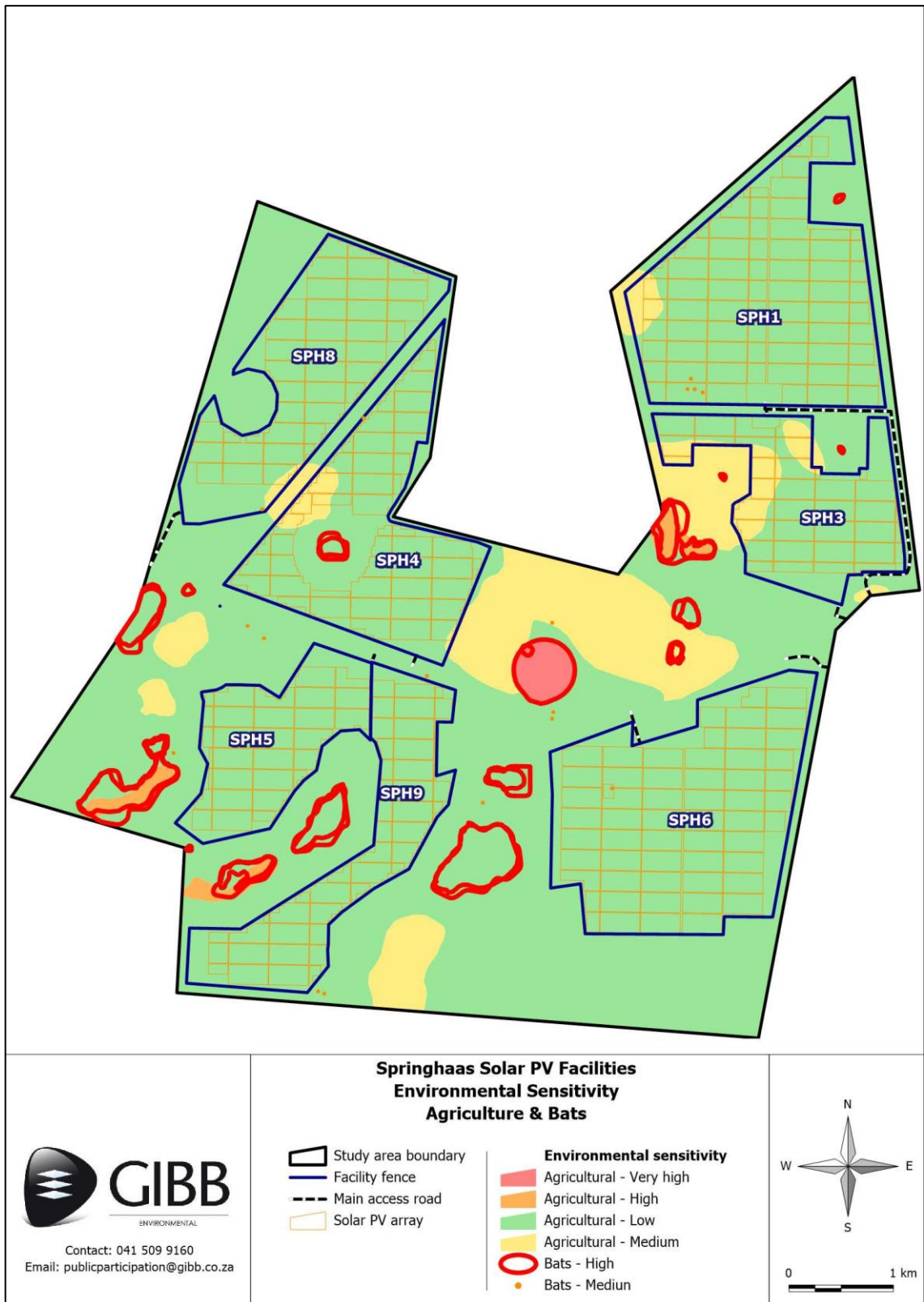


Figure 8-3: Agricultural and bat sensitivity map

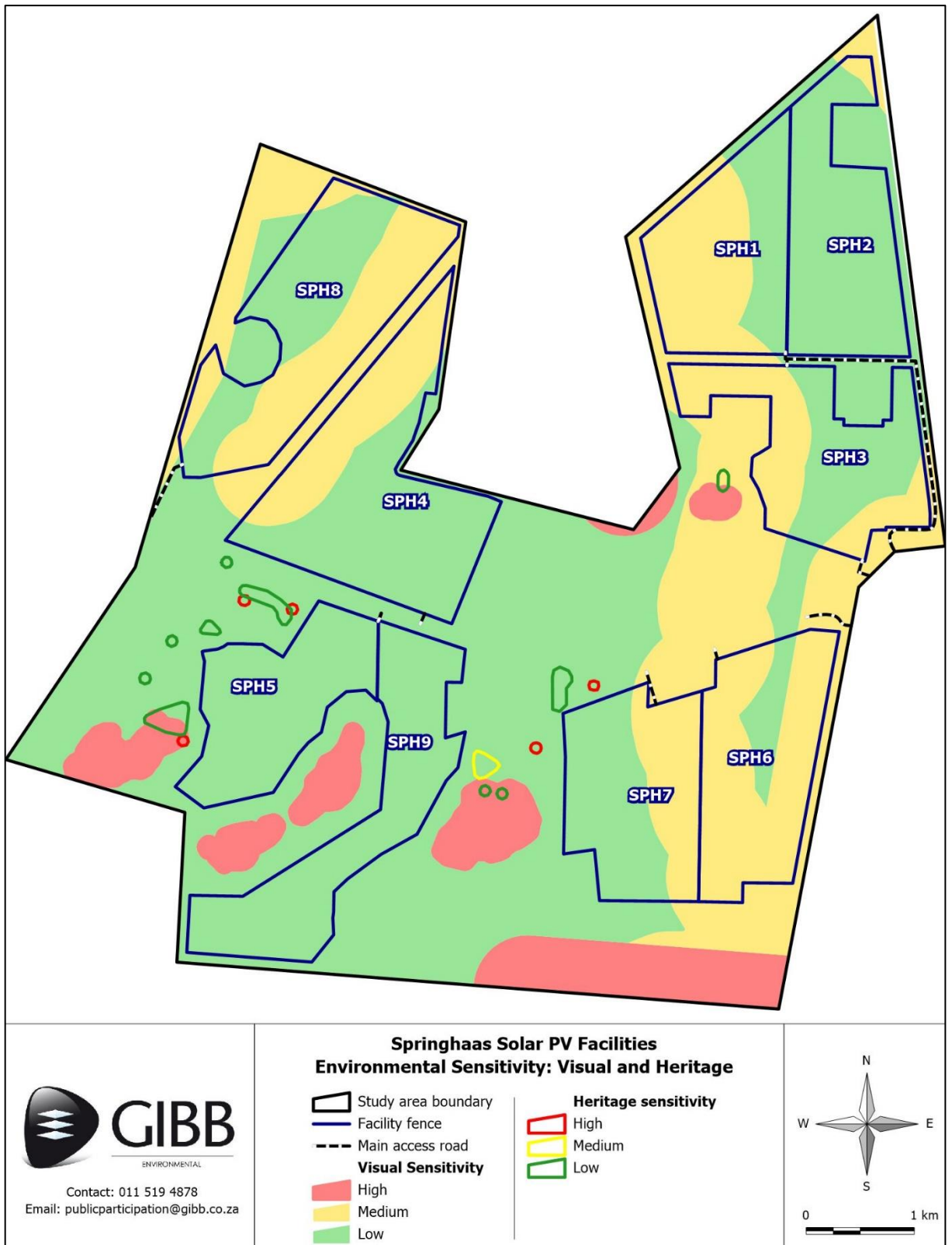


Figure 8-4: Visual and heritage sensitivity

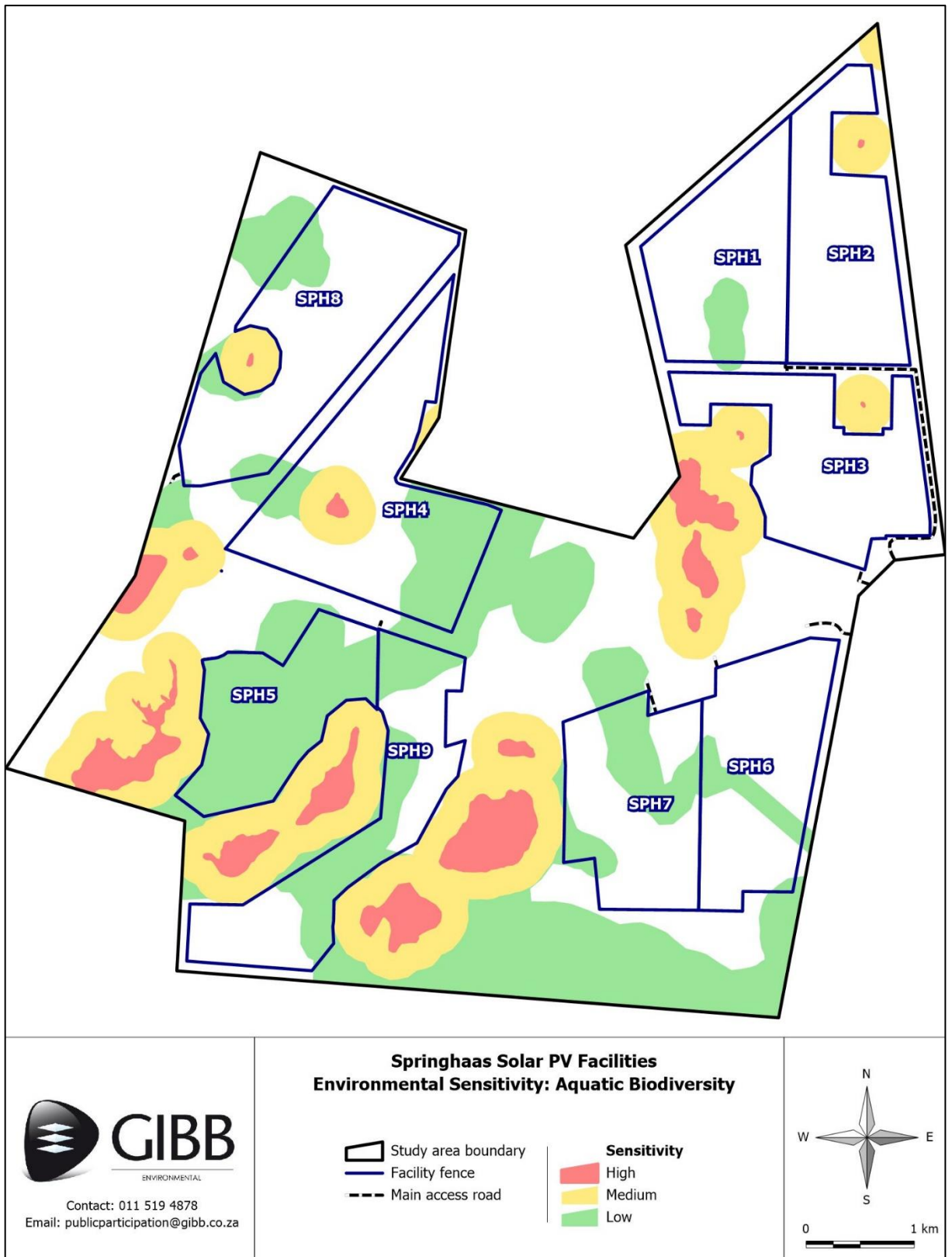


Figure 8-4: Aquatic biodiversity sensitivity

(a) Alternatives

The following alternatives were assessed for SPH1:

- Two location alternatives for the electrical infrastructure compound
- Technology alternatives for the battery technology for the BESS
- No-go option

No fatal flaws were identified with any of the alternatives proposed.

(i) Electrical infrastructure compound alternatives

The majority of specialist studies concluded there is no difference in impact between the two proposed location alternatives for the electrical infrastructure compound.

The Visual Impact Assessment and Risk Assessment both expressed a slight preference for Location Alternative 2. From a visual perspective the location will be slightly less visible from the adjacent public gravel road. Alternative 2 was preferred in terms of the Risk Assessment as it was slightly further away from the closest watercourse. The aquatic specialist study noted that both alternatives are located outside aquatic environments and the buffers of aquatic features and hence both are equally preferred. Both the Visual Impact Assessment and Risk Assessment did however note that either alternative would be acceptable and could therefore be approved.

The Terrestrial Biodiversity and Animal Species Assessment identified the Alternative 1 (preferred alternative) as the preferred alternative as it allowed the footprint of the electrical infrastructure compound to be combined with the footprint of the auxiliary buildings. The study did however note that either alternative would be acceptable and could therefore be approved.

