DRAFT SCOPING REPORT

Draft Scoping Report for the proposed development of the Vhuvhili Solar Photovoltaic (PV) Facility near Secunda in the Mpumalanga Province.

CHAPTER 5:

Project Alternatives

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5. APPROACH TO THE ASSESSMENT OF ALTERNATIVES

This chapter discusses the alternatives that have been considered as part of the Scoping Phase, as well as the selection process of the preferred alternatives that will be considered and assessed as part of the Environmental Impact Assessment (EIA) Phase. Sections 24(4) (b) (i) and 24(4A) of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) require an Environmental Assessment to include investigation and assessment of impacts associated with alternatives to the proposed project. In addition, Section 24O (1)(b)(iv) also requires that the Competent Authority, when considering an application for EA, takes into account "*where appropriate, any feasible and reasonable alternatives to the activity which is the subject of the application and any feasible and reasonable modifications or changes to the activity that may minimise harm to the environment*".

Therefore, the assessment of alternatives should, as a minimum, include the following:

- The consideration of the no-go alternative as a baseline scenario;
- A comparison of the reasonable and feasible alternatives; and
- Providing a methodology for the elimination of an alternative.

The 2014 NEMA EIA Regulations (as amended) define "alternatives", in relation to a proposed activity, "as different means of meeting the general purpose and requirements of the activity, which may include alternatives to the:

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

Appendix 2 of the 2014 NEMA EIA Regulations (as amended) provides the following objectives, *inter alia*, of the Scoping Process in relation to alternatives:

- To identify and confirm the preferred activity and technology alternative through an identification of impacts and risks and ranking process of such impacts and risks; and
- To identify and confirm the preferred site, through a detailed site selection process, which includes an identification of impacts and risks inclusive of identification of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment.

The Scoping Report is therefore required to provide a full description of the process followed to reach the proposed preferred activity and technology alternative, site and location of the development footprint within the site, including details of all the alternatives considered and the outcome of the site selection matrix. It should be noted that an initial area of approximately 13 000 to 14 000 ha was considered for the

development of the proposed Vhuvhi SEF. Based on initial screening and sensitivities identified by ENERTRAG, an initial layout area of 3 115 ha was looked at, however the total initial area (14 000 ha) is still being investigated as part of this application. This will be further refined in the EIA process.

5.1 Assessment of Alternatives

5.1.1 No-go Alternative

The no-go alternative assumes that the proposed project will not go ahead i.e., it is the option of not developing the proposed Vhuvhili Solar Energy Facility (SEF) and associated infrastructure that would generate up to 300 MW of power and have a footprint of approximately 650 hectares (ha). It should also be noted that the project footprint may be refined as part of the detailed specialist studies to be undertaken in the EIA phase. Hence, an updated, refined footprint may be presented in the EIA Report. This alternative would result in no environmental impacts on the site or surrounding local area as a result of the proposed project. It provides the baseline against which other alternatives are compared. The following implications will occur if the "no-go" alternative is implemented (i.e. the proposed project does not proceed):

- No benefits will be derived from the implementation of an additional land-use;
- No additional power of up to 300 MW will be generated or supplied through means of renewable energy resources by the proposed project at this location;
- The "no go" alternative will not contribute to and assist the government in achieving its renewable energy target of 26 630 MW total installed capacity by 2030 (for Wind, Solar PV and Concentrated Solar Power) (Integrated Resource Plan (IRP), 2019);
- Electricity generation will remain constant (i.e. no renewable energy generation will occur on the site for the proposed project) and as a result the local economy in terms of surrounding communities and towns within the local municipality will not be diversified, while existing electricity generation sources nationally will age and degrade over time, with maintenance requirements potentially leading to outages;
- There will be lost opportunity for skills transfer and education/training of local communities;
- The positive socio-economic impacts likely to result from the project such as increased local spending and the creation of local employment opportunities will not be realised;
- There will be no opportunity for additional employment in an area, where job creation is identified as a key priority;
- The local economic benefits associated with the private off-taker agreement between ENERTRAG and Sasol, or the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) or similar bidding processes, will not be realised, and socio-economic contribution payments into the local community trust will not be realised;
- The development of a solar PV Facility at a time when coal fired power stations are reaching the end-of-life and being closed down, can directly contribute to South Africa's response to climate mitigation and our international commitments under the Paris Agreement;
- Wind and solar PV energy are the cheapest sources of new electricity generation in South Africa. This has been shown in national modelling conducted by CSIR and in the REIPPPP Bid Window 5 Preferred Bidder announcements on 28 October 2021. The development of the proposed Vhuvhili SEF can

contribute to Sasol's international competitiveness to produce Sustainable Aviation Fuel; or to the competitive nature of the REIPPPP (should it be entered into this bidding process) to drive prices down even further to ensure that South Africans have access to affordable yet clean electricity; and

- The local, national and international benefits associated with the production of Sustainable Aviation Fuels and Green hydrogen will not be realised. Sustainable Aviation Fuels[1] are predicted to become a highly tradable global commodity.

Converse to the above, the following benefits could occur if the "no-go" alternative is implemented:

- Only the agricultural land use (livestock farming) will remain;
- No vegetation or species of special concern (flora and fauna) will be removed or disturbed during the development of the proposed project;
- No aquatic resources will be impacted upon during the construction and operation of the proposed Vhuvhili SEF;
- No modification of habitat will occur;
- No change to the current landscape will occur (i.e. the visual character of the area will remain unchanged);
- No heritage artefacts or palaeontological resources will be impacted upon;
- No noise impacts associated with construction activities will occur;
- No avifaunal impacts will occur due to the establishment of the project;
- No bat impacts will occur due to the construction and operation of the proposed Vhuvhili SEF; and
- No additional water use will be required.

The no-go alternative will be considered further by the specialists during the EIA Phase. Some of the specialists have discussed the no-go alternative in the current Scoping Level Specialist Assessments captured in Appendix G of this Draft Scoping Report. It is important to note that none of the Scoping Level Specialist Assessments have identified any environmental fatal flaws, and overall the high-level Scoping Phase Impact Assessments (as captured in Chapter 6 of this Draft Scoping Report) have not resulted in any unacceptable residual impacts.

The no-go alternative means no addition of renewable energy, which means further reliance on fossil fuels that will continue to have a negative environmental impact. While the no-go alternative (i.e. not developing the proposed Vhuvhili SEF) will not result in any additional negative environmental impacts in the area (besides the ongoing impacts of existing farming activities, such as grazing), it will also not have any positive community development or socio-economic benefits. In addition, it will not assist government building capacity to address the decarbonisation of the aviation sector and green hydrogen production. The no-go alternative will also impede the government in addressing climate change and reaching its set targets for

[1] **Sustainable aviation fuels** provide a large reduction of greenhouse gas emissions with little changes to current technology, as they are very similar in chemistry to traditional fossil jet fuel. They are therefore an alternative in that they are produced primarily from non-petroleum sources of hydrocarbons using a potentially broad range of biochemical and thermochemical conversion processes. The energy source is from renewable energy, the hydrogen can be sourced from water and the carbon can be sourced from biomass, waste, extracted from the air etc.

renewable energy, nor will it assist in supplying the increasing electricity demand within the country. **Hence, the no-go alternative is not the preferred alternative, nor is it a reasonable and feasible alternative to be considered in this Scoping Process**.

5.1.2 Land-Use Alternatives

The Agricultural Assessment (Appendix G.1) states that the site is in a grain farming agricultural region, but the soils vary in their suitability for crop production. Because of the favourable climate and the potentially high grain yields, farmers in the area, and particularly the large-scale farmer on whose land the site is located, utilise all suitable soil for grain production. Only soil that is not suitable for grain production is used for cattle grazing. The long-term grazing capacity of the farm is high at 5 hectares per large stock unit.

Limitations that render the soil unsuitable for grain production are depth limitations due to rock or dense clay in the subsoil, and the limited drainage associated with the dense, poorly drained clay layers in the subsoil.

The study area has **moderate agricultural potential** predominantly because of favourable climatic conditions which favour grain production.

The footprint of the Vhuvhili SEF has been deliberately laid out so that it avoids the areas that have suitable soils and are therefore used for grain production. The grazing lands are rooigras (*Themeda triandra*) grasslands. Grass fields are burned or mowed from time to time. In addition, most of the farm portions on which the proposed Vhuvhili SEF is located, form only a small part of a much bigger farming operation that utilises many different farms with a total cropland of approximately 6000 hectares and cattle grazing of around 7000 to 8000 hectares (Lanz, 2022).

According to the National Web-based screening Tool, the study area is predominantly of medium agricultural sensitivity but includes some areas of high sensitivity. Findings from the Agricultural Agro-Ecosystem Specialist Assessment indicated that most of the areas identified as high sensitivity (i.e. crop land) by the Screening Tool are no longer or have never been used as cropland. Instead, as can be seen from photographs and the latest Google Earth image (please refer to the Agriculture Assessment in Appendix G.1), they are used for pasture. Therefore, these areas should not be classified as cropland or allocated high sensitivity because of it (Lanz, 2022).

