- Pre-feasibility
- Feasibility
- Implementation

Each of the above-mentioned phases is described in detail in sections that follow. Some of these tasks occur in parallel to the EIA process.

1. Pre-feasibility

During the pre-feasibility phase, several early-stage assessments and surveys are typically undertaken by the proponent and other relevant specialists to determine if there exist any evident issues surrounding the proposed project and location. In order to progress to the next stage, the proponent should be confident that there are no obvious issues or impacts that may hinder the progress of the project and the final authorisation of the proposed development ("red flags"). The proponent communicates with the local authorities and civil aviation authorities, identify any local communities, perform wind resource evaluations based on existing or collected data, investigate grid connectivity options, conduct an environmental impact assessment and meet logistical and project phasing requirements.

2. Feasibility

During the feasibility phase the proponent will carry out thorough investigation to establish the costs and economic viability of the project through designing a financial model (sometimes in cooperation with financial institutions); verify wind resources by conducting onsite measurements; ensue that the grid connection is economical and feasible within the proposed timeframes of the project; and identify any possible off-takers for the electricity output (in this case, the proposed project intends to be submitted to the REIPPPP for selection as a preferred bidder). It is necessary to erect a wind measurement mast(s) to gather wind speed data and to correlate these measurements with other meteorological data in order to produce a final wind model of the proposed project area. A measurement campaign of at least 12 months is necessary to ensure verifiable data is obtained. The project proponent has already installed a number of masts in the area surrounding the project area and has commenced with the data capturing campaign. This data will advise on the economic feasibility of the project and inform the final layout of the wind turbine positions. The masts are a guyed lattice tower designed specifically for wind resource measurements. The masts are 'marked' as per the requirements of the Civil Aviation Authority.

The proponent will identify the order in which the project tasks will take place, including construction, operational and decommissioning phases, however the timeline will only be finalised once the project is a Preferred Bidder, if selected. Conditional on the outcome of the REIPPPP, if the applicant is selected as a preferred bidder the project will then commence.

Figure 2-5: An example of a meteorological mast.

3. Implementation

Apart from the feasibility and planning stage, the lifecycle of a wind farm can be divided into four phases namely:-

(i) Preliminary civil works
(ii) Construction
(iii) Operation
(iv) Decommissioning

Each of the above-mentioned phases are described in detail below.

(i) Preliminary civil works

Prior to the commencement of the main construction works, the Contractor may undertake vegetation clearance (if required) and site establishment works. The site establishment works may include the construction of one, or more, temporary construction compounds and laydown areas and the connection of services such as power and water to these compounds.

(ii) Construction phase

The following occurs prior to or during the construction stage:

a) *Geotechnical studies and foundation works*
A geotechnical study of the area is undertaken for safety purposes. This is commonly undertaken prior to construction phase and comprises of drilling, penetration and pressure assessments. For the purpose of the foundations, approximately 1500m^3 of soil would need to be excavated for each turbine. These excavations are then filled with steel-reinforced concrete (typically 45 tons of steel reinforcement per turbine including a “bolt ring” to connect the turbine foundation to the turbine tower). Foundation design will vary according to the type and quality of the soil.

b) *Establishment of hard standing surfaces and laydown areas*

Laydown and storage areas will be required for the contractor's construction equipment and turbine components on site.

c) *Site preparation*
If not carried out in the preliminary works phase, this will include clearance of vegetation over the access roads, platforms, lay-bys, substation and any other laydown or hard-standing areas. These activities will require the stripping of topsoil which will be stock-piled, back-filled and/or spread on site.

d) *Establishment of substation and ancillary infrastructure*
The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required.

e) *Turbine construction*
Weather permitting; the erection of the turbines can be completed swiftly and erection rates generally average 1-2 turbines per week. This phase is the most complex and costly.

Figure 2-6: Concrete pouring of a turbine foundation – note the tower base collar in the foreground.

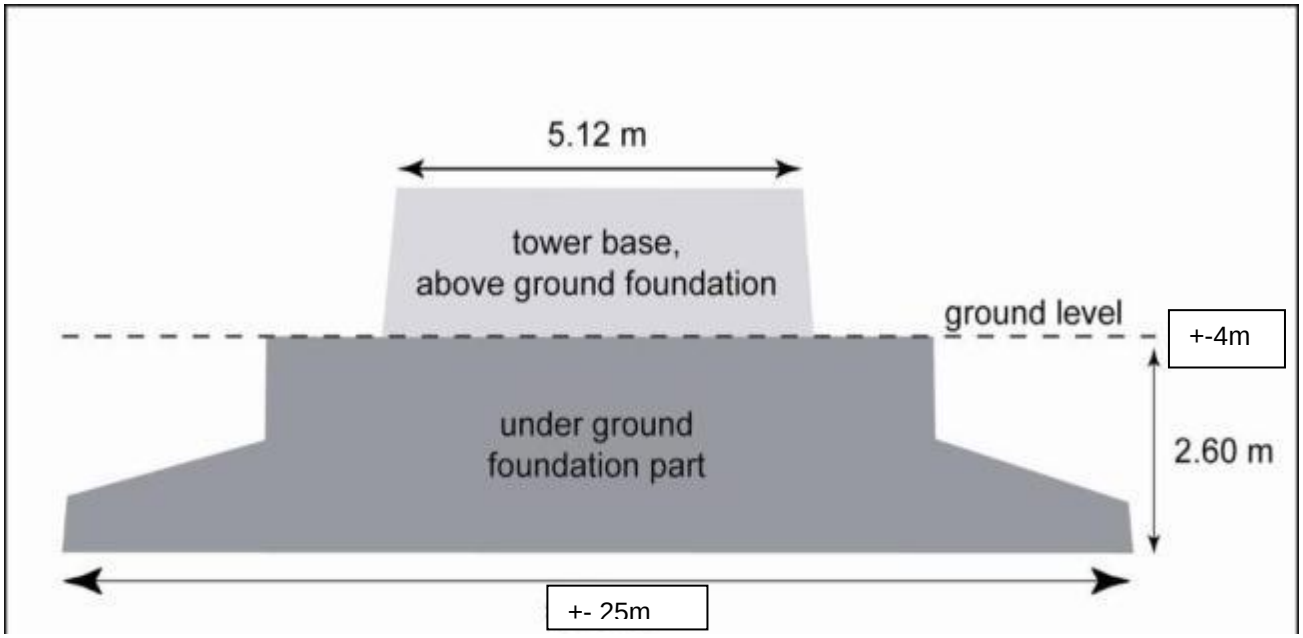

Figure 2-7: Indicative dimensions for the foundation of a 3MW/100m high wind turbine.

f) Electrical connection
Each turbine is fitted with its own transformer that steps up the voltage usually to 22 or 33kV. The entire WEF is then connected to the "point of interconnection" which is the electrical boundary between the WEF and the municipal or national grid. This is done by the IPP as part of the REIPPPP. The high voltage and grid components are ceded to be owned by Eskom.

g) Electrical cabling
Electrical and communication cables are laid in trenches which run alongside the access roads as much as possible. All previous farming activities can continue unhindered on the ground above the cables during the operational phase.

h) Undertake site remediation
Once construction is completed and all construction equipment is removed, the site will be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operational phase will be closed and rehabilitated.

The measures can vary between turbine manufacturers and will be confirmed at a later stage.

(iii) Operational phase

During the operational phase, on-site human activity drops to a minimum, and typically includes routine maintenance requiring only light vehicles to access the site. On-going environmental monitoring may also require on-going access to the project area. Only major breakdowns or refurbishment would necessitate the use of cranes and trucks.

(iv) Decommissioning phase, *refurbishment and rehabilitation*

The wind turbines are expected to have a lifespan of approximately 20 to 25 years (with appropriate maintenance). The infrastructure would only be decommissioned once it has reached the end of its economic or technological life. If economically feasible and appropriate permitting obtained, the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at the time may take place.

The decommissioning activities would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at the time. This operation is referred to as 'facility re-powering'. However, if not deemed financially feasible, then the facility would be completely decommissioned which would include the following decommissioning activities.

a) *Site preparation*
   Activities would include confirming the integrity of the access to the site to accommodate the required equipment and the mobilisation of decommissioning equipment.

b) *Disassemble all individual components*
   The components would be disassembled and reused and recycled or disposed of in accordance with regulatory requirements.

c) *Decommissioning plan*
   A decommissioning plan will be compiled in accordance with best practice to ensure the implementation of rehabilitation of disturbed areas and decommissioning activities in the closure of the project.

Figure 2-8: Assembly and erection of the tower sections using cranes.

3. ALTERNATIVES

According to Appendix 2(2) of the EIA Regulations (GN R. 982 of 2014), a Scoping Report must contain all the information 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 –

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

(i) details of alternatives considered;

(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and

(xi) a concluding statement indicating the preferred alternatives, including the preferred location of the activity.

3.1 Reasonable and feasible alternatives

Alternatives should include consideration of all possible means by which the purpose and need of the proposed activity could be accomplished. The no-go alternative must also in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed.

The determination of whether the preferred activity, site or site location is appropriate is informed by the specific circumstances of the proposed development and its environment.

"Alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to—
(a) the property on which or location where it is proposed to undertake the activity.
(b) the type of activity to be undertaken.
(c) the design or layout of the activity.
(d) the technology to be used in the activity.
(e) the operational aspects of the activity.
(f) the option of not implementing the activity.

There are two types of alternatives: Fundamental Alternatives and Incremental Alternatives (these were considered for the project).

3.2 Fundamental Alternatives

Fundamental alternatives are developments that are entirely different from the proposed project and usually involve a different type of development on the proposed site, or a different location for the proposed development.

3.2.1 Location alternatives

Project area location alternative
The proposed site was selected through an environmental and social pre-feasibility assessment commissioned by the applicant for fourteen (14) potential WEF locations throughout South Africa, including several sites within the Roggeveld area. This study was undertaken by CES in 2009 and included a high-level screening of potential environmental and socio-economic issues, as well as the identification of any 'fatal flaws' to determine suitable areas for project development.

The pre-feasibility assessment considered the following key factors:

- Noise
- Visual impact;
- Avifauna (birds) and bats;

- Terrestrial ecology (fauna and flora);
- Hydrology Impact Considerations;
- Heritage Impact Considerations;
- Road Access and Power line Servitudes;
- Potential Safety Impact Considerations;
- Proximity to airfields; and
- Proximity to other potential wind farm developments.

A number of criteria was further considered by the developer in the site selection process, including:

- **Wind resource:** Analysis of publicly available information, proprietary information and specialist on-site analysis of weather data (over 3 years) indicated that the site has sufficient wind resource to make a wind energy facility financially viable.
- **Site extent:** Sufficient land can be secured under long-term lease agreements to allow for a minimum number of wind turbines to make the project feasible.
- **Grid access:** Grid access and the distance to a viable connection point were key considerations in terms of prioritising appropriate sites. Ease of access into the Eskom electricity grid is vital to the viability of a wind facility. Projects which are in close proximity to a connection point and/or demand centre are favourable, and reduce the losses associated with power transmission. Grid access is deemed favourable for this site due to the existence of the existing Eskom Komsberg Substation. Eskom is currently considering the Komsberg Substation as a hub for connecting several renewable energy projects being developed in the area.
- **Land suitability:** The current land use of the site properties is an important consideration for site selection in terms of limiting disruption to existing land use practices. Agricultural land was preferred as the majority of farming practices can continue in tandem to the operation of the wind farm once the construction and commissioning of the project is complete. Sites that facilitate easy construction conditions (relatively flat, limited watercourse crossings, lack of major rock outcrops) are also favoured during site selection.
- **Proximity to aerodromes:** The proximity to aerodromes and possible interactions with these facilities was considered as part of site selection. The Rietkloof site is not close to any major aerodromes.
- **Landowner support:** The selection of sites where the landowners are supportive of the development of renewable energy is essential for ensuring the success of the project. The landowners do not view the development as a conflict with their current land use practices.