The Applicant's technically preferred location of the electrical infrastructure compound is Alternative 1, the southern location. As no fatal flaws were identified with either of the locations (and any associated impacts can be mitigated to acceptable levels) it is proposed that Alternative 1 be considered as the preferred for authorisation.

(ii) BESS Battery Technology Alternatives

All of the specialist studies found no difference in the impacts of the battery technology alternatives, with the exception of the risk assessment which identified certain risks associated with redox-flow batteries (noting, however, that these can still be mitigated to acceptable levels). No fatal flaws were identified for either battery technology alternative so either alternative would be acceptable for development. As such, it is recommended that the preferred alternative (lithium-ion) batteries are considered as the preferred alternative for authorisation.

(iii) No-Go Alternative

When comparing the specialists' assessment of the no-go alternative with the proposed development, the adverse impacts would have similar significance, post mitigation. Adverse impacts associated with the no-go alternative typically range from low to very low, while adverse impacts associated with the proposed development also range from low to very (with mitigation) and there would be positive impacts related to the proposed development that would be foregone.

The no-go alternative is not recommended as the project is needed to contribute to the diversification of South Africa's energy mix. In addition the positive socio-economic impacts which range from very low to moderate would not be realised if the project is not authorised.

(b) EAP Recommendations

As outlined in **Chapter 6** (Impact Assessment) of the draft BAR, all impacts associated with the proposed development of SPH1 can be mitigated to acceptable levels.

The EAP therefore recommends that DFFE grant a positive Environmental Authorisation (EA) for the proposed development of SPH1. The mitigation measures identified in the EMPr must be implemented throughout the project duration to ensure impacts are mitigated to acceptable levels.

It is the opinion of the EAP that the BAR and associated specialist studies have been conducted in an objective manner and the BAR process to date complies with the requirements of the 2014 EIA Regulations.

(c) Specialist Recommendations

All of the specialist are in agreement with the recommendation of the EAP that SPH1 can be authorised. Specialists have provided a set of mitigation measures which have been included in the EMPr (**Appendix I**) for the project.

(d) Assumptions and Limitations

A detailed list of assumptions and limitations associated with the DBAR and specialist studies are included in **Section 1.6**. The information provided in the DBAR is deemed of sufficient quality and relevance for the EAP and specialist team to make an informed decision on the recommendations for the project.

8.1.2 Springhaas Facility 3

All of the negative direct and indirect impacts identified for SPH3 can be mitigation to low or very low significance post mitigation. The positive impacts relate to employment opportunities during construction (moderate positive), employment opportunities during operation (low

positive). Two very low positive impacts were identified, the first is the use of infrastructure for nesting by birds and the second is a positive impact related to recovery of fossils from site (should fossils be uncovered and can be collected).

Cumulative impacts were assessed for SPH3. The cumulative impact ratings were done on the assumption that all seven Springhaas Solar PV facilities are authorised and constructed along with the other 13 solar PV facilities located within a 30km radius of the site. In reality it is unlikely that all projects would receive preferred bidder status and move forward to construction. All of the negative cumulative impacts were rated as low or very low significance with the exception of:

- **Avifauna** – the cumulative impact of the loss of avifaunal habitat was rated as moderate negative
- **Terrestrial biodiversity and animal species**- the cumulative impact of loss of large natural area, increased disturbance to natural areas, environmental degradation, and loss of habitat connectivity was rated as moderate negative.

No fatal flaws were identified for SPH3 during the impact assessment phase and all impacts can be mitigated to acceptable limits.

The site sensitivity for SPH3 can be summarised as follows:

Table 8-2: SPH3 site sensitivity overview

Theme	Site sensitivity verification	Comment
Agricultural	Low - Medium	The majority of the site comprises of low sensitivity agricultural land. There are small areas of medium sensitivity land on the edge of the facility footprint,
Animal species	Medium	The majority of the footprint of SPH3 comprises of natural grassland with a highly disturbed area where the vegetation has been disturbed by livestock grazing.
Aquatic biodiversity	Low	SPH3 is a relatively dry site. There are no pans, wetlands or drainage regions within the boundary of the facility.
Archaeological and cultural heritage theme	Low	No sensitive archaeological resources were identified in the footprint of SPH3.
Avian	Low - Medium	All high sensitivity areas (pans and wetlands) and their respective ecological buffers have been avoided by the layout.
Bats	Low	Low sensitivity rating identified by the Screening Tool is accurate. SPH3 does not overlap any area which are classified as medium or high sensitivity for bats.
Floodline	-	SPH3 is located outside of the 1:100 year floodline.
Geotechnical	-	The site is suitable for the development of a solar PV facility if the recommendation in the geotechnical investigation are implemented.
Landscape/ Visual	Medium	The greater site/study area was mapped as no-go (high sensitivity), sensitive (medium sensitivity) and not sensitive (low sensitivity). There are no high sensitivity areas in SPH3. There are areas of medium sensitivity land on the eastern and western boundaries of the facility. The collector substation which is the tallest component of SPH3 is located in a low sensitivity area.
Palaeontology	Low	The High sensitivity predicted by the Screening Tool was shown, in reality, to be a Low sensitivity.
Plant species	Low	Low sensitivity rating identified by the Screening Tool is

		accurate.
Risk assessment	-	No off-site risks would be present with the development of SPH 31.
Socio-economic	-	No socio-economic sensitivities were identified which would preclude the development of SPH3.
Terrestrial biodiversity	Medium	The majority of the site is natural grassland which is ascribed medium sensitivity. Degraded areas within SPH3 are classified as low sensitivity. There are no high sensitivity areas within SPH3.
Transport	-	No transport sensitivities were identified. There is an existing access road network which allows access to the site.
Groundwater	Low	The site has a low groundwater vulnerability classification.

As can be seen from **Figure 8-1** SPH3 avoids all no-go areas.

(a) Alternatives

The following alternatives were assessed for SPH3:

- Two location alternatives for the temporary laydown area
- Technology alternatives for the battery technology for the BESS
- No-go option

No fatal flaws were identified with any of the alternatives proposed.

(i) Temporary laydown areas location alternatives

The majority of specialist studies concluded there is no difference in impact between the two temporary laydown area alternatives.

The Visual Impact Assessment, Terrestrial Biodiversity and Animal Species Assessment and Avifaunal Impact Assessment all expressed a slight preference for the preferred alternative (alternative 1). These studies did however note that either alternative would be acceptable and could therefore be approved.