The proposed development offers some positive impact on agriculture by way of an additional income stream to the landowners, as well as enhanced agricultural potential through improved security against stock theft and other crime and wider, societal benefits (Lanz, 2022). Based on this, the proposed Vhuvhili SEF project is viable and from the EIA process perspective, it is preferred. It is important to note that there are no flaws from an agricultural perspective and that the proposed Vhuvhili SEF project is not seen as a significant negative impact to the current farming practices on site.

The Agricultural specialist concluded in his report (Appendix G.1) that the proposed development will not have an unacceptable negative impact on the agricultural production capability of the site. According to the land capability rating for the site, which includes a land capability value of 8, any solar facility will not

be within the allowable development limits. However, a land capability of 8 is disputed for the proposed agricultural footprint of the development, and the proposed Vhuvhili SEF is therefore within the allowable limits. The evidence for this is detailed in the Agricultural Assessment included in Appendix G.1 of this report.

5.1.3 Renewable Energy Alternatives

In terms of the type of activity, this relates to the generation of up to 300 MW of electricity from a renewable energy source, and in this particular case, from **solar** resources. ENERTRAG South Africa focuses on solar, wind and hydrogen technologies and works with landowners, technology providers, regulators and investors to source and develop renewable energy projects. In addition, the project will form an integral component of the proposed production of Sustainable Aviation Fuel at the Sasol Secunda Synfuels plant in Mpumalanga (should EA be granted) and contribute to the developing green hydrogen economy within South Africa. Therefore, the **generation of electricity from a renewable energy source** was the only activity considered by the Project Applicant, and thus considered in this Draft Scoping Report. **No other activity types were considered or deemed appropriate based on the expertise of the Project Applicant**.

Where the "activity" is the generation of electricity from a renewable energy source, possible alternatives that could potentially be considered include renewable energy technologies such as Biomass, Hydro Energy, Wind Energy and Solar Energy. However, based on the preliminary investigations undertaken by the Project Applicant, **Solar PV development is the preferred technology alternative** and no other renewable energy technologies are deemed to be feasible for the study area. The unsuitability of other renewable energy technologies in the study area, and impacts of each, are discussed below.

5.1.3.1 Biomass Energy

The proposed project study area does not contain any abundant or sustainable supply of biomass. As indicated in Figure 5-1, the proposed project area has less than 5 500 t/a commercial forest residue and between 9 000 and 30 000 exploitable alien invasive plants, which are the among the lowest for both categories. Therefore, the study area does not have any viable biomass energy potential.
Therefore, the implementation of a Biomass Energy Facility within the study area is not considered to be a reasonable and feasible alternative to be assessed as part of this Scoping and EIA Process.

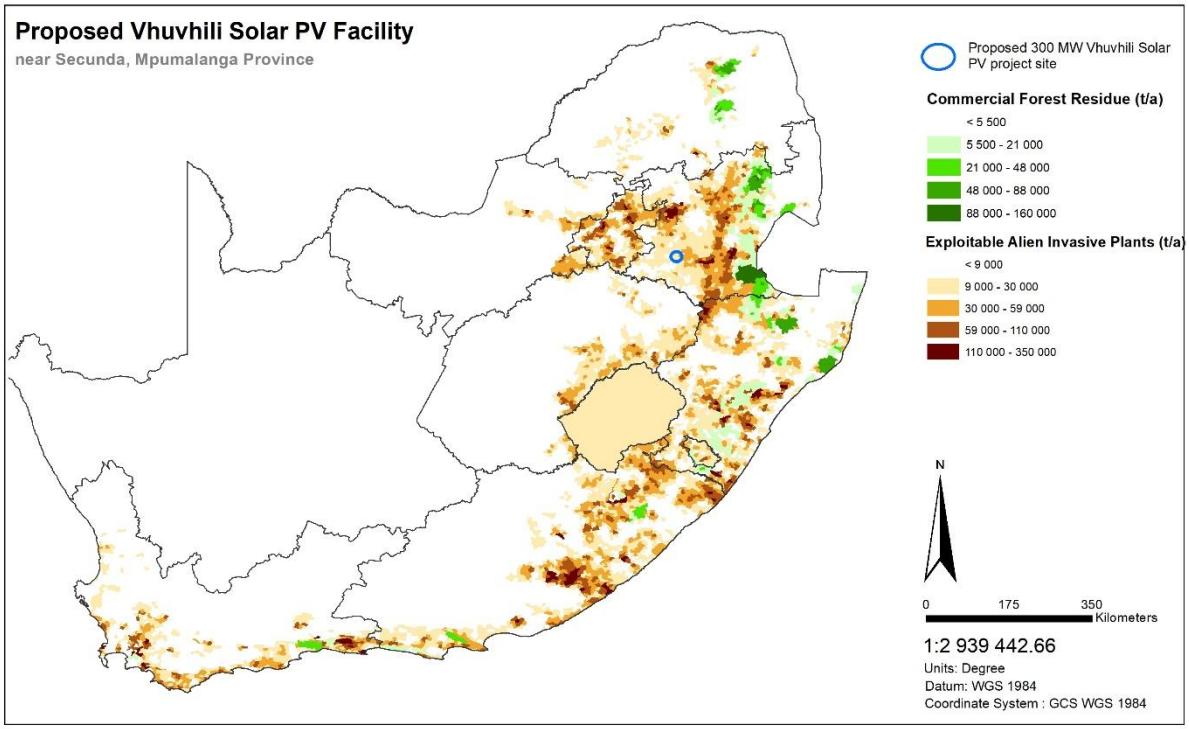

Figure 5-1: Biomass Potential in terms of Commercial Forest Residue and Exploitable Alien Invasive Plants. Note that the Vhuvhili SEF study area is depicted in red (Source: De Lange, 2013; Hugo, 2014).

5.1.3.2 Hydro Energy

The proposed project study area does not contain any large inland water bodies, nor suitable topography, which excludes the possibility of renewable energy from small- or large-scale hydro energy generation. In terms of micro hydropower potential (Figure 5-2), the study area falls within an area classified as "Not Suitable" (i.e. less than 1 000 kWH/year). **Therefore, the implementation of a Hydro Energy Facility within the study area is not considered to be a reasonable and feasible alternative to be assessed as part of this Scoping and EIA Process.**

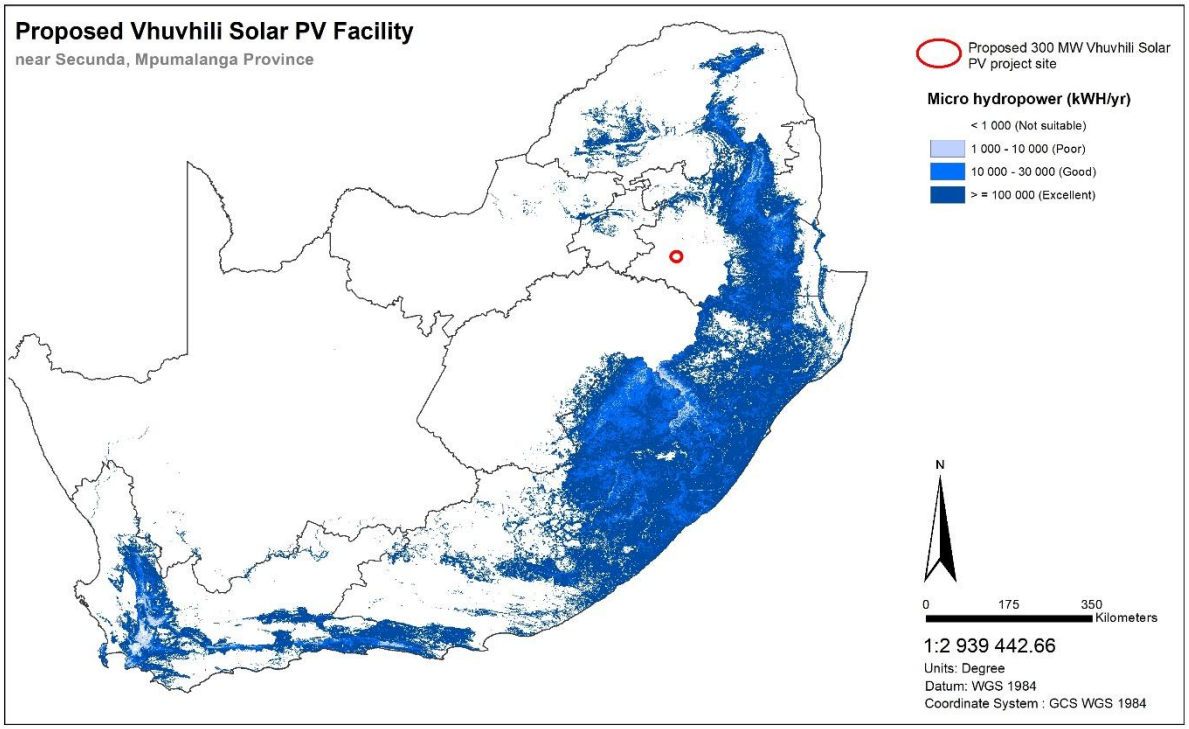

Figure 5-2: Micro Hydropower Potential (kWH/year). Note that the Vhuvhili SEF study area is depicted in red (Source: Eskom and CSIR, 1999).