The pre-feasibility assessment and matrix indicted that the proposed project area is considered a potential for a WEF development as it is not considered potentially fatally flawed. The preliminary investigation and the outcome of the site selection process, indicates that the proposed Rietkloof site location meets the criteria and is feasible for the development of a WEF.

Therefore, no further site location alternatives other than Rietkloof will be considered in the EIA process. The detailed and rigorous pre-feasibility assessment undertaken to select the site (from 14 others) provides a reasonable justification for not considering any further alternatives for the current EIA process.

Access road location alternatives

Three access road alternatives were identified during the preliminary design of the wind farm namely:

- Access road alternative 1 is proposed to start from the R354 and follow the existing gravel road to a western direction along the northern section of the project area before turning south from where various side roads branch from this main access road in southern and eastern directions in order to connect the various ridges where turbines are proposed to the main access road.

- Access road alternative 2 is located in the middle of the project area and is also proposed to start from the R354 and follow an existing farm access road in a western direction. From this alternative main access road various roads will branch to north, west and east directions.
- Access road alternative 3 is also located in the middle of the project area south of alternative 2. It connects the R354 to various side branches of access roads in north, south and eastern directions.

Please note that the main access road sections i.e. the point of access from the R354 and a short road section are the main difference between the three alternatives as the secondary roads branching to connect the ridges will be assessed in all three access road alternatives. Please see Figure 3-1 for the layout of access road alternative 1, access road alternative 2 and access road alternative 3.

Each road section will be buffered by 200m in order to allow for incremental alternatives i.e. reroute within the buffer in order to avoid any sensitive features that could be identified during the detailed specialist assessments.

Construction camp location alternatives

Five construction camp alternative layouts will be assessed during the EIA phase namely:

- Construction camp alternative 1 located southwest of the center of the project area adjacent to a proposed secondary access road.
- Construction camp alternative 2 is located adjacent and north of the existing public access road along the southern section of the project area.
- Construction camp alternative 3 is located east of construction camp alternative 2 along the same public access road along the southern section of the project area.
- Construction camp alternative 4 is located in close proximity to access road alternative 3 along a proposed secondary access road.
- Construction camp alternative 5 is proposed within the northern section of the project area along access road alternative 2.

Please see Figure 3-1 for the layout of construction camps 1, 2, 3, 4 and 5.

Substation location alternatives

Seven substation location alternatives were identified during preliminary designs for assessment during the EIA phase:

- Substation alternative 1 is proposed along a secondary road proposed to connect access road alternatives 2 and 3. .
- Substation alternative 2 is proposed adjacent and to the south of a secondary road extending from the main access road alternative 2.
- Substation alternative 3 is proposed adjacent to a secondary road west from the centre of the facility.
- Substation alternative 4 is proposed adjacent to a secondary road east of the centre of the facility.
- Substation alternative 5 is proposed along a secondary road slightly north of the centre of the facility.
- Substation alternative 6 is proposed adjacent to a secondary road more or less in the centre of the facility.
- Substation alternative 7 is proposed slightly to the south of the centre of the facility along a proposed secondary road.

Please see Figure 3-1 for the proposed substation locations.

3.2.2 Technology Alternative

Based on the hilly to mountainous terrain, the climatic conditions and current land use being agricultural, it was determined that the Rietkloof site would be best-suited for a WEF, instead of any other type of renewable energy technology. Please see Chapter 4 for the project need and desirability. Therefore, no other renewable energy technology has been considered (such as solar PV or concentrating solar power). Through the project development process, Rietkloof Wind Farm (Pty) Ltd will continue to consider various wind turbine designs and inter-technology options in order to maximise the capacity of the site. Therefore, no technology alternatives are feasible for assessment at this stage of the project other than a wind energy facility.

3.3 Incremental Alternatives

Incremental alternatives are modifications or variations to the design of a project that provide different options to reduce or minimise environmental impacts. Turbine layout is considered to be an incremental alternative.

3.3.1 Turbine Layout Alternatives

Three farm portions currently overlaps with both Rietkloof with Brandvalley as indicated in Figure 3-2 below. The detailed specialist assessments, on-going bird and bat monitoring campaigns and comments from interested and affected parties may identify no-go development zones, which would likely be recommended be excluded from the Rietkloof layout site areas.

Therefore, incremental alternatives that will be considered in the EIA Phase are alternative turbine positions.

3.4 No-Go development

It is mandatory to consider the “no-go” option in the EIA process. The no development alternative option assumes the site remains in its current state, i.e. there is no construction of a WEF and associated infrastructure in the proposed project area. The no-go alternative will be assessed in an objective manner in the EIA.

3.5 Summary of Alternatives

The above sections describe the alternatives considered in the Scoping Phase and the reasons for selecting the following alternatives for consideration in the EIA Phase:

1. Fundamental alternatives:
   - 1.1 Project area location alternative: One project location alternative namely Rietkloof Wind Farm
   - 1.2 Access road location alternatives: three access road alternatives namely access road alternative 1, access road alternative 2 and access road alternative 3
   - 1.3 Five construction camp alternatives namely construction camp 1, 2, 3, 4 or 5.
   - 1.4 Seven onsite substation location alternatives namely substation alternative 1, 2, 3 or 4.
   - 1.5 Technology alternative: One technology alternative namely a WEF
2. Incremental alternatives:
   - 2.1 Turbine layout alternatives
   - 2.2 200m buffer on access roads for sensitivity alternatives
3. No-go alternative

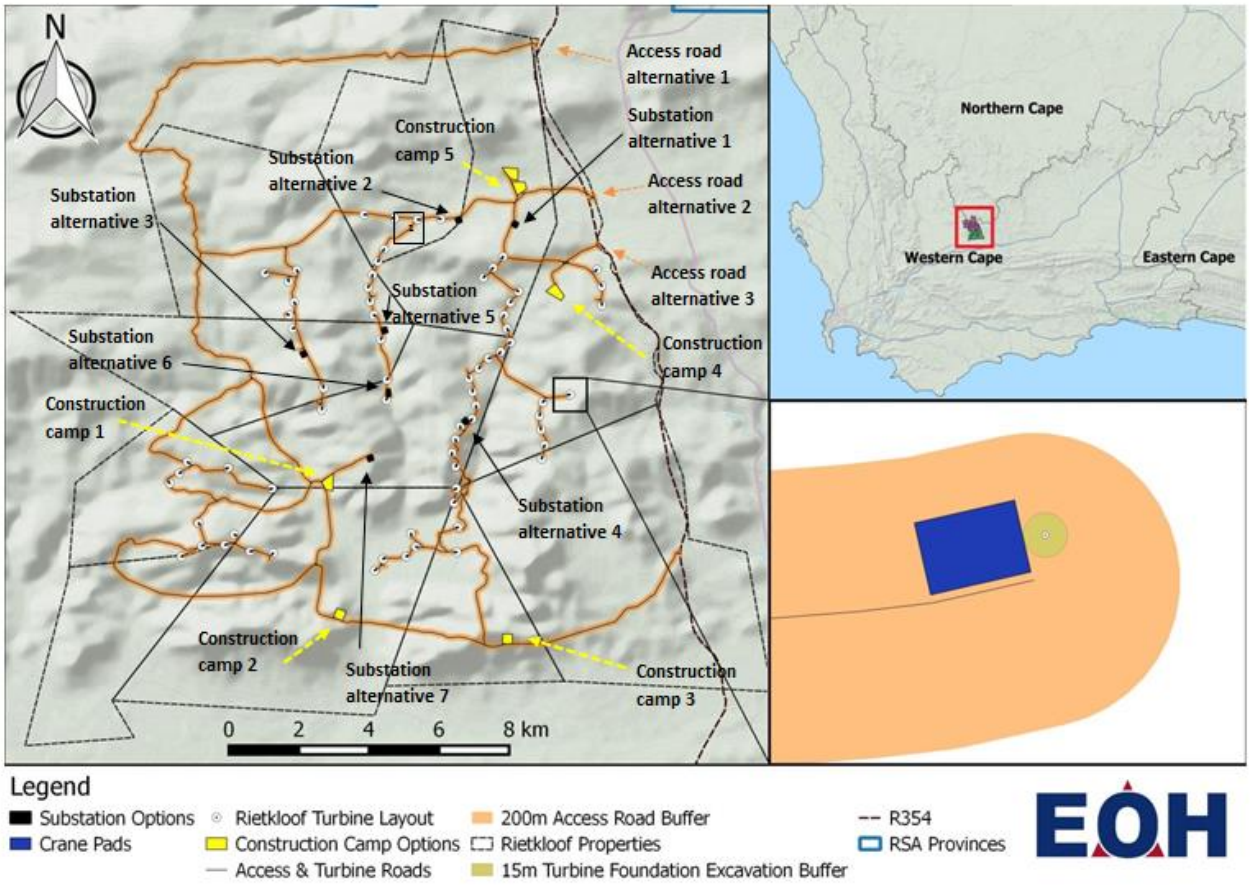

Figure 3-1: Conceptual Layout inclusive of construction camp, access road, substation alternative and turbine positions.