The Applicant's technically preferred location of the temporary laydown area is Alternative 1, the northern location. As no fatal flaws were identified with either of the locations (and any associated impacts can be mitigated to acceptable levels) it is proposed that Alternative 1 be considered as the preferred for authorisation.

(ii) BESS Battery Technology Alternatives

All of the specialist studies found no difference in the impacts of the battery technology alternatives, with the exception of the risk assessment which identified certain risks associated with redox-flow batteries (noting, however, that these can still be mitigated to acceptable levels). No fatal flaws were identified for either battery technology alternative so either alternative would be acceptable for development. As such, it is recommended that the preferred alternative (lithium-ion) batteries are considered as the preferred alternative for authorisation.

(iii) No-Go Alternative

When comparing the specialists' assessment of the no-go alternative with the proposed development, the adverse impacts would have similar significance, post mitigation. Adverse impacts associated with the no-go alternative typically range from low to very low, while adverse impacts associated with the proposed development also range from low to very (with mitigation) and there would be positive impacts related to the proposed development that would be foregone.

The no-go alternative is not recommended as the project is needed to contribute to the diversification of South Africa's energy mix. In addition the positive socio-economic impacts which range from very low to moderate would not be realised if the project is not authorised.

(b) EAP Recommendations

As outlined in **Chapter 6** (Impact Assessment) of the draft BAR, all impacts associated with the proposed development of SPH3 can be mitigated to acceptable levels.

The EAP therefore recommends that DFFE grant a positive Environmental Authorisation (EA) for the proposed development of SPH3. The mitigation measures identified in the EMPr must be implemented throughout the project duration to ensure impacts are mitigated to acceptable levels.

It is the opinion of the EAP that the BAR and associated specialist studies have been conducted in an objective manner and the BAR process to date complies with the requirements of the 2014 EIA Regulations.

(c) Specialist Recommendations

All of the specialist are in agreement with the recommendation of the EAP that SPH3 can be authorised. Specialists have provided a set of mitigation measures which have been included in the EMPr (**Appendix I**) for the project.

(d) Assumptions and Limitations

A detailed list of assumptions and limitations associated with the DBAR and specialist studies are included in **Section 1.6**. The information provided in the DBAR is deemed of sufficient quality and relevance for the EAP and specialist team to make an informed decision on the recommendations for the project.

8.1.3 Springhaas Facility 4

All of the negative direct and indirect impacts identified for SPH4 can be mitigation to low or very low significance post mitigation. The positive impacts relate to employment opportunities during construction (moderate positive), employment opportunities during operation (low positive). Two very low positive impacts were identified, the first is the use of infrastructure for nesting by birds and the second is a positive impact related to recovery of fossils from site (should fossils be uncovered and can be collected).

Cumulative impacts were assessed for SPH4. The cumulative impact ratings were done on the assumption that all seven Springhaas Solar PV facilities are authorised and constructed along with the other 13 solar PV facilities located within a 30km radius of the site. In reality it is unlikely that all projects would receive preferred bidder status and move forward to construction. All of the negative cumulative impacts were rated as low or very low significance with the exception of:

- **Avifauna** – the cumulative impact of the loss of avifaunal habitat was rated as moderate negative
- **Terrestrial biodiversity and animal species**- the cumulative impact of loss of large natural area, increased disturbance to natural areas, environmental degradation, and loss of habitat connectivity was rated as moderate negative.

No fatal flaws were identified for SPH4 during the impact assessment phase and all impacts can be mitigated to acceptable limits.

The fenceline of SPH4 encompasses a large pan which is rated as a high sensitivity feature in terms of aquatic, avifauna bats and terrestrial biodiversity themes. The pan has been excluded from the infrastructure layout and no infrastructure encroaches on pan or its 250m ecological buffer. The presence of the pan has raised the sensitivity rating of the site in some of the themes identified in the DFFE screening tool (**refer to Table 8-3**). The site sensitivity for SPH4 can be summarised as follows:

Table 8-3: SPH4 site sensitivity overview

Theme	Site sensitivity verification	Comment
Agricultural	Low - Medium	The majority of the site comprises of low sensitivity agricultural land. There is one small section of medium sensitivity land on the western edge of the facility footprint,
Animal species	High	The majority of the footprint of SPH4 comprises of natural grassland which is classified as medium sensitivity. There are also large areas of land which has been disturbed by grazing of livestock. There is a pan at the centre of SPH4 which is classified as high sensitivity. No infrastructure encroaches on the pan or its 250m buffer.
Aquatic biodiversity	High	SPH4 is classified as high sensitivity due to the presence of a pan within the facility boundary. No infrastructure encroaches on the pan or its 250m buffer.
Archaeological and cultural heritage theme	Low	No sensitive archaeological resources were identified in the footprint of SPH4.
Avian	Low - Medium	All high sensitivity areas (pans and wetlands) and their respective ecological buffers have been avoided by the layout.

Theme	Site sensitivity verification	Comment
Bats	Low	Low sensitivity rating identified by the Screening Tool is accurate. The fenced area of SPH4 does contain a large pan which is classified as high sensitivity feature. However, as no infrastructure encroach on the pan or its 250m buffer the specialist has rated the facility as low sensitivity.
Floodline	-	All of the infrastructure for SPH4 is located outside of the 1:100 year floodline.
Geotechnical	-	The site is suitable for the development of a solar PV facility if the recommendation in the geotechnical investigation are implemented.
Landscape/ Visual	Medium	The greater site/study area was mapped as no-go (high sensitivity), sensitive (medium sensitivity) and not sensitive (low sensitivity). There are no high sensitivity areas in SPH4. There is a strip of medium sensitivity land along the western boundary of SPH4. The collector substation and electrical infrastructure compound (which contains the substation) which are the tallest component of SPH4 is located in a low sensitivity area.
Palaeontology	Low	The High sensitivity predicted by the Screening Tool was shown, in reality, to be a Low sensitivity.
Plant species	Low	Low sensitivity rating identified by the Screening Tool is accurate.
Risk assessment	-	No off-site risks would be present with the development of SPH 4.
Socio-economic	-	No socio-economic sensitivities were identified which would preclude the development of SPH4.
Terrestrial biodiversity	High	The majority of the site is natural grassland which is ascribed medium sensitivity. There is pan at the centre of SPH4 which is classified as high sensitivity. This pan and its 250m buffer have been avoided in the infrastructure layout. There are also degraded areas which are classified as low sensitivity.
Transport	-	No transport sensitivities were identified. There is an existing access road network which allows access to the site. A slight re-alignment of the eastern access road is required to allow safe access to the site for heavy vehicles during the construction phase.
Groundwater	Low	The site has a low groundwater vulnerability classification.