5.1.3.3 Wind and Solar Energy

5.1.3.3.1 National Planning: Integrated Resource Plan (IRP) 2019

The 2019 IRP was published in Government Gazette 42784, Government Notice (GN) 1360 on 18 October 2019 for the period 2019 to 2030. As indicated in Figure 5-3 for the projection to 2030, coal makes up approximately 43 % of the total installed capacity, whereas Wind and Solar PV respectively make up 23 % and 10 % (Table 5, Page 42 of the IRP 2019 published in the Government Gazette of 18/10/2019).

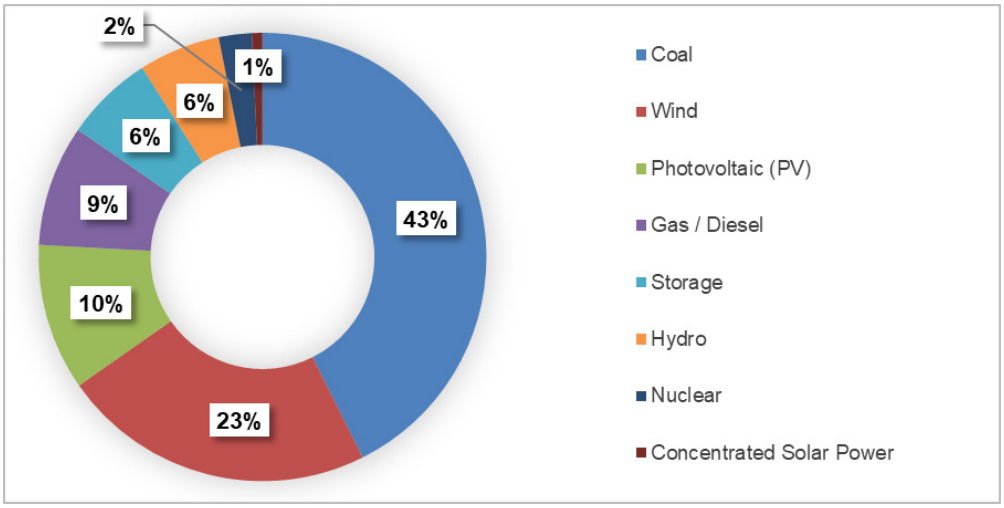

Figure 5-3: Total Installed Capacity for 2030 (% of MW) in the IRP of 2019.

The 2019 IRP proposes to secure 26 630 MW of renewable energy capacity by 2030 (for Wind, Solar PV and Concentrated Solar Power). This amount excludes Hydropower and Storage. Of this total, 1 474 MW of Solar PV, 1 980 MW of Wind and 300 MW of Concentrated Solar Power is already installed capacity. In addition, of the 26 630 MW, approximately 814 MW of Solar PV, 1 362 of Wind and 300 MW of Concentrated Solar Power is committed or already contracted capacity. Furthermore, of the 26 630 MW total, 6 000 MW is allocated to Solar PV, and 14 400 MW is allocated to wind as new additional capacity. Refer to Figure 5-4 for additional information.

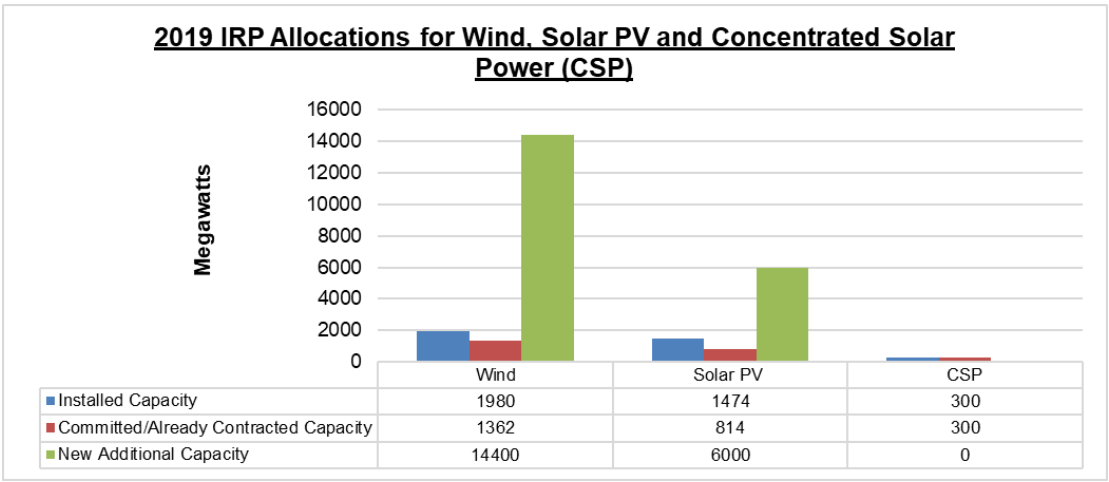

Figure 5-4: 2019 IRP Allocations for Wind, Solar and Concentrated Solar Power in MW.

As indicated in Chapter 1 and Chapter 2 of this Draft Scoping Report, the proposed Vhuvhili SEF has a generation capacity of up to 300 MW. It is intended for this project to supply the Sasol hydrogen electrolyser with renewable energy for the production of Sustainable Aviation Fuel (SAF) at the Sasol Secunda Synfuels plant in Mpumalanga. The capacity of the SAF production project at the Secunda Synfuels plant is expected to comprise of up to 500 MW of renewable energy (i.e. using wind and solar technology) and a 150 MW hydrogen electrolyser to produce approximately 60,000 t/a of SAF (please refer to Figure 1-

5 in Chapter 1). Should the proposed Vhuvhili SEF be acceptable and authorised, the facility will form one of two Renewable Energy Facilities which will feed into the hydrogen electrolyser at the Secunda Synfuels plant, contributing 300 MW of the required 500 MW.

Should the proposed Vhuvhili SEF not provide energy to Sasol, it is intended that it will be bid into a future bidding program such as the REIPPPP or another suitable tender process.

5.1.3.3.2 Wind Energy

In order to ensure that a Wind Energy Facility (WEF) is successful, a reliable wind resource is required. Wind resource is defined in terms of average wind speed and includes Weibull distribution (used to describe wind speed distributions); turbulence, wind direction, and pattern of wind direction (as depicted by a wind rose). These factors are all key considerations used in determining whether a site is suitable for the development of a Wind Energy Facility. A mean wind power density map has also been created (CSIR, 2018), which is not related to any specific turbine type and demonstrates the wind resource of the country. The mean wind power density map shows that the project study area falls within an area of approximately 700 W/m^2 (Figure 5.5).

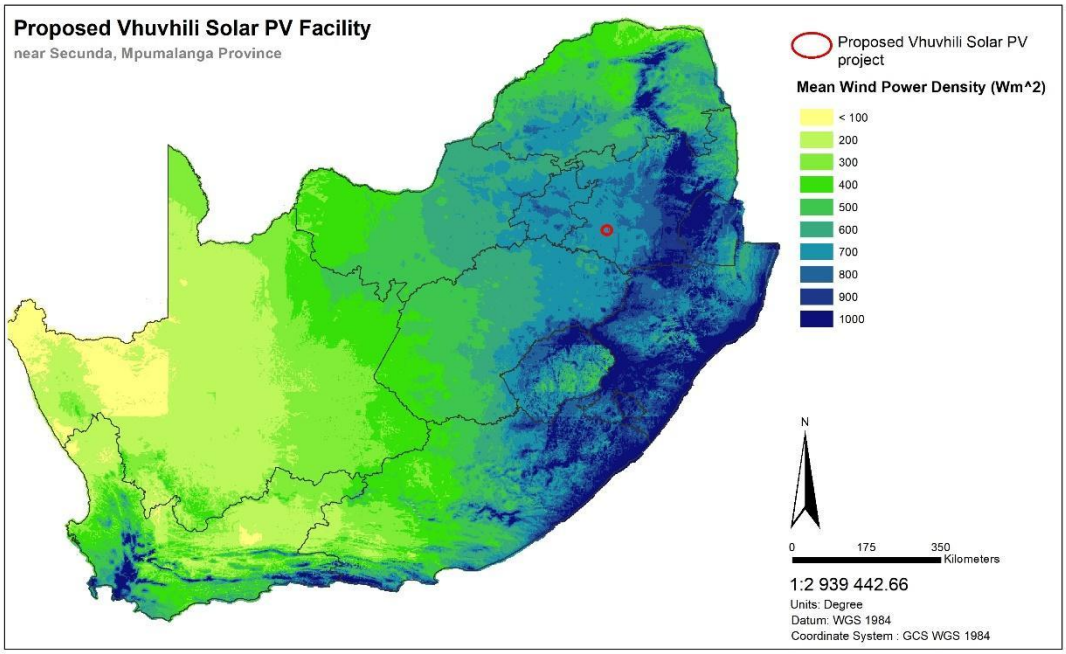

Figure 5-5: Annual Mean Wind Power Density for South Africa (W/m^2). Note that the Vhuvhili study area is depicted in red (Source: CSIR, 2018).