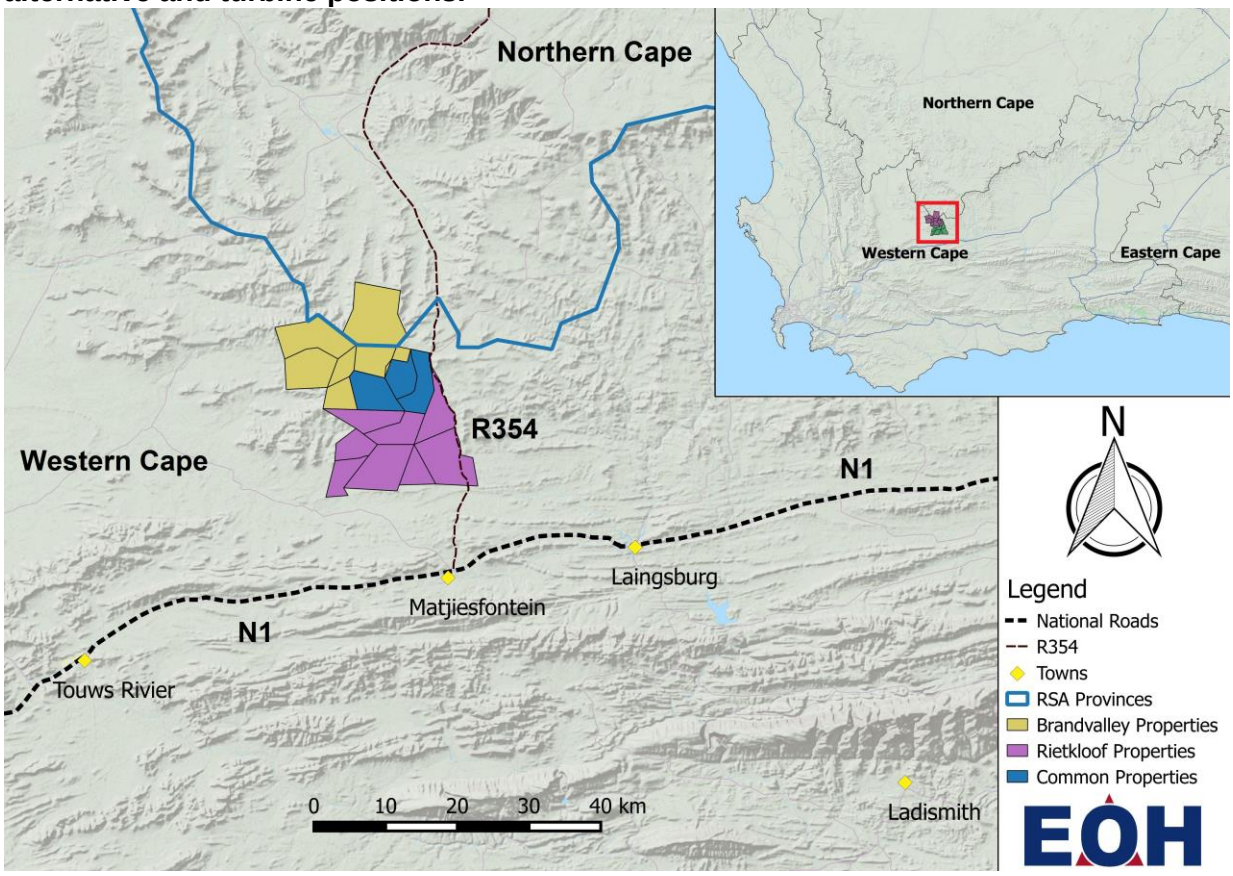

Figure 3-2: Overlapping properties for the proposed Brandvalley and Rietkloof projects.

4. PROJECT NEED AND DESIRABILITY

In terms Appendix 2(2) of the EIA Regulations (GN R. 982 of 2014), a Scoping Report must contain all the information 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 –

(f) A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location.

4.1 Introduction

Increasing pressure is being placed on countries internationally to reduce their reliance on fossil fuels, such as oil and coal, which contribute towards greenhouse gases being emitted into the atmosphere and thus climate change. Most of South Africa's energy comes from non-renewable sources like coal, petroleum, natural gas, propane, and uranium. Currently, fossil fuels supply 90% of South Africa's energy needs with demands on energy supply increasing by 3.5% in the next 20 years. By the end June 2015, 37 independent power producers commenced with commercial operation, adding 1,860MW capacity to the power system with equates to 4% of the total installed capacity in South Africa (Department of Energy, 2015). The South African Government recognises the need to diversify the mix of energy generation technologies within the country and to reduce the country's reliance on fossil fuels which contribute towards climate change and are therefore not environmentally friendly. To address the need for generation capacity from renewable energy technologies, the various planning and policy documents were developed in line with international conventions as described below.

4.2 Need

4.2.1 International

In accordance with the prescriptions of the United Nations Convention on Climate Change 1994 (UNFCCC) and its associated Kyoto protocol of 1997 South Africa has put in place a long term mitigation scenario (LTMS) by which the country aims to develop a plan of action which is economically viable and internationally aligned to the world effort on climate change. During this period (2003-2050) South Africa will aim to take action to mitigate greenhouse gas emissions by 30% - 40% by the year 2050. This is a reduction of between 9000 and 17 500 tons of CO_2 by 2050. Consequently, the South African Government has set a target of 17GW renewable energy contribution to new power generation capacity by 2030 (IRP, 2011). This is to be produced from wind, solar, biomass, landfill gas and small-scale hydro facilities.

4.2.1 National

The **National Development Plan** (NDP) is aimed at reducing and eliminating poverty in South Africa by 2030 it promotes sustainable and inclusive development in South Africa, promoting a decent standard of living for all. The proposed WEF fulfils 3 of the 12 key focus areas namely contributing to an economy that will create more jobs; improving infrastructure and transition to a low carbon economy. The NDP outlines the need for South Africa to increase production of electricity by 40,000 MW by 2030, 20,000 MW of this capacity has been allocated for production from renewable sources. The proposed project aims to be a contributor.

The proposed WEF, is in line with the **Integrated Energy Plan** for the Republic of South Africa (2003) commissioned by then Department of Minerals and Energy (now Department of Energy) in response to the requirements of the National Energy Policy. The framework is intended to create a balance between energy demand and resource availability so as to provide low cost electricity for

social and economic development, while taking into account health, safety and environmental parameters. This WEF would contribute to diversification of energy supply and the promotion of universal access to clean energy.

The **Integrated Resource Plan** (IRP2010) for South Africa illustrates a clear need for renewable energy projection. The IRP was initiated by the Department of Energy (DoE) and lays the foundation for the country's energy combination up until 2030, and seeks to find an appropriate balance between the expectations of different stakeholders considering a number of key constraints and risks, including the reduction of carbon emissions; security of supply; Southern African regional development and integration and localisation and job creation. The Policy-Adjusted IRP includes recent development prices and issues allocations of 17.8GW for renewable energies, of the total 42.6GW new-build up to 2030 distributed to wind (8.4GW), concentrated solar power (1.0GW) and photovoltaic (8.4GW).

Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), aimed to promote and procure electricity generated by the private-sector from renewable energy sources. DoE has placed a target of 10 000 Gigawatt hours (GWh) of renewable energy power generation for the country. The REIPPPP initially aimed to procure 3 725MW renewable energy by 2016, however in 2012 it was announced that an additional 3 200MW of renewable energy will be procured and in August 2015, this allocation further increased to a renewable energy generation capacity of 6 300 MW gazetted in a Ministerial determination (DoE, 2015). As demonstrated above there is a need for renewable energy in South Africa and the proposed Rietkloof Wind Farm aims, in part, to fulfil this need. If this project is deemed feasible, Rietkloof Wind Farm intends to bid this wind farm under the REIPPP programme in order to supply the electricity generated to Eskom.

4.2.2 Local

Integrated Development Plans (IDPs)

IDPs for the Cape Winelands, the Namakwa and Central Karoo District Municipalities (2012 – 2016) are in accordance with the objectives of the National Development Plan (NDP), which encourage the generation of electricity through renewable energy and to reduce carbon-intensive electricity production. The proposed Rietkloof WEF is thus in accordance with the objectives of the IDPs for the municipalities in which it falls, as described in Table 4-1 below.

Table 4-1: District and Local Municipality Integrated Development Plans (IDPs) and relevance of the proposed project.

Local Planning Guide	Relevance
Cape Winelands District Municipality (CWDM) IDP (2012/13-2016/17)	*The overarching vision and mission statement of the CWDM IDP promotes both sustainable development and job creation. The key stakeholder priorities highlighted in the strategic objectives includes the promotion of renewable energy projects. The IDP furthermore calls for an increase in employment opportunities through the green economy, and more specifically, through green energy initiatives.*[2]
Central Karoo District Municipality (CKDM) IDP (2012-2017)	*The CKDM IDP promotes sustainability through the integration of social, economic and ecological components. The planning document highlights the increasingly importance of sustainable energy, emphasising the national vision to focus on renewable energy as a movement towards less carbon-intensive electricity production. The CKDM IDP and SDF make provision for wind farms within the Central Karoo as an alternative energy source.*[3]
Witzenberg Local Municipality IDP (2012/2017)	*The Witzenberg LM IDP promotes renewable energy and the management and use of natural resources as an opportunity to stimulate growth and achieve sustainable development. The environmental policy of the LM calls for environmental projects that ensure environmental*

[2] Cape Winelands District Municipality IDP

[3] Central Karoo District Municipality IDP

	sustainability and contribute to job creation. *The Rietkloof WEF aim to be environmentally sustainable and will contribute to local job opportunities.*
Laingsburg Local Municipality (LLM) IDP (2012/2017)	*The key strategies proposed by the LLM IDP within the Strategic Infrastructure and the Environmental and Spatial Development approaches include the support and promotion of wind, solar and bio-gas developments as a source of alternative energy.*

4.3 Desirability

4.3.1 Project location

The vast plains, the mountainous topography, the grid proximity and expected capacity as well as the predicted and confirmed wind resources contribute to the suitability of the Karoo, and the proposed location, for the development of WEFs for the generation of power to meet the renewable energy requirements for South Africa.

The Strategic Environmental Assessment (SEA) for wind and solar PV energy in South Africa (CSIR, 2013) identified eight (8) **Renewable Development Zones** (REDZs). The REDZs identified areas where large scale wind energy facilities can be developed in in a manner that limits significant negative impacts on the environment while yielding the highest possible socio-economic benefits to the country. Parts of the proposed Rietkloof WEF fall within the Komsberg Wind REDZ (Figure 4-1.). It is, however, important to note that the prioritised areas have not yet been gazetted or officially adopted for implementation, although this is foreseen to take place during 2016.

4.3.2 Proximity to other wind farms

There are other wind energy developments proposed in close proximity to the Rietkloof WEF. These facilities are in various stages of development ranging from application phase to authorised (environmental authorisation and preferred bidder). Although each location has its own wind patterns, the close proximity of wind farms in an area does have environmentally preferred advantages such as limiting certain impacts to that location as opposed to impacting a number of areas.

The following projects are located within a 30km buffer around Rietkloof:

- Konstabel Solar Project;
- Roggeveld Wind Project;
- Perdekraal Wind Project;
- Witberg Wind Project;
- Sutherland Wind and Solar Project;
- Hidden Valley Wind Project;
- PV Solar Project, south of Sutherland;
- Suurplaat Wind Project;
- Gunstfontein Wind Project;
- Komsberg Substation; and
- Brandvalley Wind Project.

The projects located within the 20km buffer radius will be considered in the cumulative impact assessment.