As can be seen from **Figure 8-1** the infrastructure for SPH4 avoids all no-go areas.

(a) Alternatives

The following alternatives were assessed for SPH4:

- Technology alternatives for the battery technology for the BESS
- No-go option

(i) BESS Battery Technology Alternatives

All of the specialist studies found no difference in the impacts of the battery technology alternatives, with the exception of the risk assessment which identified certain risks associated with redox-flow batteries (noting, however, that these can still be mitigated to acceptable levels). No fatal flaws were identified for either battery technology alternative so either alternative would be acceptable for development. As such, it is recommended that the

preferred alternative (lithium-ion) batteries are considered as the preferred alternative for authorisation.

(ii) No-Go Alternative

When comparing the specialists' assessment of the no-go alternative with the proposed development, the adverse impacts would have similar significance, post mitigation. Adverse impacts associated with the no-go alternative typically range from low to very low, while adverse impacts associated with the proposed development also range from low to very (with mitigation) and there would be positive impacts related to the proposed development that would be foregone.

The no-go alternative is not recommended as the project is needed to contribute to the diversification of South Africa's energy mix. In addition the positive socio-economic impacts which range from very low to moderate would not be realised if the project is not authorised.

(b) EAP Recommendations

As outlined in **Chapter 6** (Impact Assessment) of the draft BAR, all impacts associated with the proposed development of SPH4 can be mitigated to acceptable levels provided that the pan and its 250m ecological buffer remain are excluded from the infrastructure layout (as is currently proposed).

The EAP therefore recommends that DFFE grant a positive Environmental Authorisation (EA) for the proposed development of SPH4. The mitigation measures identified in the EMPr must be implemented throughout the project duration to ensure impacts are mitigated to acceptable levels.

It is the opinion of the EAP that the BAR and associated specialist studies have been conducted in an objective manner and the BAR process to date complies with the requirements of the 2014 EIA Regulations.

(c) Specialist Recommendations

All of the specialist are in agreement with the recommendation of the EAP that SPH4 can be authorised. Specialists have provided a set of mitigation measures which have been included in the EMPr (**Appendix I**) for the project.

(d) Assumptions and Limitations

A detailed list of assumptions and limitations associated with the DBAR and specialist studies are included in **Section 1.6**. The information provided in the DBAR is deemed of sufficient quality and relevance for the EAP and specialist team to make an informed decision on the recommendations for the project.

8.1.4 Springhaas Facility 5

All of the negative direct and indirect impacts identified for SPH5 can be mitigation to low or very low significance post mitigation. The positive impacts relate to employment opportunities during construction (moderate positive), employment opportunities during operation (low positive). Two very low positive impacts were identified, the first is the use of infrastructure for nesting by birds and the second is a positive impact related to recovery of fossils from site (should fossils be uncovered and can be collected).

Cumulative impacts were assessed for SPH5. The cumulative impact ratings were done on the assumption that all seven Springhaas Solar PV facilities are authorised and constructed along with the other 13 solar PV facilities located within a 30km radius of the site. In reality it is unlikely that all projects would receive preferred bidder status and move forward to construction. All of the negative cumulative impacts were rated as low or very low significance with the exception of:

- **Avifauna** – the cumulative impact of the loss of avifaunal habitat was rated as moderate negative
- **Terrestrial biodiversity and animal species**- the cumulative impact of loss of large natural area, increased disturbance to natural areas, environmental degradation, and loss of habitat connectivity was rated as moderate negative.

No fatal flaws were identified for SPH5 during the impact assessment phase and all impacts can be mitigated to acceptable limits.

The boundary of SPH5 was amended at the recommendation of Terrestrial Ecologist to avoid two rocky outcrops which are classified as high sensitivity areas in terms of terrestrial biodiversity.

The site sensitivity for SPH5 can be summarised as follows:

Table 8-4: SPH5 site sensitivity overview

Theme	Site sensitivity verification	Comment
Agricultural	Low - Medium	The majority of the site comprises of low sensitivity agricultural land. There are smalls of medium sensitivity land on the edge of the facility footprint,
Animal species	Medium	The majority of the footprint of SPH5 comprises of natural grassland with a highly disturbed area where the vegetation has been disturbed by livestock grazing.
Aquatic biodiversity	High	SPH5 is a relatively dry site. There are no pans, wetlands or drainage regions within the boundary of the facility.
Archaeological and cultural heritage theme	Low	No sensitive archaeological resources were identified in the footprint of SPH5.
Avian	Low - Medium	All high sensitivity areas (pans and wetlands) and their respective ecological buffers have been avoided by the layout.
Bats	Low	Low sensitivity rating identified by the Screening Tool is accurate. SPH5 does not overlap any area which are classified as medium or high sensitivity for bats.
Floodline	-	SPH5 is located outside of the 1:100 year floodline.

Theme	Site sensitivity verification	Comment
Geotechnical	-	The site is suitable for the development of a solar PV facility if the recommendation in the geotechnical investigation are implemented.
Landscape/ Visual	Medium	The greater site/study area was mapped as no-go (high sensitivity), sensitive (medium sensitivity) and not sensitive (low sensitivity). There are no high sensitivity areas in SPH5. There are areas of medium sensitivity land on the eastern and western boundaries of the facility. The collector substation which is the tallest component of SPH5 is located in a low sensitivity area.
Palaeontology	Low	The High sensitivity predicted by the Screening Tool was shown, in reality, to be a Low sensitivity.
Plant species	Low	Low sensitivity rating identified by the Screening Tool is accurate.
Risk assessment	-	No off-site risks would be present with the development of SPH 5.
Socio-economic	-	No socio-economic sensitivities were identified which would preclude the development of SPH5.
Terrestrial biodiversity	High	The majority of the site is natural grassland which is ascribed medium sensitivity. Degraded areas within SPH5 are classified as low sensitivity. There are no high sensitivity areas within SPH5.
Transport	-	No transport sensitivities were identified. There is an existing access road network which allows access to the site.
Groundwater	Low	The site has a low groundwater vulnerability classification.

As can be seen from **Figure 8-1** the infrastructure for SPH5 avoids all no-go areas.