Overall, wind energy development can occur within this area but other localities in South Africa may be more favourable for such development. Site specific requirements for **Wind Energy Facility** however make this proposed project study area a **less feasible alternative** when compared to solar PV. **Therefore, the implementation of a WEF within the proposed project study area is not considered to be a feasible alternative to be assessed as part of this current Application for EA**.

5.1.3.3.3 Solar Energy

In terms of the suitability of solar energy development at this location, the proposed project area falls within the third **highest** Global Horizontal Irradiation[2] (GHI) category, relevant to PV installations (Figure 5-6). As indicated in this figure, the site for the proposed Vhuvhili SEF has a GHI between 1 900 – 2 000 kWh/m^2 in terms of the long-term yearly total.

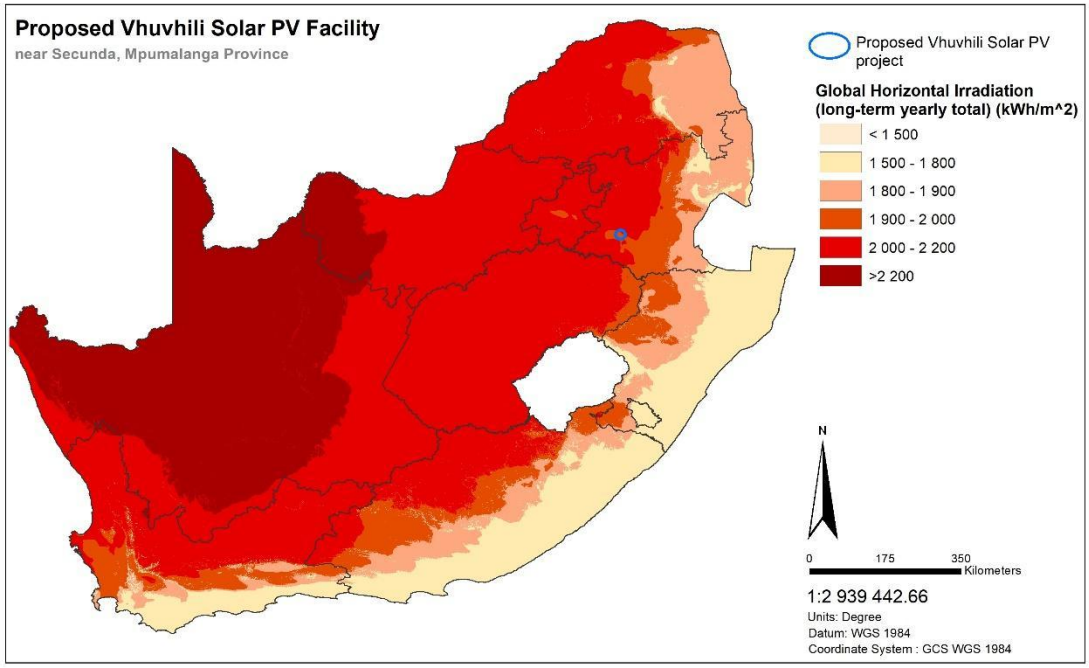

Figure 5-6: Solar Resource Availability for South Africa (kWh/m^2). Note that the Vhuvhili study area is depicted in blue (Source: CSIR, 2018).

Therefore, this area is deemed as one of the most suitable for the construction and operation of a SEF as opposed to other areas and provinces within South Africa. For example, coastal regions within the Eastern Cape and Western Cape mainly have a lower GHI (shown in the lighter orange shades in Figure 5-6), which is not completely feasible for the proposed Vuvhili SEF project. Furthermore, as indicated in the earlier discussion on the outcomes of Bid Window 5 in October 2021, solar PV is currently the least cost energy generation option for South Africa. These factors substantiate that the use of solar resources in the area is extremely viable and support the development of Solar PV within the proposed project study area.

During the Screening Phase, ENERTRAG also commissioned an Agricultural Screening Assessment to determine the environmental suitability of the site for the development of Wind Energy Facility and/or Solar PV Facility, and to eliminate areas that are considered unsuitable from an agricultural perspective. The study was undertaken by Johann Lanz (dated August 2021), and it concluded the following in terms of Solar Energy development (Lanz, 2021):

[2] Global Horizontal Irradiance is the total amount of shortwave radiation received from above by a surface horizontal to the ground

- There is no land identified as Category 1 (i.e. Very high land capability (11-15); or irrigated land; or dryland horticulture or viticulture; Solar development is not permissible and would not be granted).
- The Vhuvhili site comprises of land comprising of different viability categories (i.e. Figure 5-7). However, there are fairly large contiguous pieces of land (up to about 300 ha) on which solar technology could potentially be developed from an agricultural approval point of view.

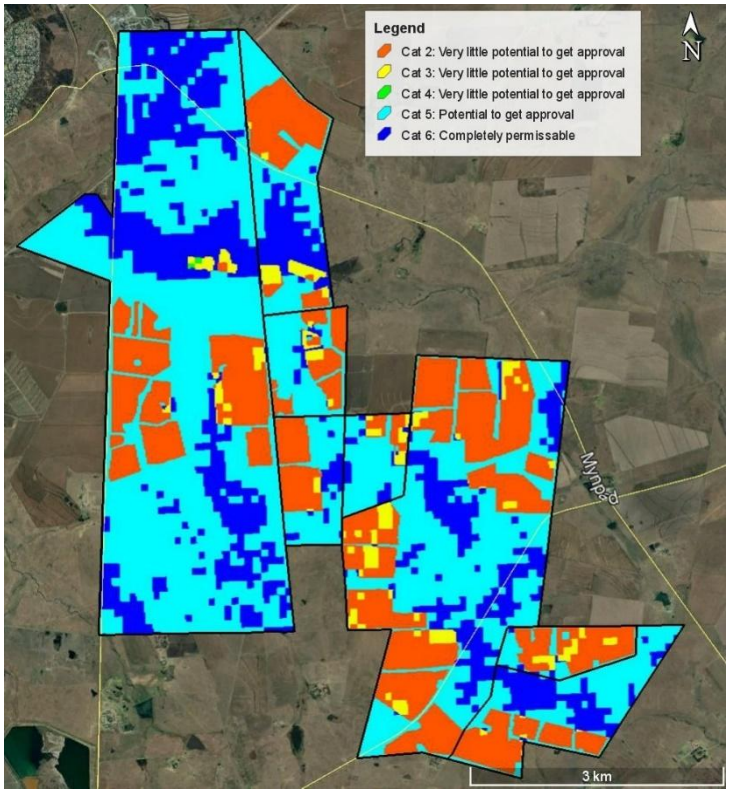

Figure 5-7: The distribution of different viability categories of the likelihood of achieving agricultural approval on land for solar development across the Vhuvhili SEF site (Source: Lanz, 2021).

Therefore, the implementation of a solar energy facility within the study area is more favourable and feasible than wind energy, biomass and hydropower development, especially from a project economic and energy generation viability and location compatibility perspective. Therefore, the proposed Vhuvhili Solar PV Energy project is the most feasible and preferred Renewable Energy Alternative.

Furthermore, the detailed Agricultural Specialist Assessment confirmed that the areas identified during the Screening Phase as Category 2 land, indicated in Orange in Figure 5-7 above (i.e. All other cultivated land; Is not permissible and is highly unlikely to be granted) are no longer or have never been used as cropland, most of these land portions are used for pasture. The Agricultural specialist therefore recommended that most of the Category 2 land (with the exception of one land portion located near the western boundary of the proposed site) should not be allocated a Category 2 rating. Please refer to Appendix G.1 for the detailed Agricultural Specialist Assessment.

In addition, unlike opencast coal mining within the broader Mpumalanga coal area, the proposed Project facilitates multiple land use functions within the development area. As solar modules are clustered on surface developments this allows multiple land use functions such as operating the solar farm in tandem with underground coal mining. This will boost the economic activities in the area which will in turn increase job opportunities in that area and help improve the local community's welfare without jeopardizing the environment.

Finally, since the alternative renewable energy generation activities considered were deemed to be unreasonable and unfeasible for the study area, no other Renewable Energy alternatives were further assessed as part of the current Scoping and EIA Processes.

5.1.3.3.4 Summary of the Renewable Energy Alternatives

Table 5-1 presents a summary and an evaluation matrix for the possible renewable energy alternatives with regards to resource suitability and availability, and potential risks and impacts.