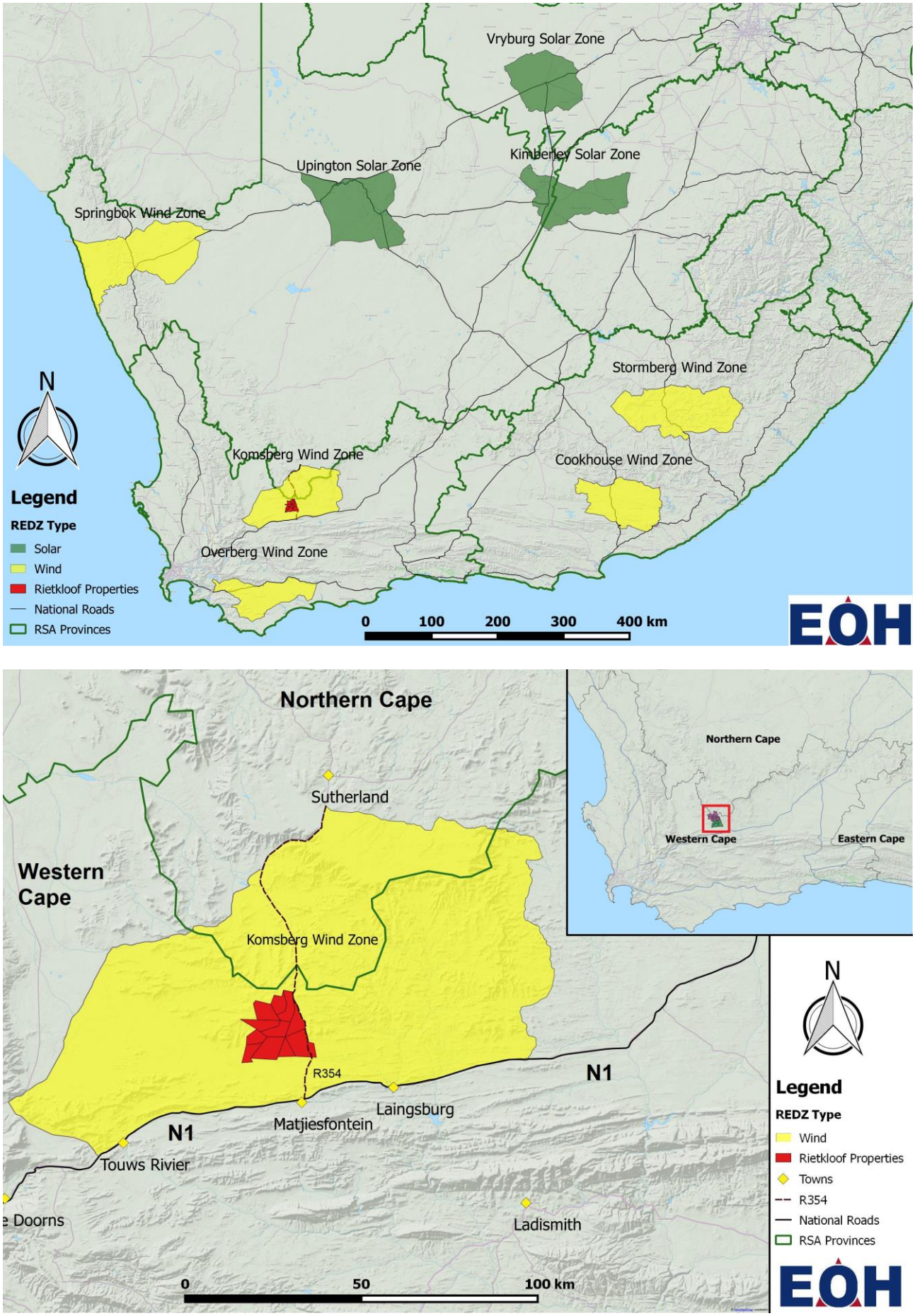

Figure 4-1: The proposed Rietkloof WEF project site in relation to the REDZs.

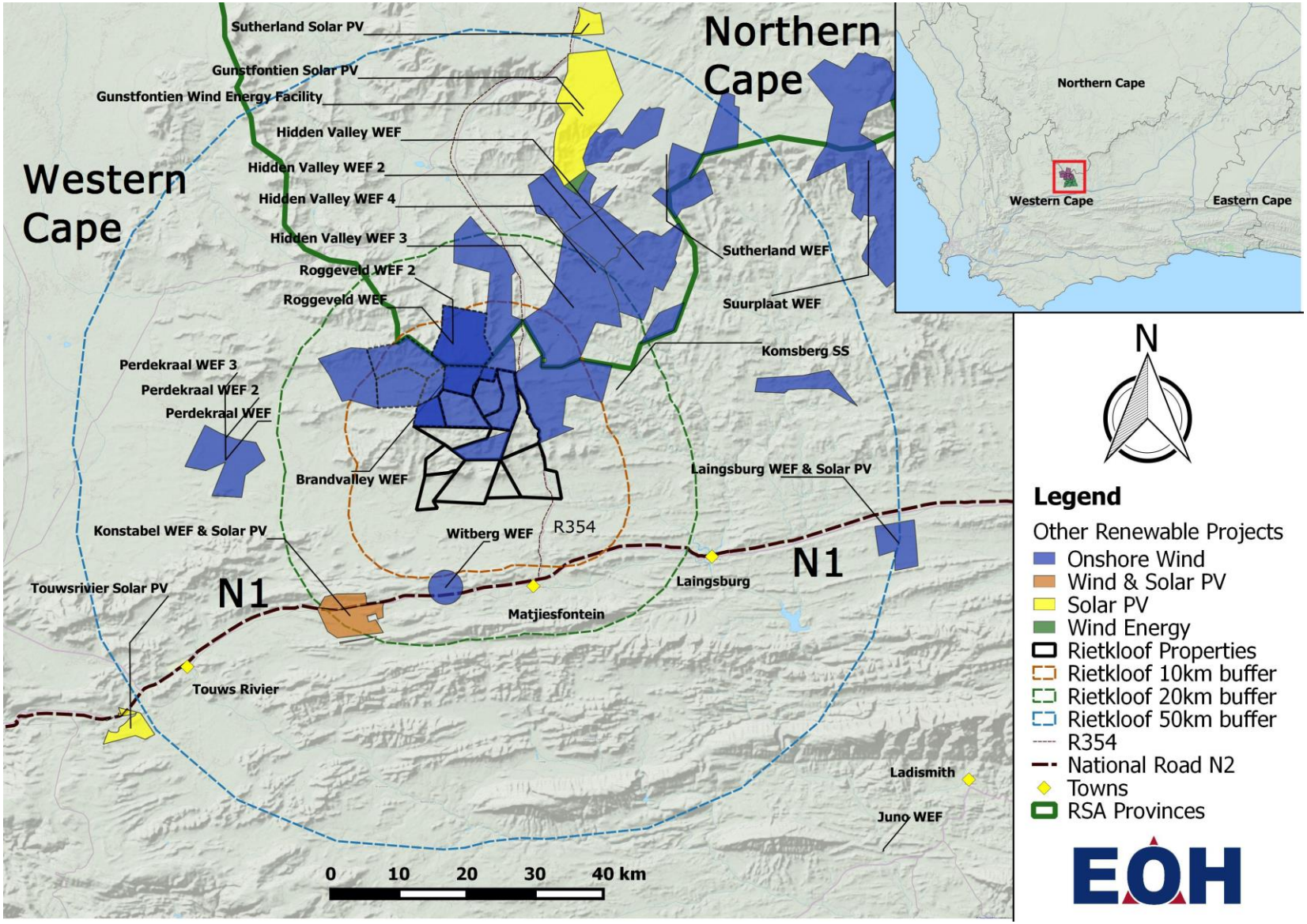

Figure 4-2: The proposed Rietkloof WEF project site in relation to other renewable energy projects (solar and wind).

4.3.3 Wind resource

The Karoo, and more specifically the proposed location, is identified as a feasible area for wind energy is terms of the Wind Atlas for South Africa (WASA) for the Western Cape and parts of the Northern, Western and Eastern Cape Provinces. WASA is a tool for identifying areas suitable for large-scale wind power generation and to provide more accurate wind resource data to identify potential off-grid wind generation location opportunities, using high climatological (30-year) annual mean wind speed (m/s) 100m above ground level. Figure 4.3 below indicates the proposed location in relation to the WASA.

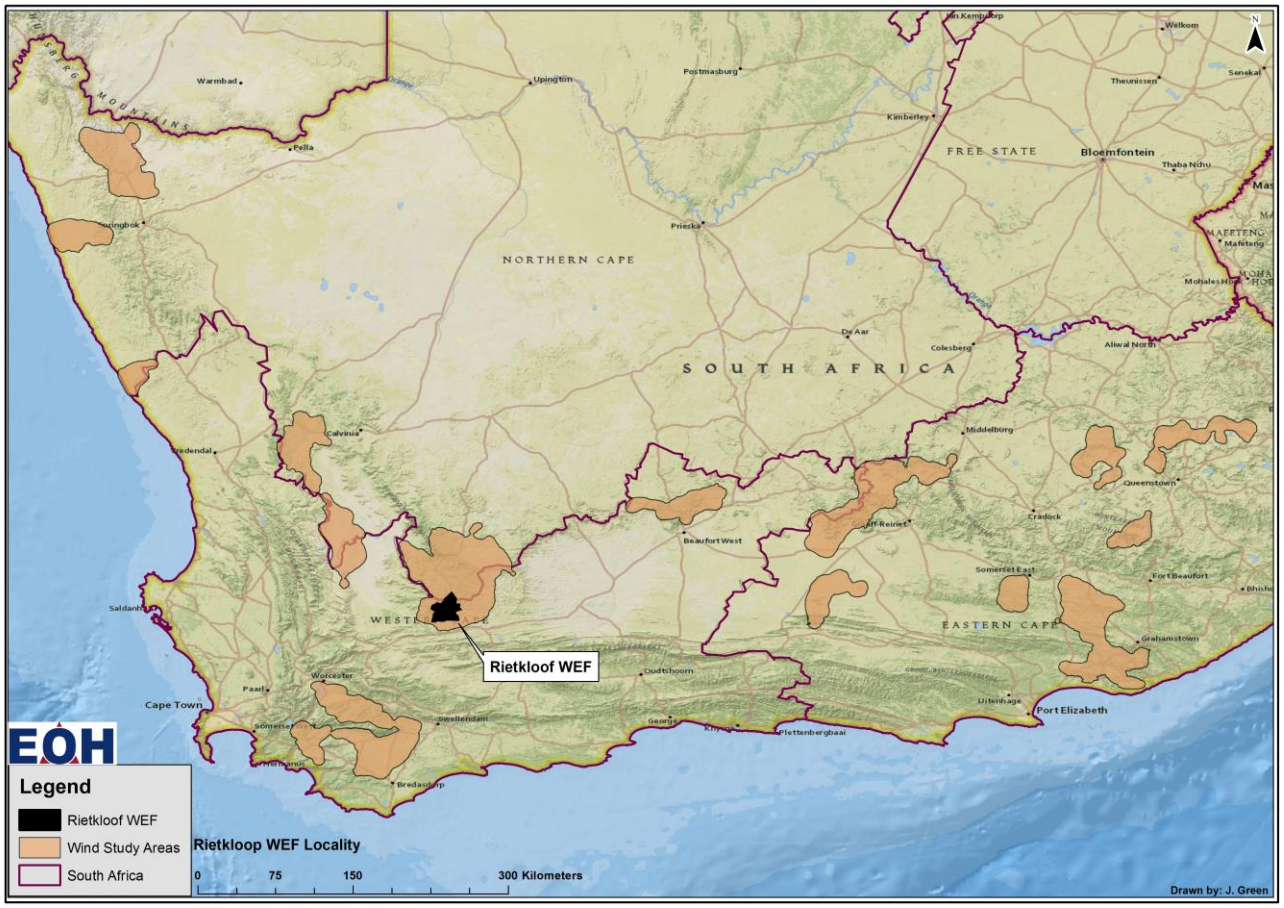

Figure 4-3: The Proposed Rietkloof WEF located within an area of high wind energy resources as identified by WASA

Rietkloof WEF is located in an area from where four wind projects were selected as preferred bidders under the REIPPPP. This is a good indication that the area has high wind resources and the projects are competitive for succeeding in the REIPPPP.