(a) Alternatives

The following alternatives were assessed for SPH5:

- Technology alternatives for the battery technology for the BESS
- No-go option

(i) BESS Battery Technology Alternatives

All of the specialist studies found no difference in the impacts of the battery technology alternatives, with the exception of the risk assessment which identified certain risks associated with redox-flow batteries (noting, however, that these can still be mitigated to acceptable levels). No fatal flaws were identified for either battery technology alternative so either alternative would be acceptable for development. As such, it is recommended that the preferred alternative (lithium-ion) batteries are considered as the preferred alternative for authorisation.

(ii) No-Go Alternative

When comparing the specialists' assessment of the no-go alternative with the proposed development, the adverse impacts would have similar significance, post mitigation. Adverse impacts associated with the no-go alternative typically range from low to very low, while

adverse impacts associated with the proposed development also range from low to very (with mitigation) and there would be positive impacts related to the proposed development that would be foregone.

The no-go alternative is not recommended as the project is needed to contribute to the diversification of South Africa's energy mix. In addition the positive socio-economic impacts which range from very low to moderate would not be realised if the project is not authorised.

(b) EAP Recommendations

As outlined in **Chapter 6** (Impact Assessment) of the draft BAR, all impacts associated with the proposed development of SPH5 can be mitigated to acceptable levels.

The EAP therefore recommends that DFFE grant a positive Environmental Authorisation (EA) for the proposed development of SPH5. The mitigation measures identified in the EMPr must be implemented throughout the project duration to ensure impacts are mitigated to acceptable levels.

It is the opinion of the EAP that the BAR and associated specialist studies have been conducted in an objective manner and the BAR process to date complies with the requirements of the 2014 EIA Regulations.

(c) Specialist Recommendations

All of the specialist are in agreement with the recommendation of the EAP that SPH5 can be authorised. Specialists have provided a set of mitigation measures which have been included in the EMPr (**Appendix I**) for the project.

(d) Assumptions and Limitations

A detailed list of assumptions and limitations associated with the DBAR and specialist studies are included in **Section 1.6**. The information provided in the DBAR is deemed of sufficient quality and relevance for the EAP and specialist team to make an informed decision on the recommendations for the project.

8.1.5 Springhaas Facility 6

All of the negative direct and indirect impacts identified for SPH6 can be mitigation to low or very low significance post mitigation. The positive impacts relate to employment opportunities during construction (moderate positive), employment opportunities during operation (low positive). Two very low positive impacts were identified, the first is the use of infrastructure for nesting by birds and the second is a positive impact related to recovery of fossils from site (should fossils be uncovered and can be collected).

Cumulative impacts were assessed for SPH6. The cumulative impact ratings were done on the assumption that all seven Springhaas Solar PV facilities are authorised and constructed along with the other 13 solar PV facilities located within a 30km radius of the site. In reality it is unlikely that all projects would receive preferred bidder status and move forward to construction. All of the negative cumulative impacts were rated as low or very low significance with the exception of:

- **Avifauna** – the cumulative impact of the loss of avifaunal habitat was rated as moderate negative
- **Terrestrial biodiversity and animal species**- the cumulative impact of loss of large natural area, increased disturbance to natural areas, environmental degradation, and loss of habitat connectivity was rated as moderate negative.

No fatal flaws were identified for SPH6 during the impact assessment phase and all impacts can be mitigated to acceptable limits.

The site sensitivity for SPH6 can be summarised as follows:

Table 8-5: SPH6 site sensitivity overview

Theme	Site sensitivity verification	Comment
Agricultural	Low	SPH6 is wholly located in an area of low agricultural sensitivity.
Animal species	Medium/ High	The majority of the footprint of SPH6 comprises of natural grassland (medium sensitivity) with two highly disturbed areas where the vegetation has been disturbed by livestock grazing. There is one small pan near the centre of the facility which is classified as high sensitivity.
Aquatic biodiversity	Low	There are no high or medium sensitivity areas in SPH6. A drainage region traverses the site from north to south, this feature is classified as low sensitivity.
Archaeological and cultural heritage theme	Low	No sensitive archaeological resources were identified in the footprint of SPH6.
Avian	Low - Medium	All high sensitivity areas (pans and wetlands) and their respective ecological buffers have been avoided by the layout.
Bats	Low	Low sensitivity rating identified by the Screening Tool is accurate. SPH6 overlaps one small area of medium sensitivity for bats.
Floodline	-	SPH6 is located outside of the 1:100 year floodline.
Geotechnical	-	The site is suitable for the development of a solar PV facility if the recommendation in the geotechnical investigation are implemented.
Landscape/ Visual	Medium	The greater site/study area was mapped as no-go (high sensitivity), sensitive (medium sensitivity) and not sensitive (low sensitivity). There are no high sensitivity areas in SPH6. A ridgeline (medium sensitivity) runs north to south through SPH6. The Electrical Infrastructure Compound which is the tallest component of SPH3 is located in this medium sensitivity area.
Palaeontology	Low	The High sensitivity predicted by the Screening Tool was shown, in reality, to be a Low sensitivity.
Plant species	Low	Low sensitivity rating identified by the Screening Tool is accurate.
Risk assessment	-	No off-site risks would be present with the development of

		SPH 6.
Socio-economic	-	No socio-economic sensitivities were identified which would preclude the development of SPH6.
Terrestrial biodiversity	Medium/ High	The majority of the site is natural grassland which is ascribed medium sensitivity. There are degraded areas within SPH6 which are classified as low sensitivity. One small pan (high sensitivity) is located within SPH6.
Transport	-	No transport sensitivities were identified. There is an existing access road network which allows access to the site.
Groundwater	Low	The site has a low groundwater vulnerability classification.

As can be seen from **Figure 8-1** the infrastructure for SPH6 avoids all no-go areas.

(a) Alternatives

The following alternatives were assessed for SPH6:

- Technology alternatives for the battery technology for the BESS
- No-go option

(i) BESS Battery Technology Alternatives

All of the specialist studies found no difference in the impacts of the battery technology alternatives, with the exception of the risk assessment which identified certain risks associated with redox-flow batteries (noting, however, that these can still be mitigated to acceptable levels). No fatal flaws were identified for either battery technology alternative so either alternative would be acceptable for development. As such, it is recommended that the preferred alternative (lithium-ion) batteries are considered as the preferred alternative for authorisation.

(ii) No-Go Alternative

When comparing the specialists' assessment of the no-go alternative with the proposed development, the adverse impacts would have similar significance, post mitigation. Adverse impacts associated with the no-go alternative typically range from low to very low, while adverse impacts associated with the proposed development also range from low to very (with mitigation) and there would be positive impacts related to the proposed development that would be foregone.