Table 5-1: Summary of Evaluation of Potential Risks and Impacts for Renewable Energy Alternatives

Type of Renewable Energy Alternative	Are suitable resources available at the proposed project site?	Main Potential Impacts and Risks	Is this the preferred Alternative?
Biomass Energy	▪ No – not suitable i.e. less than 5 500 t/a commercial forest residue and less between 9 000 and 30 000 t/a exploitable alien invasive plants (which are the among the lowest for both categories).	▪ Significant Waste Generation with the potential need for a Waste Management Licence; and ▪ Air Emissions with the potential need for an Atmospheric Emissions Licence.	▪ No
Hydro Energy	▪ No – "Not Suitable" (i.e. less than 1 000 kWH/year), lack of water and topography unsuitable.	▪ Significant impacts on aquatic biodiversity and hydrology of the affected river system; ▪ Water Use Licence would be required for the establishment of an in-stream hydropower development; and ▪ Long lead times would be required for the various permits needed for such development.	▪ No
Wind Energy	▪ Yes (approximately 700 W/m^2) but less economically	▪ Visual impacts as a result of construction activities and presence of turbines during operation;	▪ No

Type of Renewable Energy Alternative	Are suitable resources available at the proposed project site?	Main Potential Impacts and Risks	Is this the preferred Alternative?
	competitive than solar PV and other regions in South Africa have better wind resources.	▪ Noise generation as a result of construction activities and turbines during operation; ▪ Bird and bat collisions during the operational phase as well as mortalities to bats due to barotrauma. ▪ Blanket curtailment for all turbines from January to May each year to reduce the impact on vultures; ▪ Shut down on demand from June to December for vultures and raptors; ▪ Implementation of a system of carcass removal to ensure vultures are not attracted to the site; ▪ Impacts on aquatic ecology and terrestrial ecology; ▪ Impact on archaeology and palaeontology; and ▪ Impact on Civil Aviation due to nearby aerodromes.	
Solar Energy	▪ Yes – 1 900 – 2 000 kWh/m^2	▪ Visual impacts as a result of construction activities and the presence of PV panels during operation; ▪ Noise generation as a result of construction activities; ▪ Loss of agricultural land (i.e. grain farming and grazing); ▪ Impacts on heritage resources (i.e. archaeology and palaeontology); ▪ Impacts on the water balance as a result of water required for panel cleaning; and ▪ Impacts on avifauna, aquatic ecology and terrestrial ecology.	▪ Yes

5.1.4 Site Alternatives

As per the requirements listed within Appendix 2 – [(1) (d)] and [(2) (1) (g) (ix)] of the 2014 NEMA EIA Regulations (as amended), a site selection matrix should be provided to show how the preferred site was determined through a site selection process. Within this context, it is understood that the "site" referred

to in the Regulations are the farms or land portions earmarked for the development of the proposed Vhuvhili SEF.

The preferred site was selected based on national level considerations (high solar radiation levels) and various local factors as described below. It was selected based on national level considerations (i.e. high Horizontal Irradiation levels), close proximity to the Sasol Secunda Synfuels plant and to the Eskom substation (should the project be entered into the REIPPPP or similar bidding process) and various local factors as described below. Based on the initial screening and sensitivities identified by the Project Developer, this area was reduced to a total study area of approximately 3 115 ha.

The proposed affected farm portions for the development of the Vhuvhili SEF were selected as they were already heavily disturbed by agricultural and coal mining activities. Thus, preliminary investigations indicated that the development of these farms would have a minimal impact on the region's flora, fauna and water resources. Furthermore, from an impact and risk assessment perspective, the implementation of the Vhuvhili SEF at the **preferred site** will most likely result in fewer risks in comparison to its implementation at alternative sites within Mpumalanga (i.e. regions with similar GHI levels), based on the following points:

- There is no guarantee that the current land use of alternative sites will be flexible in terms of development potential, for example, the agricultural potential at the alternative sites might be higher and of greater significance.
- There is no guarantee of the willingness of other landowners to allow the implementation of a solar facility on their land and if the landowners strongly object, then the project will not be feasible.
- There is no guarantee that other sites will be located close to the Sasol Secunda Synfuels plant to enable connection to the proposed Green Hydrogen electrolyser. The further away a project is from the Synfuels plant, the higher the potential for significant environmental and economic impacts and the production of Sustainable Aviation fuels being unfeasible.
- There is no guarantee that other sites will be located close to existing or proposed electrical infrastructure to enable connection to the national grid. The further away a project is from the grid, the higher the potential for significant environmental and economic impacts.

5.1.4.1 Site Specific Considerations

As indicated above, the preferred site for the proposed Vhuvhili SEF extends over the following farm portions:

- Remainder of Grootvlei No.584;
- Portion 23 of Grootvlei No. 293;
- Portion 18 of Grootvlei No. 293;
- Portion 21 of Grootvlei No. 293;
- Portion 20 of Grootvlei No. 293;
- Remainder of Poverty Acres No. 585;
- Portion 21 of Vlakspruit No.292; and
- Portion 22 of Vlakspruit No.292.

On a site specific (local) level, the preferred site was deemed suitable due to all the site selection factors (such as land availability, environmental sensitivities, distance to the Sasol Secunda Synfuels plant and the

national grid, site accessibility, topography, current land use and landowner willingness) being favourable. The site selection criteria considered by ENERTRAG are discussed in detail below in Table 5.2.

Table 5-2: Site selection factors and suitability of the preferred site for the development of the proposed Vhuvhili SEF

Factor	Suitability of the Preferred Site
Land Availability	The farm portions comprising the preferred site are of a suitable size for the proposed project. The land available for the development of the proposed Vhuvhili SEF is approximately 3 115 ha in extent. Therefore, sufficient land will be available for the development of the proposed Vhuvhili SEF.
Environmental Sensitivity	After a thorough evaluation of the regional farms, the specific farms were selected because they were already heavily disturbed by agricultural and coal mining activities. Thus, it was concluded that the development of these farms would have a minimal impact on the region's flora, fauna and water resources. The initial area assessed was approximately 13 000 to 14 000 ha for the development of proposed Vhuvhili SEF. Based on the initial screening and sensitivities identified by the Project Developer, this area was reduced to a total study area of approximately 3 115 ha. Other reasons for significantly reducing the area were due to large number of landowners to be engaged to secure land, the vast majority of the land was utilized for cultivation – as such the Project Developer did not want to negatively impact the agricultural land, and lastly the solar resource tended to be less attractive in other areas as compared to the area selected. Although the preferred site for the proposed Vhuvhili SEF does contain environmental features that need to be avoided due to very high or high environmental sensitivity as described in Chapter 3 and Appendix G of this Draft Scoping Report, following these exclusions sufficient suitable land is still available to ensure the development feasibility of the project (see Section 5.1.5 below).
Irradiation Levels	The Project site was also selected on the availability of solar resource in the Mpumalanga region (i.e. Good to Very Good, between 1 900 – 2 000 kWh/m^2). The availability of the solar resource is the main drivers of project viability. The Project site was identified by the Project Developer through a desktop pre-feasibility analysis based on the estimation of the solar energy resource. This viable solar resource ensures the best value for money is gained from the project, allowing for competitive pricing and maximum generation potential, with the resulting indirect benefits for the South African economy.
Distance to the proposed Hydrogen Electrolyser at the Sasol Secunda Synfuels plant	The proposed Vhuvhili SEF is located approximately 9 km east of the Hydrogen Electrolyser at the Sasol Secunda Synfuels plant. It is proposed that the proposed project would connect to the electrolyser directly or via a nearby third-party substation to aid in the production of Sustainable Aviation Fuels. The Electrical

Factor	Suitability of the Preferred Site
	Grid Infrastructure to connect the proposed Vhuvhili SEF to the grid at Sasol will undergo a separate Basic Assessment process.
Distance to and availability of the Grid	The Project is located adjacent to the Sasol Secunda to reduce the environmental, social, and financial impacts caused by long connection option. Long connection lines have vast environmental impacts as well as added increased costs from a development, construction and operational perspective. Thus, this Project site has ideal grid connection potential as the Project will connect to the planned step-down substation to be constructed at the Sasol Secunda plant, which is located approximately 15 km from the Project. Existing powerlines are located within close proximity to the site, allowing for potential direct connection to these existing lines where insufficient allocation may be available at the Sasol plant, or where Eskom planning indicate different future use should the project be bid in the REIPPPP. The proposed Vhuvhili SEF is located approximately 14 km East of the Eskom Sol Substation. Therefore, should the proposed SEF not be used in the production of Sustainable Aviation Fuels (as mentioned above), it is proposed that Vhuvhili SEF would connect to the Eskom Sol Substation, either directly or via a nearby third-party substation. The Electrical Grid Infrastructure to connect the proposed Vhuvhili SEF to the national grid will be subject to a separate Basic Assessment process. With regards to renewable energy facilities, there is minimal competition in the area. Should the project proceed, it will be the one of the first commercial scale solar PV facilities in the province and will act as one of the pioneering developments and open opportunities for other renewable developments. It will also serve as a case study for solar resource in the province, showing that commercially viable solar energy facilities are suitable for certain parts of Mpumalanga Province.
Site Accessibility	The Project site can be accessed easily via the tarred N17 national roads which run along the northern boundary of the site. There are existing roads that go through the land parcels to allow for direct access to the project development area. Based on an access investigation conducted for the site by the Traffic Specialist (Wink, 2021), two site access points are recommended for the site. The access points are proposed off the gravel sections of the D823 and D619 road. The access points are located off existing gravel access roads thus access spacing restrictions are not envisaged. Sight lines along the access points are within the recommended limits. The final site access points will be based on the access investigation findings, geometric considerations and site layout restrictions. The existing gravel road will be widened and upgraded for the proposed project, with