Rietkloof Wind Farm has monitored the wind resource in the greater area for the past five years and has confirmed the high wind resources with certainty. The direct project area is currently being monitored by six wind monitoring masts to confirm the onsite wind resource which has informed the preliminary layout of the facility.

4.3.4 Grid capacity and access

Grid access is deemed favourable for this site due to the close proximity of the existing Eskom Capacitor station, which is planned to be upgraded to a 400kV substation. The current Komsberg substation area is currently proposed to be expanded as hub for connecting preferred bidder and

future developments in the area. The distance from a substation directly affects construction costs and losses associated with power transmission over a distance. The existing Eskom 400kV Komsberg Capacitor station has sufficient grid capacity for the proposed project to connect.

Similarly to the Renewable Energy SEA, Eskom's Electricity Grid Infrastructure Strategic Environmental Assessment (Grid SEA) is also underway. The area where the Karreebosch Wind Farm is proposed is currently within the corridor planned to be strengthened by Eskom as part of the Grid SEA.

4.3.5 Land suitability

The current land use is Agricultural which is desirable as the majority of farming practices can continue in tandem to the construction and operation of the wind farm. The landowners are supportive of the development and do not view the development as a conflict with their current land use practices.

4.3.6 Turbine import and transportation

The project area is in close proximity to the N1 national road. The R354 is the main arterial road providing access to the project area, where there are a number of existing local, untarred roads providing access within the project area. The use of existing roads is desirable as this will facilitate transport of construction materials and turbines. Existing roads will be upgraded and used as far as possible in order to develop fewer new roads, which will result in minimal environmental damage.

4.3.7 Social

As described in Section 6.3, the area is characterised by high unemployment rates and low levels of education. The proposed WEF has a potential to create much needed employment opportunities for unskilled locals during the construction phase. Training opportunities will also be afforded to qualified local people who can be up-skilled to undertake certain roles during the construction and operational phases.

In terms of the needs on the local community, the IDPs identified the need for development, social services, education and employment opportunities in this area. The Rietkloof WEF has a potential to make positive contribution towards the identified community needs. In terms of the economic development requirements of the REIPPPP, the project will commit benefits to the local community, including job creation, localisation and community ownership.

A percentage of the revenue per annum from the operational wind energy facility will be made available to the community through a social beneficiation scheme, in accordance with the DoE bidding requirements of the REIPPPP. Therefore, the potential for creation of employment and business opportunities, and the opportunity for skills development for the local community is significant.

Secondary social benefits can be expected in terms of additional spend in the nearby towns due to the increased demand for goods and services.

4.4 Summary on need and desirability

The need and desirability of the Rietkloof WEF can be summarised as follows:

- The project site has high wind resources as confirmed by onsite wind monitoring campaigns. The economic viability of a WEF and success in the REIPPP directly depend on the strength of the wind resource.
- Proximity to grid connectivity via the Komsberg Substation currently proposed for expansion to cater for the proposed projects in the area.

- The national need for establishment of additional generation capacity through renewable energy resources.
- The local need for community upliftment through additional employment opportunities within the project area and economic development contributions in terms of the REIPPPP.
- Site extent and the option for the current landuse namely agriculture to be retained.
- Landowner support for wind farm development.
- Being located within the Renewable Energy and Electricity Grid Infrastructure SEAs.
- The proximity to the N1 and secondary roads for use during the construction and operation phases for the transportation of material and components.

5. RELEVANT LEGISLATION

According to Appendix 2(2) of the EIA Regulations (GNR. 982 of 2014), a *Scoping Report must contain all the information 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 –*

(e) A description of the policy and legislative context within which the development is proposed including identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process;

The development of the proposed Rietkloof WEF will be subject to various South African legislative requirements. In addition to the environmental authorisation, there are other permits, contracts and licenses that will need to be obtained by the project proponent for the proposed project some of which fall outside the scope of the EIA. The relevant national legislation, policies and conventions to which South Africa is a signatory to, are described in Table 5-1 below.

Table 5-1: Relevant Legislation.

LEGISLATION	RELEVANCE TO THE PROPOSED PROJECT	PERMIT / LICENCE REQUIRED	COMMENT
ENVIRONMENTAL			
The Constitution of South Africa (Act 108 of 1996)	The WEF developer has an obligation to ensure that the proposed activity is ecologically sustainable, will not result in pollution and ecological degradation while demonstrating economic and social development and upholding environmental rights.	N/A	-
National Environmental Management Act (107 of 19989) (NEMA)	This EIA will be undertaken in terms of NEMA requirements. The WEF developer must be mindful of the principles, broad liability and implications associated with NEMA and must eliminate or mitigate any potential impacts.	X	-
Environmental Impact Assessment (EIA) Regulations, 2014	The proposed development triggers the three lists of activities, published on 4 December 2014, as Listing Notices GN R.983, R.984, and R.985. These Listing Notices define the activities that require, respectively, a Basic Assessment (applies to activities with limited environmental impacts listed in GN R. 983 and R.985), or a Scoping and EIA (applies to activities which are significant in extent and duration listed in GN R. 984) process. Based on the NEMA EIA listed activities identified by EAP, namely the Listing Notice 2 (GN R.984), the proposed project's EIA application will be subject to the Scoping and EIA reporting process as stipulated in the Regulations. The relevant competent authority is the National DEA. This Assessment will be submitted to the DEA to ensure that the national environmental principles, fair decision making and integrated environmental management approach is applied through the process. The assessment and associated environmental management plan aim to prevent pollution and ecological degradation, promote conservation and secure ecological sustainable development and use of natural resources while promoting justifiable economic and social development, as outlined in the Act.	X	-
The National Environment Management: Biodiversity Act (10 of 2004)	The project development area located within the Western Cape and Northern Cape are considered to be a Critical Biodiversity Area which means there are potentially sensitive and potentially irreplaceable vegetation. To avoid and or mitigate threats to any endangered ecosystems all impacts on sensitive ecosystems will be assessed in detail during the EIA process to ensure the impacts of the proposed development are understood and can be mitigated; If the specialist ecology assessment identifies protected species on site that will be at risk due to project related activities the WEF developer will require the necessary permit(s) in terms of this act; and construction and	X	A permit may be required depending on the outcome of the detailed Ecological Specialist Assessment.

LEGISLATION	RELEVANCE TO THE PROPOSED PROJECT	PERMIT / LICENCE REQUIRED	COMMENT
	operational activities could leave the development area susceptible to alien vegetation. To avoid alien vegetation from establishing on disturbed areas, appropriate measures will be implemented.		
National Water Act (36 of 1998)	The WEF and its associated infrastructures could potentially alter the bed, banks, course or characteristics of a watercourse. For instance, road crossings. Once the layout is finalised and exact locations of the watercourse crossing confirmed, the WEF developer will apply for the relevant water authorisations from the DWS.	X	-
National Environmental Management: Waste Act (No. 59 of 2008)	Construction activities will generate construction related waste that will need to be disposed of at a registered landfill site if the waste cannot be recycled or reused. Waste generated will be dealt with in a manner compliant with the requirements of the Act.	N/A	-
National Environmental Management: Air Quality Act (39 of 2004)	The clearing of vegetation, turbines foundation excavations, stockpiles and transportation of materials might result in dust fall out. It is expected to be below the dust control regulations of 2013 since mitigation measures will be implemented to reduce dust fall out. Dust control regulations were published under Government Notice R827 in Government Gazette 36974 of 1 November 2013.	N/A	-
National Veld and Forest Fire Act (No. 101 of 1998)	The proposed project must register as a member of the fire protection association in the area as required in Section 3 of the Act. The developer will be required to take all practical measures to ensure that fire breaks are prepared and maintained according to the specifications contained in Section 12 - 14 of Chapter 4.	N/A	-
National Forests Act (84 of 1998)	If any protected trees in terms of this Act occur on site, the developer will require a licence from the Department of Agriculture, Forestry and Fisheries to perform any of the above-listed activities.	X	A licence may be required depending on the outcome of the detailed Ecological Specialist Assessment.
Conservation of Agricultural Resources Act (43 of 1983) & Subdivision of Agricultural Land Act (No. 70 of 1970)	Approval will be required from the Department of Agriculture, Forestry and Fisheries (DAFF) for any activities on the land zoned for agriculture and any proposed rezoning or sub-divisions of agricultural land. An agricultural potential assessment may need to be conducted to determine how the proposed development may impact on the agricultural production potential of the WEF site. Comment from DAFF will be obtained. The area is currently used for grazing and will continue to be used for grazing after construction. The majority of infrastructure will be placed on ridgelines and are unlikely to be of high agricultural potential.	X	-
Mineral and Petroleum Resources Development Act (107 of 2002) (MPRDA)	Borrow pits and or quarries will be required to source material for road and turbine construction.	X	The borrow pits and/or quarries will permit/ licence requirements will be assessed in a separate Basic Assessment process
SOCIAL			
Occupational Health and Safety Act (85 of 1993)	The developer must be mindful of the principles and broad liability and implications contained in the Operational Health and Safety Act and mitigate any potential impacts.	N/A	N/A for the EIA process

LEGISLATION	RELEVANCE TO THE PROPOSED PROJECT	PERMIT / LICENCE REQUIRED	COMMENT
National Heritage Resources Act (25 of 1999)	The project will be registered with South African Heritage Resource Agency (SAHRA). A desktop heritage assessment must be undertaken to determine if heritage features occur on site and what level impact assessment (if any) maybe required. In the event that archaeological or historically significant sites would be destroyed, damaged, excavated, altered or defaced by the proposed project activity the relevant permit will be granted before the project can continue. A Notice of Intent to Develop (NID) will be submitted to Heritage Western Cape (HWC) and Ngwao-Boswa Ya Kapa Bokone (Northern Cape heritage authority).	X	Pending the outcome of the heritage impact assessment
PLANNING			
National Road Traffic Act (No. 93 of 1996)	All the requirements stipulated in the NRTA will need to be complied with during the construction and operational phases of the proposed WEF.	X	N/A for the EIA process
Civil Aviation Act (Act No. 13 of 2009): 13th Amendment of the Civil Aviation Regulations (2011)	Due to requirements of the Act to ensure the safety of aircrafts, the WEF developer must engage directly with the Civil Aviation Authority (CAA) regarding the structural details of the facility.	X	Comment will be requested from the CAA

5.1 Other Relevant Legislation

At this stage in the EIA process the above list of applicable legislation should not be regarded as definitive or exhaustive, and it is probable that additional legislative requirements will be identified as the process progresses. This is particularly applicable to any relevant municipal by laws that will have to be adhered to

The Terms of Reference (ToR) for most of the respective specialist studies will include the need for a review of all relevant legislation and guidelines pertaining to the proposed development and to their given fields of expertise.

Other legislation that may be relevant to the proposed wind energy project are listed in the sections below.