The no-go alternative is not recommended as the project is needed to contribute to the diversification of South Africa's energy mix. In addition the positive socio-economic impacts which range from very low to moderate would not be realised if the project is not authorised.

(b) EAP Recommendations

As outlined in **Chapter 6** (Impact Assessment) of the draft BAR, all impacts associated with the proposed development of SPH6 can be mitigated to acceptable levels.

The EAP therefore recommends that DFFE grant a positive Environmental Authorisation (EA) for the proposed development of SPH6. The mitigation measures identified in the EMPr must be implemented throughout the project duration to ensure impacts are mitigated to acceptable levels.

It is the opinion of the EAP that the BAR and associated specialist studies have been conducted in an objective manner and the BAR process to date complies with the requirements of the 2014 EIA Regulations.

(c) Specialist Recommendations

All of the specialist are in agreement with the recommendation of the EAP that SPH6 can be authorised. Specialists have provided a set of mitigation measures which have been included in the EMPr (**Appendix I**) for the project.

(d) Assumptions and Limitations

A detailed list of assumptions and limitations associated with the DBAR and specialist studies are included in **Section 1.6**. The information provided in the DBAR is deemed of sufficient quality and relevance for the EAP and specialist team to make an informed decision on the recommendations for the project.

8.1.6 Springhaas Facility 8

All of the negative direct and indirect impacts identified for SPH8 can be mitigation to low or very low significance post mitigation. The positive impacts relate to employment opportunities during construction (moderate positive), employment opportunities during operation (low positive). Two very low positive impacts were identified, the first is the use of infrastructure for nesting by birds and the second is a positive impact related to recovery of fossils from site (should fossils be uncovered and can be collected).

Cumulative impacts were assessed for SPH8. The cumulative impact ratings were done on the assumption that all seven Springhaas Solar PV facilities are authorised and constructed along with the other 13 solar PV facilities located within a 30km radius of the site. In reality it is unlikely that all projects would receive preferred bidder status and move forward to construction. All of the negative cumulative impacts were rated as low or very low significance with the exception of:

- **Avifauna** – the cumulative impact of the loss of avifaunal habitat was rated as moderate negative
- **Terrestrial biodiversity and animal species**- the cumulative impact of loss of large natural area, increased disturbance to natural areas, environmental degradation, and loss of habitat connectivity was rated as moderate negative.

No fatal flaws were identified for SPH8 during the impact assessment phase and all impacts can be mitigated to acceptable limits.

The site sensitivity for SPH8 can be summarised as follows:

Table 8-6: SPH8 site sensitivity overview

Theme	Site sensitivity verification	Comment
Agricultural	Low - Medium	SPH8 is wholly located in an area of low agricultural sensitivity with the exception of a small area of medium sensitivity on the eastern edge of the site.
Animal species	Medium	The majority of the footprint of SPH8 comprises of natural grassland (medium sensitivity), there is one small area of low sensitivity (degraded) land in the north of the facility. The facility has been designed to avoid a pan to the west of the facility which is rated as high sensitivity.
Aquatic biodiversity	Low	There are no high or medium sensitivity areas in SPH8. Three drainage regions overlap the site. These features are classified as low sensitivity.
Archaeological and cultural heritage theme	Low	No sensitive archaeological resources were identified in the footprint of SPH8.
Avian	Low - Medium	All high sensitivity areas (pans and wetlands) and their respective ecological buffers have been avoided by the layout.
Bats	Low	The low sensitivity rating identified by the Screening Tool is accurate. SPH8 overlaps one small area of medium sensitivity for bats.
Floodline	-	SPH8 is located outside of the 1:100 year floodline.
Geotechnical	-	The site is suitable for the development of a solar PV facility if the recommendation in the geotechnical investigation are implemented.
Landscape/ Visual	Medium	The greater site/study area was mapped as no-go (high sensitivity), sensitive (medium sensitivity) and not sensitive (low sensitivity). There are no high sensitivity areas in SPH8. There are medium sensitivity areas within SPH8. The collector substation which is the tallest component has been sited to avoid the medium sensitivity area. The electrical infrastructure compound which contains the substation does however encroach slightly on the medium sensitivity area.
Palaeontology	Low	The High sensitivity predicted by the Screening Tool was shown, in reality, to be a Low sensitivity.
Plant species	Low	Low sensitivity rating identified by the Screening Tool is accurate.
Risk assessment	-	No off-site risks would be present with the development of SPH 8.
Socio-economic	-	No socio-economic sensitivities were identified which would preclude the development of SPH8.
Terrestrial biodiversity	Medium	The majority of the site is natural grassland which is ascribed medium sensitivity. There are degraded areas within SPH8 which are classified as low sensitivity. One small pan (high sensitivity) is located within SPH8.
Transport	-	No transport sensitivities were identified. There is an existing access road network which allows access to the site.
Groundwater	Low	The site has a low groundwater vulnerability classification.

As can be seen from **Figure 8-1** the infrastructure for SPH8 avoids all no-go areas.

(a) Alternatives

The following alternatives were assessed for SPH8:

- Technology alternatives for the battery technology for the BESS
- No-go option

(i) BESS Battery Technology Alternatives

All of the specialist studies found no difference in the impacts of the battery technology alternatives, with the exception of the risk assessment which identified certain risks associated with redox-flow batteries (noting, however, that these can still be mitigated to acceptable levels). No fatal flaws were identified for either battery technology alternative so either alternative would be acceptable for development. As such, it is recommended that the preferred alternative (lithium-ion) batteries are considered as the preferred alternative for authorisation.

(ii) No-Go Alternative

When comparing the specialists' assessment of the no-go alternative with the proposed development, the adverse impacts would have similar significance, post mitigation. Adverse impacts associated with the no-go alternative typically range from low to very low, while adverse impacts associated with the proposed development also range from low to very (with mitigation) and there would be positive impacts related to the proposed development that would be foregone.

The no-go alternative is not recommended as the project is needed to contribute to the diversification of South Africa's energy mix. In addition the positive socio-economic impacts which range from very low to moderate would not be realised if the project is not authorised.

(b) EAP Recommendations

As outlined in **Chapter 6** (Impact Assessment) of the draft BAR, all impacts associated with the proposed development of SPH8 can be mitigated to acceptable levels.