Factor	Suitability of the Preferred Site
	an upgraded width ranging up to approximately 10 m. Exact specifications of the widening and upgrading of the farm gravel road will be confirmed during the detailed design phase. Internal roads will also be constructed within the footprint of the PV Facility. The internal roads are expected to be composed of gravel and will extend approximately 4 to 5 m wide. The total internal road length may vary slightly, depending on the final design.
Topography	The Scoping Level Visual Impact Assessment (Appendix G.6 of this Draft Scoping Report) notes that the broader area surrounding the proposed is characterised by relatively flat to slightly undulating terrainwhich is suitable for the development of a solar project. Areas of slightly higher elevation occur along the south-eastern boundary of the study area. Slopes across the study area are relatively gentle to moderate, with steeper slopes being largely associated with the more incised river valleys. Average gradients across the study area are generally between 1:50 – 1:20. The proposed Vhuvhili SEF site is located on the flattest ground near the Sasol facility and thus in combination with suitable solar resource within the study area is optimized from a construction and technical perspective.
Current Land Use	Agriculture - the wider study area is mainly used for grain cultivation and livestock grazing and the current site extent for the project is limited to grazing areas.
Landowner Willingness	The landowners have signed letters of consent for the use of the land for the proposed project (should EA be granted). This is considered an important aspect of the proposed project in terms of its viability (i.e. this will limit potential appeals during the decision-making process, as the landowner is willing and supportive of the proposed Vhuvhili SEF project being undertaken on the affected farm portions).

Furthermore, one of the main determining points for the Project Developer was to find suitable, developable land in one contiguous block to (i) consolidate and optimize design, (ii) minimize construction and operational costs, and (iii) minimize sprawling development and limit the impact footprints. In addition, the proximity of the proposed Vhuvhili SEF to the Sasol Secunda Synfuels plant and the Eskom Sol Substation was also a major determinant for identifying a suitable site for the proposed development. Further motivation for the proposed project is provided in Chapter 1 of this Draft Scoping Report.

In order to submit a bid in terms of the REIPPPP, the proponent is required to have obtained an EA in terms of the EIA Regulations as well as several additional authorisations or consents. It is important to note that the National Department of Environmental Affairs (DEA) in discussion with the Department of Energy (DoE) (now respectively operating as the DFFE and DMRE), was mandated by MinMec to commission a Strategic Environmental Assessment (SEA) to identify the areas in South Africa that are of strategic importance for

Wind and Solar PV development. The Phase 1 Wind and Solar PV SEA[3] was completed in 2015 and was in support of the Strategic Infrastructure Plan (SIP) 8, which focuses on the promotion of green energy in South Africa. Similarly, the Phase 2 Wind and Solar SEA was commissioned in 2017 and completed in 2019. The SEA aimed to identify strategic geographical areas best suited for the roll-out of large-scale wind and solar PV energy project, referred to as Renewable Energy Development Zones (REDZs). Through the identification of the REDZs, the key objective of the SEA was to enable strategic planning for the development of large-scale wind and solar PV energy Facility in a manner that avoids or minimises significant negative impact on the environment while being commercially attractive and yielding the highest possible social and economic benefit to the country – for example through strategic investment to lower the cost and reduce timeframes of grid access. Following the completion of the Phase 1 Wind and Solar SEA, eight REDZs were gazetted in February 2018 in GN 114 by the Minister of Environmental Affairs. In addition, following the completion of the Phase 2 Wind and Solar SEA, three REDZs were gazetted in February 2021 in GN 144 by the Minister of Forestry, Fisheries and the Environment.

The proposed Vhuvhili SEF is located approximately 29 km away (at its closest point) from the Emalahleni REDZ (i.e. REDZ 9). In addition, the proposed Vhuvhili SEF is located approximately 34 km away (at its closest points) from the International Strategic Transmission Corridor (as gazetted on 16 February 2018 in GN 113). While the proposed Vhuvhili SEF is not located within the Emalahleni REDZ or International Strategic Transmission Corridor, the proposed project still indeed supports the development of a large-scale renewable energy project at the proposed location. The proposed project is linked to the national planning vision for Renewable Energy development as well the development of the Green Hydrogen economy in South Africa.

Given the site selection requirements associated with the solar energy facility and the suitability of the land available on the **preferred site**, and the fact that no initial fatal flaws are present on the site, **no other site alternatives were considered as part of this Scoping and EIA Process. Therefore, the site for the Vhuvhili SEF is therefore deemed feasible and selected as the preferred site.**

5.1.5 Location Alternatives – Development Footprint within the Preferred Site

The process followed to reach the preferred site and to consider various development footprints (or location alternatives) within the preferred site are discussed in this section and illustrated in Figure 5-8.

As an initial step, the Project Developer consulted the National Web-Based Environmental Screening Tool (https://screening.environment.gov.za/screeningtool/#/pages/welcome) to determine a baseline description of the prevalent environmental sensitivities within the proposed preferred project site. An initial study area of approximately 13 000 to 14 000 ha was considered by the Project Developer for the development of the proposed Vhuvhili SEF. Subsequent research and consultation with the affected landowners was then also undertaken in order to identify possible areas within the initial study area that should be excluded from development. This then guided the selection of the best suitable study area to be assessed by the specialists from an environmental sensitivities and practical/technical perspective. The

[3] More information on the SEA can be accessed at https://redzs.csir.co.za

study area that was subjected to specialist assessment for purposes of this S&EIA Process comprises the aforementioned affected farm portions (see Section 5.1.4.1) and covers approximately 3 115 ha.

As discussed above, ENERTRAG then commissioned an Agricultural Screening Assessment to determine any high-level no-go areas and the suitability of the site.

ENERTRAG then determined the **Original Scoping Buildable Area** based on the sensitivities identified in the Screening Study. Following this, the Environmental Assessment Practitioner (CSIR) and Specialists were appointed by ENERTRAG to undertake the Scoping and EIA Processes for the proposed Vhuvhili SEF. The specialists then undertook the Scoping Level Specialist Assessments (included in Appendix G of this Draft Scoping Report), and site verifications, where necessary. The specialists assessed the full extent of the preferred site (i.e. approximately **3 115 ha**), which serves as the **Study Area** for this Scoping and EIA Process. The Scoping Level Specialist Assessments resulted in the determination and verification of environmental sensitivities present on the preferred site.

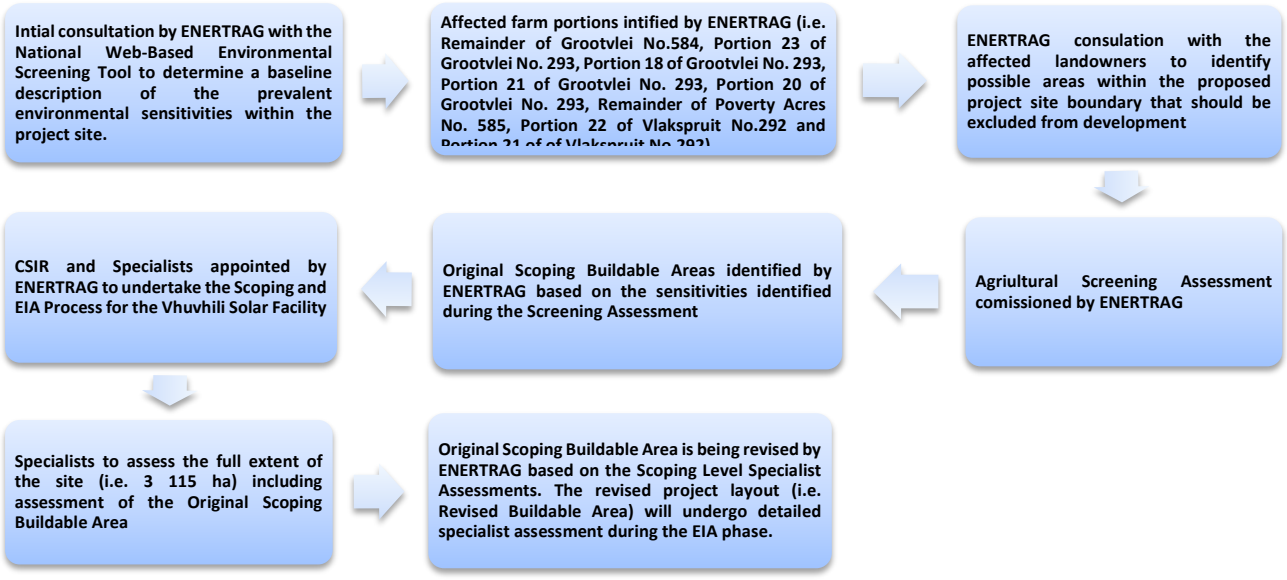

Figure 5-8: Process flow for the identification of the Preferred Site and Development Footprint

Based on these Scoping Level Specialist Assessments, a development footprint area was proposed for the development of the proposed Vhuvhili SEF. The development footprint area will be further refined in the EIA phase. An environmental sensitivity map has been produced (included as Figure 3-99 of Chapter 3 of this Draft Scoping Report). This map shows the no-go sensitive environmental features found within the preferred site, as described in the Scoping Level Specialist Assessments (Appendix G) and discussed in Chapter 3 of this Draft Scoping Report. Following the exclusion of the required areas, sufficient developable area is still available on site which does not compromise the current ecological integrity of the site. The sensitivity map will be further refined in the EIA phase.