5.1.1 International

- The 1992 United Nations Framework Convention on Climate Change (UNFCCC)
- The Kyoto Protocol (2002)

5.1.2 National

- Basic Conditions of Employment Act (Act no 75 of 1997)
- Electricity Regulation on New Generation Capacity (Government Gazette No 32378 of 5 August 2009)
- Electricity Regulation Act (Act No. 4 of 2006)
- Employment Equity Act (Act no 55 of 1998)
- Industrial Policy Action Plan 2011/12 – 2013/14
- Integrated Energy Plan for the Republic of South Africa, March 2003
- Integrated Resource Plan for Electricity 2010-2030
- Long Term Mitigation Scenarios (2007)
- Municipal Systems Act (Act 32 of 2000)

- National Development Plan (2011)
- National Climate Change Response White Paper (2012)
- National Energy Bill (2008)
- Spatial Planning and Land Use Management Act (Act No. 16 of 2013)
- Strategic Infrastructure Projects (2012)
- SIP 8: Green energy in support of the South African economy
- SIP 9: Electricity generation to support socio-economic development
- The Environment Conservation Act No. 73 of 1989 (ECA) Noise Control Regulations, which specifically provide for regulations to be made with regard to the control of noise, vibration and shock, including prevention, acceptable levels, powers of local authorities and related matters.
- The Mountain Catchment Areas Act No. 63 of 1970 provides for catchment conservation
- The Skills Development Act No. 97 of 1998 promotes the development of skills
- The Telecommunication Act of 1966 which has certain requirements with regard to potential impacts on signal reception
- The Tourism Act No. 3 of 2014 provides for the promotion of tourism and regulates the tourism industry
- The Development Facilitation Act No. 67 OF 1995 Provides for development and planning
- White Paper on Energy Policy for South Africa (Energy White Paper)
- White Paper on Renewable Energy Policy (2003) (Renewable Energy White Paper)
- Astronomy Geographic Advantage Act, 2007 (No. 21 of 2007)

5.1.3 Provincial

Western Cape

- Western Cape Land Administration Act 6 of 1998 regulates land and land usage.
- Western Cape Planning and Development Act 7 of 1999 regulates planning and development within the province.
- Western Cape Nature Conservation Laws Amendment Act (No. 3 of 2000).
- Cape Nature and Environmental Conservation Ordinance (No. 19 of 1974).
- Western Cape Noise Control Regulations 2013.

The DEA&DP 2010 and 2013 EIA Guideline and Information Document Series will be considered throughout the EIA phase, informing the EIA process.

The following plans and frameworks are relevant to the project area and are discussed in detail in Chapter 4 of this report:

5.1.4 District Municipality Planning Documents

Relevant district planning documentation includes:

- The Cape Winelands District Municipality IDP (2012/13 – 2016/17), EMF (May 2011) and SDF (2007).
- The Central Karoo District Municipality IDP (2012-2017).
-

5.1.5 Local Municipality Planning Documents

The relevant local planning documentation includes:

- The Witzenberg (Ceres) Local Municipality IDP (2012/2017) and SDF (2006)/SDF draft (2012); and
- The Laingsburg Local Municipality IDP (2012/2017).

6. DESCRIPTION OF THE AFFECTED ENVIRONMENT

In terms Appendix 2(2) of the EIA Regulations (GN R. 982 of 2014), a Scoping Report must contain all the information 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–

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

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

(ix) The outcome of the site selection matrix;

This section of the report provides a description of the ecological, social and economic description of the environment that may be directly or indirectly affected by the proposed project.

6.1 The Bio-Physical Environment

The proposed WEF falls within both the Western Cape Province within the Laingsburg and Witzenburg Local Municipalities in the Central Karoo and Cape Winelands District Municipalities, respectively. A biodiversity summary of each municipality is provided in Table 6-1 below.

Table 6-1: Biodiversity summary for the municipalities in which the proposed project area falls (BGIS, 2015).

	Laingsburg Municipality	Cape Winelands Municipality
Size (ha)	878448ha	1076276.2ha
Area remaining natural (%)	96.6%	91.6%
Reserves (distance from the project site)	- Anysberg Nature Reserve (~30km) - Gamkapoort Nature Reserve (~100km) - Gamkaskloof (Die Hel) Nature Reserve (~100km) - Groot Swartberg Nature Reserve (~100km) - Klein Swartberg Mountain Catchment Area (~70km) - Towerkop Nature Reserve (~80km)	- Anysberg Nature Reserve (~30km) - Ben-Etive Nature Reserve (~90km) - Bokkeriviere Nature Reserve (~60km) - Boosmansbos Wilderness Area (~100km) - Cederberg Mountain Catchment Area (~100km) - Koue Bokkeveld Mountain Catchment Area (~100km) - Langeberg -Oos/East Mountain Catchment Area (~100km) - Langeberg -Wes Mountain Catchment Area (~60km) - Matroosberg Mountain Catchment Area (~90km) - Tankwa Karoo National Touw Local Authority Nature Reserve Park (~50km) - Warmwaterberg Nature Reserve (~80km)
Biomes	- Albany Thicket - Fynbos - Nama-Karoo - Succulent Karoo	- Fynbos - Succulent Karoo
No. of vegetation types	19	31
Threatened terrestrial ecosystems	None	- Kouebokkeveld Alluvium Fynbos (Endangered – EN) - Cederberg Sandstone Fynbos (Vulnerable – Vu) - Ceres Shale Renosterveld (Vulnerable – Vu) - Kouebokkeveld Shale Fynbos (Vulnerable – Vu) - Montagu Shale Renosterveld (Vulnerable – Vu)
Water Management Areas	- Gouritz - Lower Orange - Olifants/Doorn	- Gouritz - Lower Orange - Olifants/Doorn
No. of rivers	8	23

No. of wetlands	420	1641

6.1.1 Climate

The project area has an arid to semi-arid climate. The project area experiences rainfall throughout the year with peak rainfall occurring during the winter season (from May to August). The mean annual precipitation (MAP) is 150mm, with the project area receiving the lowest rainfall (4mm) in January and the highest (28mm) in June (Figure 6-1). The average midday temperatures range from 12.4°C in June to 29.3°C in January. The lowest temperatures are experiences in July with average temperatures of 0°C at night. The mean annual temperature (MAT) is approximately 16°C and the incidence of frost is relatively high (approximately 30 days). The wind direction is predominately north-west with average high wind speeds of up to 7 meters per second (m/s).

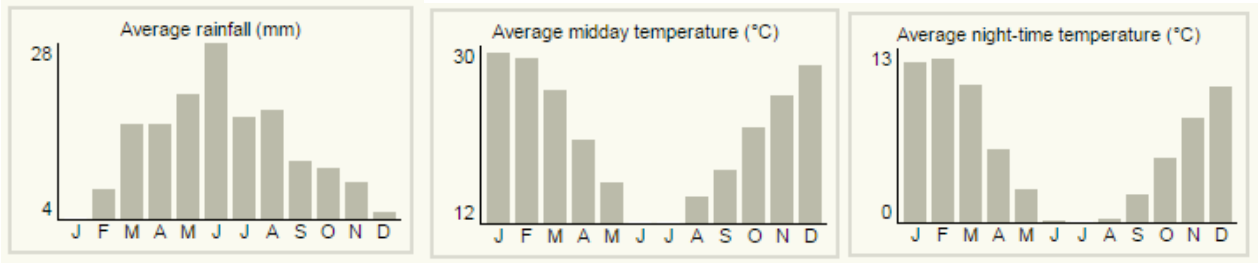

Figure 6-1. The average annual rainfall, midday and night-time temperature.[4]

The project area is located approximately 70km south of the town of Sutherland, in the Northern Cape Province and approximately 10km north from Matjiesfontein, in the Western Cape Province. The town of Laingsburg is a further 30km east of Matjiesfontein, along the N1 national road in the Western Cape Province. Sutherland has cold temperatures and commonly experiences snow in the winter season. The average annual temperature for Sutherland is 11.3°C and the average annual minimum temperature is a low of 2.8°C. The town of Laingsburg is located in a semi-dessert region with hot and dry summers of temperatures, commonly reaching temperatures higher than 30°C. The winter season experience much lower temperatures with occasional snow occurring in the surrounding area.

6.1.2 Geology and Topography

The surrounding area consists of a slightly undulating to hilly landscape, while the majority of the project area comprises slopes and broad ridges of low mountains and escarpments as shown in Plate 6-1, Plate 6-2 and Figure 6-2. The underlying geology of most of the project area comprises clayey soils of Fc and Ib land types located on the mudstones and sandstones of the Adelaide Subgroup of the Beaufort Group, with smaller areas of arenite shale in the southern region (Figure 6-3). The properties located on the northern and western sections of the project area additionally comprise sandstone, shale and mudstone of the Permian Waterford Formation of the Ecca Group and lithified sedimentary rock of the Dwyka Group of Fc and Ib land types. The Beaufort, Ecca Group and Dwyka Groups are all of the Karoo Supergroup. The majority of the project area comprises Lithosols, shallow soils with minimal development on hard or weathering rock, with or without intermittent diverse soils. Lime is generally present in parts or most of the landscape. The central area of the project area comprises rock with limited soils.

[4] Source: (SA Explorer, 2015)

Plate 6-1: Photograph illustrating the topography of the outer regions and surrounding area of the project area.

Plate 6-2: Photograph illustrating the general topography of the project area.