The EAP therefore recommends that DFFE grant a positive Environmental Authorisation (EA) for the proposed development of SPH8. The mitigation measures identified in the EMPr must be implemented throughout the project duration to ensure impacts are mitigated to acceptable levels.

It is the opinion of the EAP that the BAR and associated specialist studies have been conducted in an objective manner and the BAR process to date complies with the requirements of the 2014 EIA Regulations.

(c) Specialist Recommendations

All of the specialist are in agreement with the recommendation of the EAP that SPH8 can be authorised. Specialists have provided a set of mitigation measures which have been included in the EMPr (**Appendix I**) for the project.

(d) Assumptions and Limitations

A detailed list of assumptions and limitations associated with the DBAR and specialist studies are included in **Section 1.6**. The information provided in the DBAR is deemed of sufficient quality and relevance for the EAP and specialist team to make an informed decision on the recommendations for the project.

8.1.7 Springhaas Facility 9

All of the negative direct and indirect impacts identified for SPH9 can be mitigation to low or very low significance post mitigation. The positive impacts relate to employment opportunities during construction (moderate positive), employment opportunities during operation (low positive). Two very low positive impacts were identified, the first is the use of infrastructure for nesting by birds and the second is a positive impact related to recovery of fossils from site (should fossils be uncovered and can be collected).

Cumulative impacts were assessed for SPH9. The cumulative impact ratings were done on the assumption that all seven Springhaas Solar PV facilities are authorised and constructed along with the other 13 solar PV facilities located within a 30km radius of the site. In reality it is unlikely that all projects would receive preferred bidder status and move forward to construction. All of the negative cumulative impacts were rated as low or very low significance with the exception of:

- **Avifauna** – the cumulative impact of the loss of avifaunal habitat was rated as moderate negative
- **Terrestrial biodiversity and animal species**- the cumulative impact of loss of large natural area, increased disturbance to natural areas, environmental degradation, and loss of habitat connectivity was rated as moderate negative.

No fatal flaws were identified for SPH9 during the impact assessment phase and all impacts can be mitigated to acceptable limits.

The site sensitivity for SPH9 can be summarised as follows:

Table 8-7: SPH9 site sensitivity overview

Theme	Site sensitivity verification	Comment
Agricultural	Low	SPH9 is wholly located in an area of low agricultural sensitivity.
Animal species	Medium	The majority of the footprint of SPH9 comprises of natural grassland (medium sensitivity), there is one small area of

		low sensitivity (degraded) land in the south of the facility. The facility has been designed to avoid pans to the west of the facility which are rated as high sensitivity.
Aquatic biodiversity	Low	There are no high or medium sensitivity areas in SPH9. Drainage regions cover large section of SPH9. These features are classified as low sensitivity.
Archaeological and cultural heritage theme	Low	No sensitive archaeological resources were identified in the footprint of SPH9.
Avian	Low - Medium	All high sensitivity areas (pans and wetlands) and their respective ecological buffers have been avoided by the layout.
Bats	Low	The low sensitivity rating identified by the Screening Tool is accurate. SPH9 does not overlap any medium or high sensitivity areas for bats.
Floodline	-	SPH9 is located outside of the 1:100 year floodline.
Geotechnical	-	The site is suitable for the development of a solar PV facility if the recommendation in the geotechnical investigation are implemented.
Landscape/ Visual	Low	The greater site/study area was mapped as no-go (high sensitivity), sensitive (medium sensitivity) and not sensitive (low sensitivity). SPH9 is wholly located in an area of low visual sensitivity.
Palaeontology	Low	The High sensitivity predicted by the Screening Tool was shown, in reality, to be a Low sensitivity.
Plant species	Low	Low sensitivity rating identified by the Screening Tool is accurate.
Risk assessment	-	No off-site risks would be present with the development of SPH 9.
Socio-economic	-	No socio-economic sensitivities were identified which would preclude the development of SPH9.
Terrestrial biodiversity	Medium	The majority of the footprint of SPH9 comprises of natural grassland (medium sensitivity), there is one small area of low sensitivity (degraded) land in the south of the facility. The facility has been designed to avoid pans to the east and west of the facility which are rated as high sensitivity.
Transport	-	No transport sensitivities were identified. There is an existing access road network which allows access to the site.
Groundwater	Low	The site has a low groundwater vulnerability classification.

As can be seen from **Figure 8-1** the infrastructure for SPH9 avoids all no-go areas.

(a) Alternatives

The following alternatives were assessed for SPH9:

- Technology alternatives for the battery technology for the BESS
- No-go option

(i) BESS Battery Technology Alternatives

All of the specialist studies found no difference in the impacts of the battery technology alternatives, with the exception of the risk assessment which identified certain risks associated with redox-flow batteries (noting, however, that these can still be mitigated to acceptable levels). No fatal flaws were identified for either battery technology alternative so either alternative would be acceptable for development. As such, it is recommended that the

preferred alternative (lithium-ion) batteries are considered as the preferred alternative for authorisation.

(ii) No-Go Alternative

When comparing the specialists' assessment of the no-go alternative with the proposed development, the adverse impacts would have similar significance, post mitigation. Adverse impacts associated with the no-go alternative typically range from low to very low, while adverse impacts associated with the proposed development also range from low to very (with mitigation) and there would be positive impacts related to the proposed development that would be foregone.

The no-go alternative is not recommended as the project is needed to contribute to the diversification of South Africa's energy mix. In addition the positive socio-economic impacts which range from very low to moderate would not be realised if the project is not authorised.

(b) EAP Recommendations

As outlined in **Chapter 6** (Impact Assessment) of the draft BAR, all impacts associated with the proposed development of SPH9 can be mitigated to acceptable levels.

The EAP therefore recommends that DFFE grant a positive Environmental Authorisation (EA) for the proposed development of SPH9. The mitigation measures identified in the EMPr must be implemented throughout the project duration to ensure impacts are mitigated to acceptable levels.

It is the opinion of the EAP that the BAR and associated specialist studies have been conducted in an objective manner and the BAR process to date complies with the requirements of the 2014 EIA Regulations.

(c) Specialist Recommendations

All of the specialist are in agreement with the recommendation of the EAP that SPH9 can be authorised. Specialists have provided a set of mitigation measures which have been included in the EMPr (**Appendix I**) for the project.

(d) Assumptions and Limitations

A detailed list of assumptions and limitations associated with the DBAR and specialist studies are included in **Section 1.6**. The information provided in the DBAR is deemed of sufficient quality and relevance for the EAP and specialist team to make an informed decision on the recommendations for the project.