The sensitivities identified and verified by the specialists during the scoping phase will be used to develop the Revised Buildable Area (or the revised development footprint area) which will be included and assessed

by the specialists in the EIA phase. During the EIA Phase, the specialists will, based on their impact assessment of the proposed development footprint of the Vhuvhili SEF following the Scoping Phase, refine their sensitivity mapping of the proposed project layout with recommendations regarding micro-siting and selection of infrastructure location alternatives, as well as required mitigation measures and management actions. As a result, the preferred project layout of the proposed Vhuvhili SEF within the identified development footprint area will be determined, whereby any sensitive features identified and confirmed by the specialist impact assessments, will be avoided, remedied or mitigated by the proposed project layout. The layout will therefore be further refined in the EIA phase.

Although all existing access roads will be utilised for the proposed project, the planned internal road network, including all additional access service roads to be constructed, will be confirmed as part of the project layout, and will be assessed by the specialists during the EIA Phase.

5.1.5.1 Project Infrastructure Location Alternatives

Various infrastructure alternatives are being considered and will be assessed in this S&EIA Process. This includes alternative locations for the substation hubs, as well as alternative technologies for the Battery Energy Storage Systems (BESS).

- **Substation Complex**

The proposed project will also include a substation and BESS complex on site. The on-site substation and BESS complex will extend approximately up to 10 ha and will have a height of up to 10 m.

The capacity of the proposed substation varies according to the detailed design and requirements from potential clients. A transformation capacity of 200 - 250 MVA is assumed, and generally stepped up from 22 kV or 33 kV to 132 kV for connection to the Eskom grid (or to the Sasol grid via the proposed 150 MW Hydrogen electrolyser). It is estimated that the on-site substation will have a 200 - 250 MVA transformation capacity and will generally step up from 22 kV or 33 kV to 132 kV for connection to the national grid.

The on-site substation and BESS complex will comprise the following components:

- On-site Independent Power Producer (IPP) or Facility Substation (+-2 ha). This will include the relevant section that will be maintained by the IPP or the Project Developer; and/or
- Switching Station and Collector Station (+-2 ha); and/or
- BESS (+-5 ha).

Two potential location alternatives for the substation and BESS complex have been identified at the proposed Vhuvhili SEF project site. These are listed below:

  - Substation and BESS complex (preferred alternative) is located on Remainder of the Farm Grootvlei No. 584.
  - Substation and BESS complex (Alternative 1) is located on Portion 20 of the Farm Grootvlei No. 293.

Substation and BESS (Alternative 1) was ruled out by the Project Developer as a viable alternative during the Scoping Phase. Therefore, Alternative 1 will not be taken forward for further assessment by the specialists in the EIA Phase.

5.1.6 Technology Alternatives

The following technology alternatives are being considered as part of this Scoping and EIA Process.

5.1.6.1 Solar Panel Types

Only the PV solar panel technology type will be considered in this Scoping and EIA Process. Due to the scarcity of water in the proposed project area and the large volume of water required for Concentrated Solar Power (CSP), this technology is not deemed feasible or sustainable and will not be considered in this Scoping and EIA Process. This is the main difference between PV and CSP technology that led to the selection of PV as the preferred solar panel technology for the proposed Vhuvhili SEF.

Furthermore, CSP technology requires a larger development footprint to obtain the same energy output as PV technology, and it requires active solar tracking to be effective. As described above, in terms of the 2019 IRP, 300 MW capacity is already installed for CSP; and an additional 300 MW has been allocated for 2019, whilst there is no new additional capacity allocated for this technology. Solar PV is allocated an additional new capacity of 6 000 MW in terms of the 2019 IRP. This means that the need and desirability of CSP is not as evident and justified compared to PV.

5.1.6.2 Mounting System

Solar panels can be mounted in various ways to ensure maximum exposure of the PV panels to sunlight. The main mounting systems that will be considered as part of the Scoping and EIA Process and design are Single Axis Tracking structures (aligned north-south); Fixed Axis Tracking (aligned east-west); Dual Axis Tracking (aligned east-west and north-south); Fixed Tilt Mounting Structure or Bifacial Solar Modules.

5.1.6.3 Battery Energy Storage Systems

It is proposed that Lithium Battery Technologies, such as Lithium-Ion Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology, however, the specific technology will only be determined following Engineering, Procurement and Construction (EPC) procurement. As indicated in Chapter 2 of this Draft Scoping Report, Lithium-Ion BESS and Redox Flow BESS technologies have been considered by ENERTRAG for the proposed project during the Scoping Phase. ENERTRAG considered the advantages and disadvantages of Lithium-Ion BESS and Redox Flow BESS technologies (Table 5-3). Refer to Appendix G.5 of this Draft Scoping Report for a High-Level Safety, Health and Environment Risk Assessment Scoping Input Report, which provides high level information on the safety, health and environmental risks of the BESS technology.

Table 5-3: Advantages and disadvantages associated with the BESS technologies that were considered for the proposed Vhuvhili Solar Energy Facility (Sources: Parsons, 2017; Zhang *et al.*, 2016)

BESS technologies being considered	Advantages	Disadvantages
Lithium-ion BESS	▪ Sealed systems i.e., pre-assembled off site and delivered to site for placement (i.e., carries less potential risk to the environment in terms of spillages). Hence, they are easier to install and will not likely need many permanent staff. ▪ Does not require active cooling unlike other BESS technologies. ▪ Reduced risk of spillage as storage of large quantities of electrolyte is not required.	▪ Explosions and fires can occur as well as the possibility of generating noxious smoke under these circumstances. This can occur as result of electrolytes mixing when a breach occurs due to: - improper maintenance near operating temperature, - thermal expansion, or - freeze thaw cycles. ▪ Over the long term these BESS may be more difficult to repurpose / dispose of and may present cumulative long term environmental impacts.
Redox Flow Batteries (RFB): Vanadium-Vanadium Redox Flow Battery (VRFB)	▪ RFBs are self-discharging systems therefore generally require little maintenance. However, RFBs are more difficult to install, i.e. formal brick and mortar structures, and will potentially require many permanent staff. ▪ High economic efficiency as Vanadium has a high economic value and can be recycled.	▪ Risk of spillage tends to be higher for RFB as opposed to sealed solid-state BESS as the storage tanks of RFB, may be subjected to leaks or spills during the replacement or blending of the electrolyte, or during transport of the battery to and from site.

5.2 Summary of Legislative Requirements for the Assessment of Alternatives

As noted in Chapter 1 of this Scoping Report, the 2014 NEMA EIA Regulations (as amended) have certain requirements in terms of the selection of the **proposed preferred activity, site and location of the development footprint within the site**. Table 5.4 below indicates the requirements of the 2014 NEMA EIA Regulations (as amended) in terms of the process leading to the preferred activity, site and development footprint location alternatives. Table 5.4 also includes a response from the EAP showing how the requirements of the 2014 NEMA EIA Regulations (as amended) have been addressed in this report.

Table 5-4: Requirements for the consideration of Alternatives based on the 2014 NEMA EIA Regulations (as amended)

	Section of the EIA Regulations	Requirements for a Scoping Report in terms of Appendix 2 of the 2014 NEMA EIA Regulations (as amended)	Response from EAP
1	Appendix 2 – 2 – 1 – g – (i)	2. (1) A scoping report must contain the information that is necessary for a proper understanding of the process, informing all preferred alternatives, including location alternatives, the scope of the assessment, and the consultation process to be undertaken through the environmental impact assessment process, and must include: (g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including: (i) details of all the alternatives considered;	Refer to Sections 5.1, 5.2 (i.e. this section) and 5.3 of this chapter which provides a description of the process that led to the identification of the preferred alternatives and which alternatives will be taken further into the EIA Phase for assessment.
2	Appendix 2 – 2 – 1 – g – (ii)	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Refer to Chapter 4 of this Draft Scoping Report and Appendix E, which details the process followed in terms of Public Participation and includes the supporting documentation.
3	Appendix 2 – 2 – 1 – g – (iii)	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	This will be completed following the release of the Draft Scoping Report for comment.
4	Appendix 2 – 2 – 1 – g – (iv)	(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Refer to Section 5.1.3 and 5.1.4 of this chapter for a description of the environmental sensitivities associated with the **preferred site** (i.e. Remainder of Grootvlei Farm No.584, Portion 23 of Grootvlei Farm No. 293, Portion 18 of Grootvlei Farm No. 293, Portion 20 of Grootvlei Farm No. 293, Portion 21 of Grootvlei Farm No. 293, Remainder of Poverty Acres No. 585, Portion 21 of Vlakspruit Farm No.292 and Portion 22 of of Vlakspruit No.292).