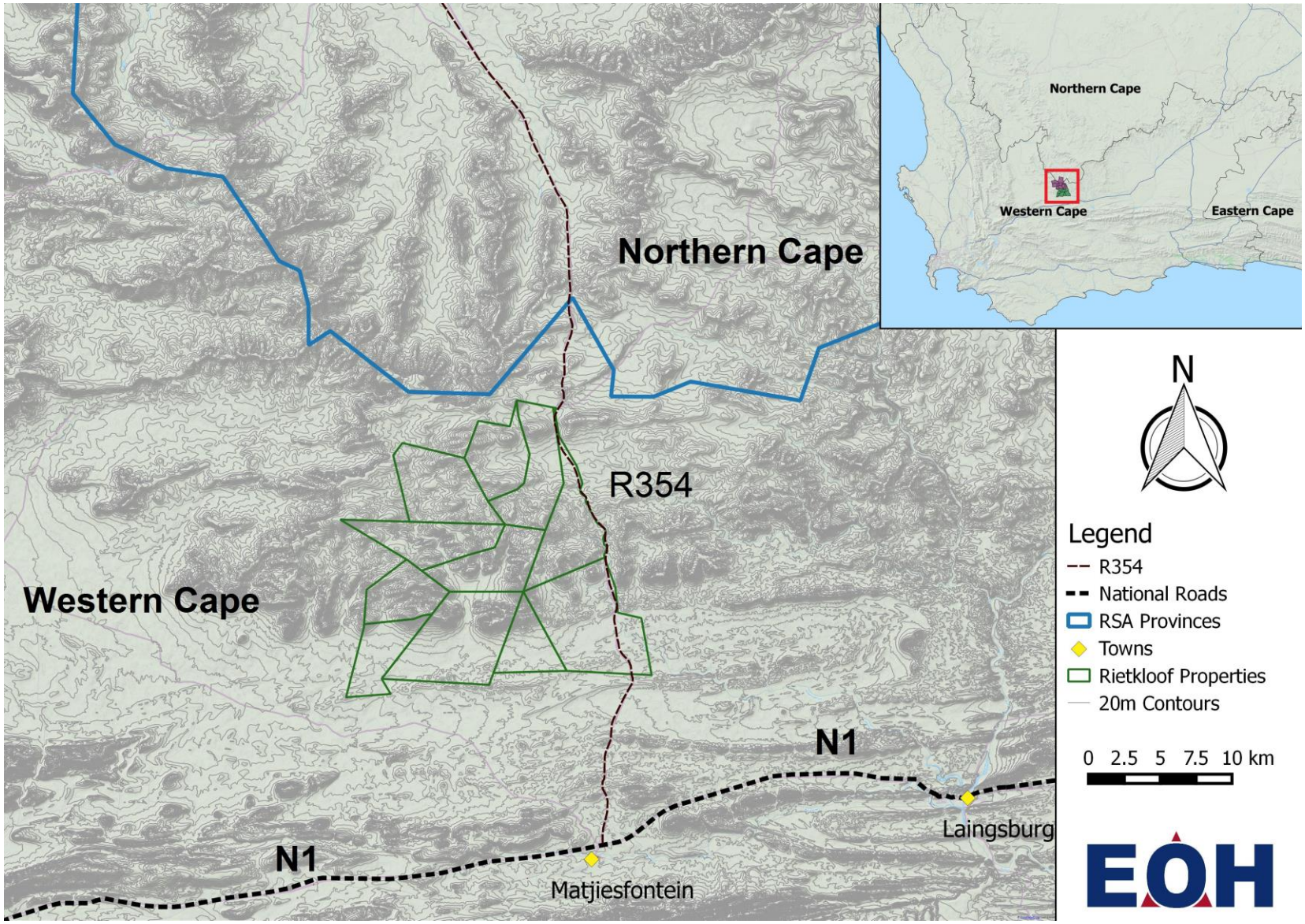

Figure 6-2: The topography of the proposed Rietkloof WEF project area.

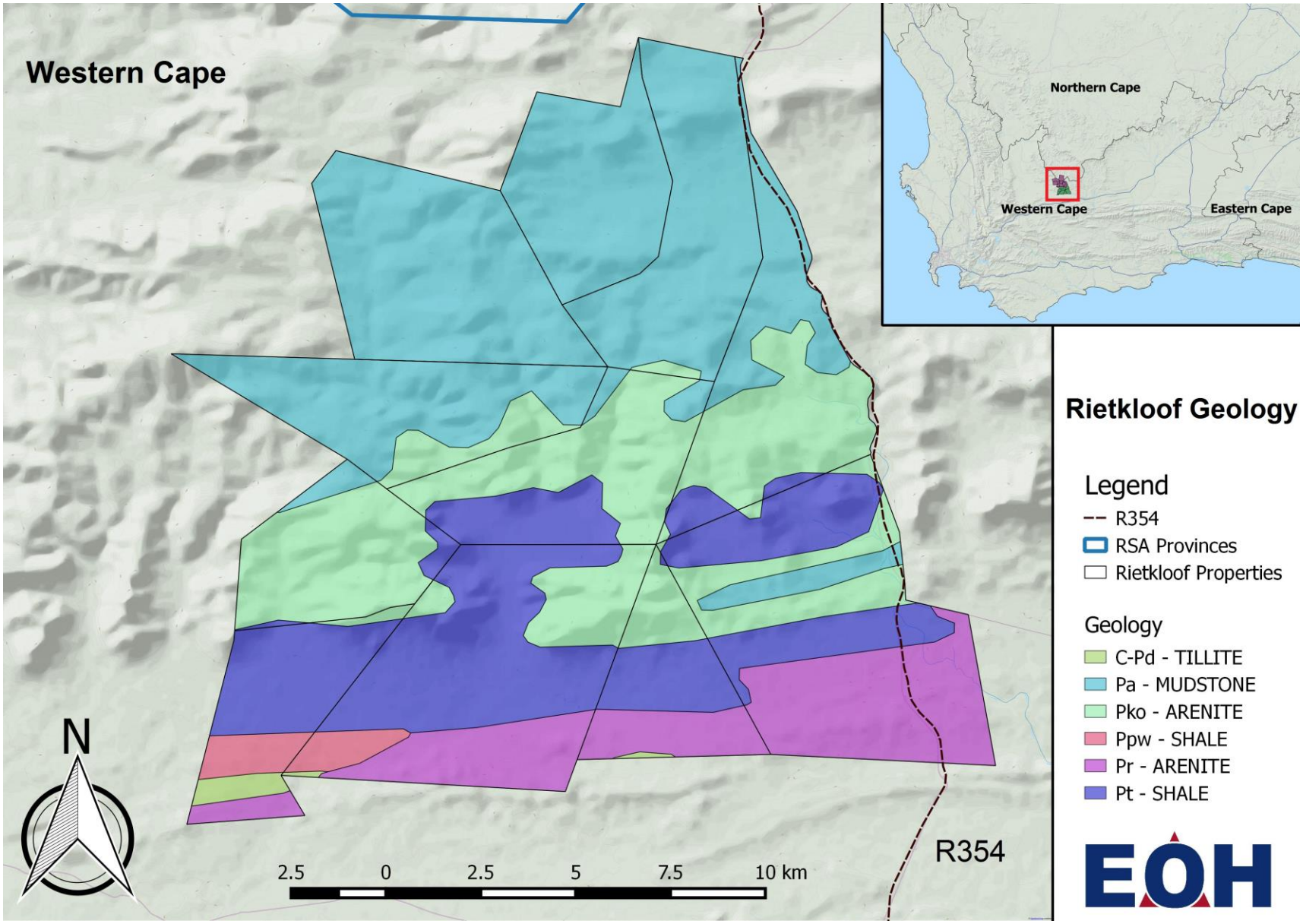

Figure 6-3. The geology of the proposed Rietkloof WEF.

6.1.3 Current and Proposed Land Use Other Than WEF

The project area consists of natural habitat, which has experienced some grazing, but is predominately untouched. The proposed project area is currently used for animal husbandry, game farming and agriculture. The predominant land use in the project area is for the farming and grazing of sheep, most suited to Western Cape region of the project area (Plate 6-3).

There are a few Bed and Breakfast accommodation services (B&Bs) within the project area to accommodate those visiting the area and its surroundings. The South African Large Telescope (SALT) is located approximately 50km north-west of the site. The renowned heritage resources and historical value associated with the Karoo are a few of the features contributing to the tourism in the area, which promotes the use of the B&Bs.

The project area additionally overlaps with the area in which Technical Cooperation Permits (TCPs) are held by certain Oil and Gas companies. The project area is, however, relatively insignificant in comparison to the overall size of the TCP.

There are three existing power lines running across the project area. The two 400kV and on 765kV are a visible feature in the area and present the opportune positioning of the project in relations to grid connection.

Plate 6-3: Current land uses in the project area: sheep farming and game farming.

6.1.4 Agricultural Potential

Any land is considered to have potential for agricultural if it meets all requirements for cultivation purposes as stipulated in Act 43 of 1983, and is:

a) under permanent irrigation, or
b) can be classified into one of the soil forms and families as listed by the Soil Classification System of South Africa and
c) the effective soil depth is equal to or greater than the minimum as listed by the Department of Agriculture guidelines and
d) the average topsoil clay content falls within the limits as listed by the Department of Agriculture guidelines.

All the properties impacted by the WEF have been classified by the Department of Agriculture (reference: AGIS) as agricultural land and has the potential for either crop or livestock farming.

Land Capability

Land capability is defined as the inherent capacity of land to be productive under sustained use and specific management methods. Land capabilities are derived by combining the land systems information with climatic, agronomic, and forestry data.

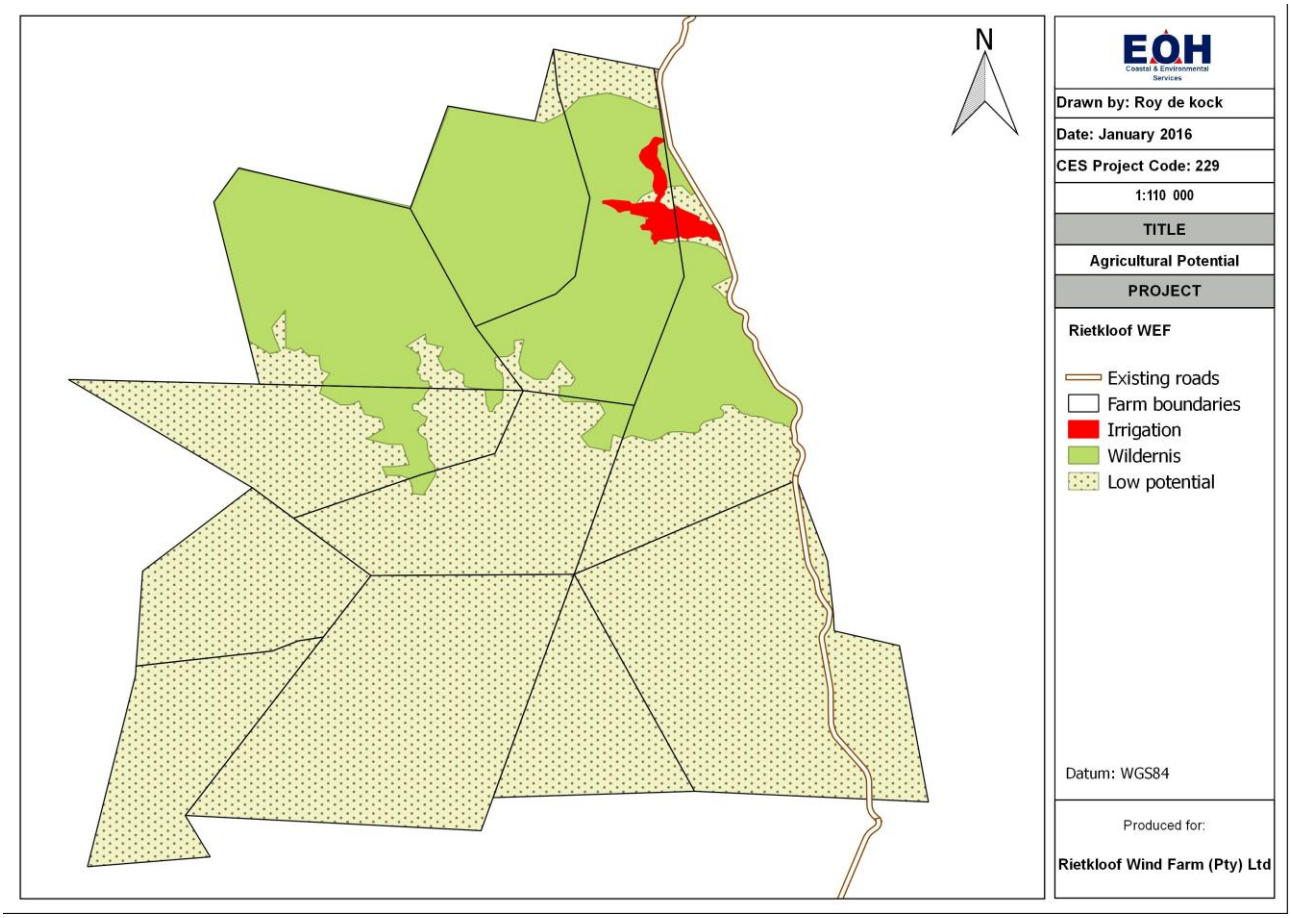

Figure 6-4: Agricultural potential of project site.