	Section of the EIA Regulations	Requirements for a Scoping Report in terms of Appendix 2 of the 2014 NEMA EIA Regulations (as amended)	Response from EAP
			Section 5.1.4 of this chapter also provides information on environmental attributes that were considered in the selection of the preferred site for the proposed Vhuvhili SEF. Chapter 3 of this Draft Scoping Report also includes a description of the wider affected environment.
5	Appendix 2 – 2 – 1 – g – (v)	(v) the impacts and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified impacts, including the degree to which these impacts: (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	In terms of the no-go alternative, this is not considered as the preferred alternative, as discussed in Section 5.1.1 of this chapter. The impacts and risks of both adopting and not adopting the no-go alternative have been discussed in this section. Furthermore, this will be unpacked during the EIA Phase. Feedback on the impacts and risks that informed the identification of the preferred activity (i.e. generation of energy from solar resources) is provided in Section 5.1.3 and Section 5.1.4 above. Such feedback relating to the preferred site and location of the development footprint within the site is captured in Chapter 6 of this Scoping Report. This chapter includes a high-level assessment of impacts and risks of the proposed Vhuvhili SEF at the preferred site and location of the development footprint within the site, and it includes a description and assessment of the nature, significance, consequence, extent, duration and probability of the identified impacts for the preferred alternatives, as well as an assessment of the reversibility and irreplaceability of the potential identified impacts, as well as the degree to which the identified impacts can be avoided, managed or mitigated.

	Section of the EIA Regulations	Requirements for a Scoping Report in terms of Appendix 2 of the 2014 NEMA EIA Regulations (as amended)	Response from EAP
			Furthermore, various technologies for the BESS have been considered and assessed in terms of impacts and risks in the Scoping Phase. It is proposed that Lithium Battery Technologies, such as Lithium-Ion Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology, however, the specific technology will only be determined following EPC procurement.
6	Appendix 2 – 2 – 1 – g – (vi)	(vi) the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Refer to Chapter 7 of this Draft Scoping Report for the impact assessment methodology that was used in the assessment of impacts captured in Chapter 6. The same impact assessment methodology will be used in the EIA Phase and as such has only been mentioned once in the Scoping Report.
7	Appendix 2 – 2 – 1 – g – (vii)	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Feedback on the impacts and risks that informed the identification of the preferred activity (i.e. generation of energy from solar resources) is provided in Section 5.1.3 and Section 5.1.4 above. Such feedback relating to the preferred site and location of the development footprint within the site is captured in Chapter 6 of this Draft Scoping Report. This chapter includes a high-level assessment of impacts and risks of the proposed Vhuvhili SEF at the preferred site and location of the development footprint within the site.
8	Appendix 2 – 2 – 1 – g – (viii)	(viii) the possible mitigation measures that could be applied and level of residual risk;	Feedback on the impacts and risks that informed the identification of the preferred activity (i.e. generation of energy from solar resources) is provided in Section 5.1.3 and Section 5.1.4 above. Such feedback relating to the preferred site and location of the development footprint within the site is captured in Chapter 6 of this Draft Scoping Report. This chapter includes a high-level assessment of impacts and risks of the

	Section of the EIA Regulations	Requirements for a Scoping Report in terms of Appendix 2 of the 2014 NEMA EIA Regulations (as amended)	Response from EAP
			proposed Vhuvhili SEF at the preferred site and location of the development footprint within the site.
9	Appendix 2 – 2 – 1 – g – (ix)	(ix) the outcome of the site selection matrix;	Refer to Section 5.1.4 and Section 5.1.5 of this chapter for information on the process that led to the identification of the preferred site.
10	Appendix 2 – 2 – 1 – g – (x)	(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	Where no further alternatives were considered, a motivation has been provided in this chapter.
11	Appendix 2 – 2 – 1 – g – (xi)	(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	Refer to Section 5.3 of this chapter for a concluding statement.

5.3 Concluding Statement of Preferred Alternatives

As per Appendix 2, Section 2 (1) (g) (xi) of the 2014 NEMA EIA Regulations (as amended), and based on Section 5.1 above, the following alternatives or preferred alternatives will be taken forward into the EIA Phase for further assessment:

- **No-Go Alternative:**
    - The no-go alternative assumes that the proposed project will not go ahead i.e., it is the option of not constructing the proposed Vhuvhili SEF. This alternative would result in no environmental impacts (positive and negative) on the site or surrounding local area, as a result of the proposed Vhuvhili SEF. It will provide a baseline against which other alternatives will be compared and considered during the EIA Phase. The no-go alternative will be assessed in detail by all the specialists on the project team. **At this Scoping Phase, the no-go alternative is not preferred**.

- **Land-Use Alternative:**
    - The current land-use is agriculture, specifically grain farming and cattle grazing. The study area has **moderate agricultural potential** predominantly because of favourable climatic conditions which favour grain production. The footprint of the Vhuvhili SEF has been deliberately laid out so that it avoids the areas that have suitable soils and are therefore used for grain production.

      Findings from the Agricultural Agro-Ecosystem Specialist Assessment indicated that most of the areas identified as high sensitivity (i.e., crop land) by the Screening Tool are no longer or have never been used as cropland. Instead, as can be seen from photographs and the latest Google Earth image (please refer to the Agriculture Assessment in Appendix G.1), they are used for pasture. Therefore, these areas should not be classified as cropland or allocated high sensitivity because of it (Lanz, 2022). In addition, most of the farm portions on which the proposed Vhuvhili SEF (covering approximately 650 hectares) is located, form only a small part of a much bigger farming operation that utilises many different farms with a total cropland of approximately 6000 hectares and cattle grazing of around 7000 to 8000 hectares. It should also be noted that the project footprint may be refined as part of the detailed specialist studies to be undertaken in the EIA phase. Hence, an updated, refined footprint may be presented in the EIA Report.

      The proposed development offers some positive impact on agriculture by way of an additional income stream to the landowners, as well as enhanced agricultural potential through improved security against stock theft and other crime and wider, societal benefits (Lanz, 2022). Based on this, the proposed Vhuvhili SEF project is viable and from the EIA process perspective, it is preferred. It is important to note that there are no flaws from an agricultural perspective and that the proposed Vhuvhili SEF project is not seen as a significant impact to the current farming practices on site.

- **Type of Activity Alternative:**

- This relates to the generation of electricity from a renewable energy source, and in this particular case, from solar resources. The **generation of electricity from a renewable energy source was the only activity considered** by the Applicant, and thus considered in this Draft Scoping Report. **No other activity types were considered or deemed appropriate** based on the expertise of the Applicant.

- **Renewable Energy Alternatives:**
  - Given the above, the development of Solar PV is the preferred and only renewable energy technology to be developed on site because the site has a **good to very good solar resource availability** (i.e. GHI of between 1 900 – 2 000 kWh/m^2 in terms of the long-term yearly total) and the **local conditions are favourable**.
  - In addition, **Hydro Power and Biomass Energy** are deemed **unsuitable**.
  - The study area does have wind resources (i.e. 700 W/m^2), however other sites might have better wind resources.

- **Preferred Site and Development Footprint within the site:**
  - The preferred site for the proposed Vhuvhili SEF comprises the following farm portions which cover a combined footprint of approximately 3 115 ha, which serves as the study area for this Scoping and EIA Process:
    - Remaining Extent (RE) of the Farm Grootvlei No. 584 (SG Code: T0IS00000000058400000);
    - Portion 23 of Farm Grootvlei No. 293 (SG code: T0IS00000000029300023);
    - Portion 18 of Farm Grootvlei No. 293 (SG code: T0IS00000000029300018);
    - Portion 20 of Farm Grootvlei No. 293 (SG code: T0IS00000000029300020);
    - Portion 21 of Farm Grootvlei No. 293 (SG code: T0IS00000000029300021);
    - RE of Farm Poverty Acres No. 585 (SG code: T0IS00000000058500000);
    - Portion 21 of Farm Vlakspruit No. 292 (SG code: T0IS00000000029200021); and
    - Portion 22 of Farm Vlakspruit No. 292 (SG code: T0IS00000000029200022

  - The development footprint within the preferred site was determined based on the initial Screening Studies undertaken by Lanz (2021). This led to the identification of the Original Scoping Buildable Area within the preferred site. Furthermore, a screening and site verification exercise of the study area was undertaken by the specialist team during this Scoping Phase. The Scoping Level Specialist Assessments are included in Appendix G of this Draft Scoping Report.
  - The preferred project layout will be confirmed following the input from the various specialists during the EIA Phase.

- **Project Infrastructure Location Alternatives**
  - Two possible locations for the substation complex have been considered in the Scoping Phase by the Project Proponent. However, the Alternative 1 Substation was ruled out as

a feasible alternative and will therefore not be taken forward for further assessment by the specialists in the EIA Phase.

- **Technology Alternatives**
  - Only the PV solar panel type will be considered in this Scoping and EIA Process, along with various mounting options that will be considered in the design.
  - It is proposed that Lithium Battery Technologies, such as Lithium-Ion Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies be considered as the preferred battery technology, however, the specific technology will only be determined following Engineering, Procurement and Construction (EPC) procurement.:
  - These different BESS technologies will therefore be taken forward for further assessment by the in the BESS Risk Assessment to be undertaken by ISHECON in the EIA phase.