The Rietkloof WEF has been classified as non-arable agricultural land with a low potential for grazing livestock and, unless under irrigation, no potential for field crops or horticulture (Figure 6-4).

A large portion of land in the northern sections is classified as wilderness where dense vegetation and undulating topography renders the land unsuitable for commercial agriculture.

Grazing Capacity

The grazing capacity of a grazeable portion of a homogeneous unit of vegetation can be defined as the area of land required to maintain a single animal unit (AU) over an extended number of years without deterioration of the vegetation or soil (ha/AU). An animal unit (AU), also commonly referred to as a large stock unit (LSU), is defined as an animal with a mass of 450 kg, which gains 0.5 kg/day on forage with a digestible energy percentage of 55 %.

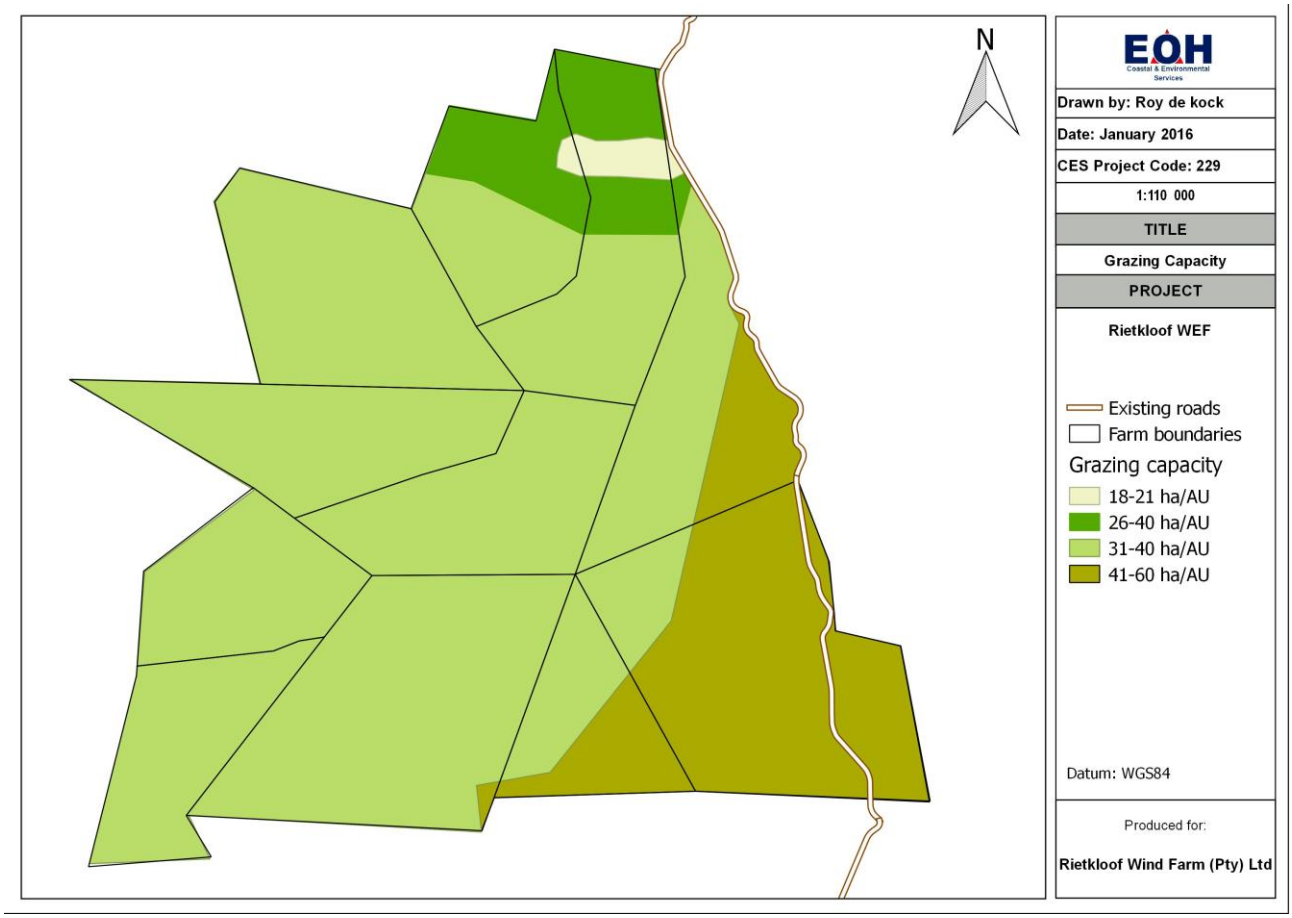

Figure 6-5: Grazing capacity of proposed project site.

The grazing capacity on the Rietkloof WEF site is considered as low, increasing from extremely low values (41-60 ha/AU) in the south, north and west to average values of 18-21 ha/AU in a small area in the eastern section of the WEF site (Figure 6-5).

6.1.5 Vegetation

Regional Context of the Vegetation

The project area falls within the Fynbos Biome of the Shale Renosterveld Group of the Karoo Renosterveld Bioregion and the Succulent Karoo Biome, of the Rainshadow Valley Karoo Bioregion (Mucina and Rutherford, 2006). The Fynbos Biome, with a Mediterranean-climate, comprises three naturally fragmented vegetation types, namely Fynbos, Renosterveld and Strandveld, that are dominated by small-leaved, evergreen shrubs that regenerate when exposed to fire. The Fynbos Biome is one of two biomes that is endemic to South Africa.

The Succulent Karoo Biome covers approximately 111 000km and is therefore the fourth largest biome in southern Africa. The Succulent Karoo is one of only two semi-arid biodiversity hotspots in the world. The Succulent Karoo experiences winter rainfall in comparison with the Nama Karoo with summer rainfall. The combination of both summer and winter rainfall contributes to the high biodiversity occurring in the area. The vegetation of the area includes Central Mountain Shale Renosterveld, occurring in majority of the project area, and Koedoesberge-Moordenaars Karoo, found in the northern and western regions of the project area (Figure 6-6).

SANBI National Vegetation Map

Mucina and Rutherford (2006) developed the National Vegetation Map as part of a South African National Biodiversity Institute (SANBI) funded project: "It was compiled to provide floristically based vegetation units of South Africa, Lesotho and Swaziland at a greater level of detail than had been available before." The map was developed using a wealth of data from several contributors and has allowed for the best national vegetation map to date, the last being that of Acocks developed over 50 years ago. The National Vegetation map informs finer scale bioregional plans such as the Subtropical Thicket Ecosystem Project (STEP). This project had two main aims:

- to determine the variation in and units of southern African vegetation based on the analysis and synthesis of data from vegetation studies throughout the region, and
- to compile a vegetation map. The aim of the map was to accurately reflect the distribution and variation on the vegetation and indicate the relationship of the vegetation with the environment. For this reason the collective expertise of vegetation scientists from universities and state departments were harnessed to make this project as comprehensive as possible.

The map and accompanying book describes each vegetation type in detail, along with the most important species including endemic species and those that are biogeographically important. This is the most comprehensive data for vegetation types in South Africa.

Succulent Karoo Ecosystem Programme (SKEP)

The Succulent Karoo biome extends from the south-west through to the north west of South Africa and up into Namibia (Driver *et al.*, 2003). It is classified as one of the 25 internationally recognised biodiversity hotspots and is the world's only arid hotspot. It is remarkably diverse with 6,356 plant species, 40% of which are endemic and 17% of which are listed on the Red Data list. Despite this rich diversity and high level of endemism, only 3.5% of the biome is formally conserved. As a result, the biome's diversity is under pressure from human impacts, especially mining, agriculture, overgrazing and climate change. The goal of the SKEP is therefore to provide a framework to guide conservation efforts of this unique biome (Driver *et. al.*, 2003). SKEP is defined as a bi-regional development programme for Namibia and South Africa implemented for conservation of these ecosystems. Priority areas are identified to have conservation value and are most vulnerable.

The three main aims of the project are to:

- "provide a hierarchy of priority actions to guide conservation efforts and donor investment in the biome (both on and off formal reserves);
- build human resource capacity to implement the plan by including training and mentorship activities as part of the planning process; and
- generate the institutional and government support required to ensure its effective implementation.

SKEP describes the vegetation types found in the project area as Mountain Succulent Karoo, Lowland Succulent Karoo, Nama Karoo, Renosterveld and Upland Succulent Karoo (Figure 6-7).

Both Mucina and Rutherford (2006) and Succulent Karoo Ecosystem Plan (SKEP) have mapped the vegetation for the region. These vegetation maps and descriptions of the vegetation types are presented below.

1. Central Mountain Shale Renosterveld

This vegetation type is found in the Northern and Western Cape Provinces on slopes and broad ridges of low mountains and escarpments, with tall shrubland dominated by renosterbos and large areas of succulent karoo shrubs, with rich geophytic flora in more open, wetter or rocky habitats.

The conservation status of this vegetation type is listed as **Least Threatened**, with a conservation

target of 27%. This vegetation type is not protected in statutory or private conservation area and only about 1% has been transformed.

2. Koedoesberge-Moordenaars Karoo

This vegetation type is found in both the Northern and Western Cape Provinces, in the broad area of Laingsburg and Merweville. It tends to occur on slightly undulating hills to hilly landscapes comprises low succulent scrubs, scattered tall shrubs and patches of "white" grass visible on plains. The dwarf shrubs include *Pteronia, Drosanthemum* and *Galenia.* This vegetation type is listed as **Least Threatened** with a conservation target of 19%. The vegetation type is classified as hardly protected, with only a very small portion statutorily protected in the Gamkapoort Nature Reserve. The vegetation is transformed only to a very small extent with no serious alien plant invasions recorded.

3. Tanqua Wash Riviere

This vegetation type is found in the Western Cape Province and to a lesser extent, in the Northern Cape. It is commonly occurs within valleys of intermittent rivers comprising of succulent shrubland with *Salsola* and *Lycium* alternating with *Acacia karroo* thickets. The vegetation type is listed as **Least Threatened** with a conservation target of 19%. Currently 13% is statutorily conserved in the Tankwa National Park and in other private reserves. The vegetation is transformed to an extent of 3% for cultivation and dam building.

4. Tanqua Karoo

This vegetation type is found in the Western and Northern Cape Provinces, within valleys of altitudes of 140-960m, including the Tanqua and Doring Rivers located between Cederberg in the west, the Roggeveld Escarpment in the east and the Klein Roggeveld Mountains in the southeast. This vegetation type commonly occurs in slightly undulating intra-mountain basin, sheltered by steep slopes of mountain ranges and valley. This vegetation type is listed as **Least Threatened** with a conservation target of 19%. Approximately 10% of this vegetation type is statutorily conserved in the Tankwa Karoo National Part with a further 4% conserved within private reserves. Only a small extent of the vegetation type in the areas of low agricultural production have been transformed, however alien species have invaded due to overgrazing.

Plate 6-4: Photographs illustrating the vegetation types of the project area.

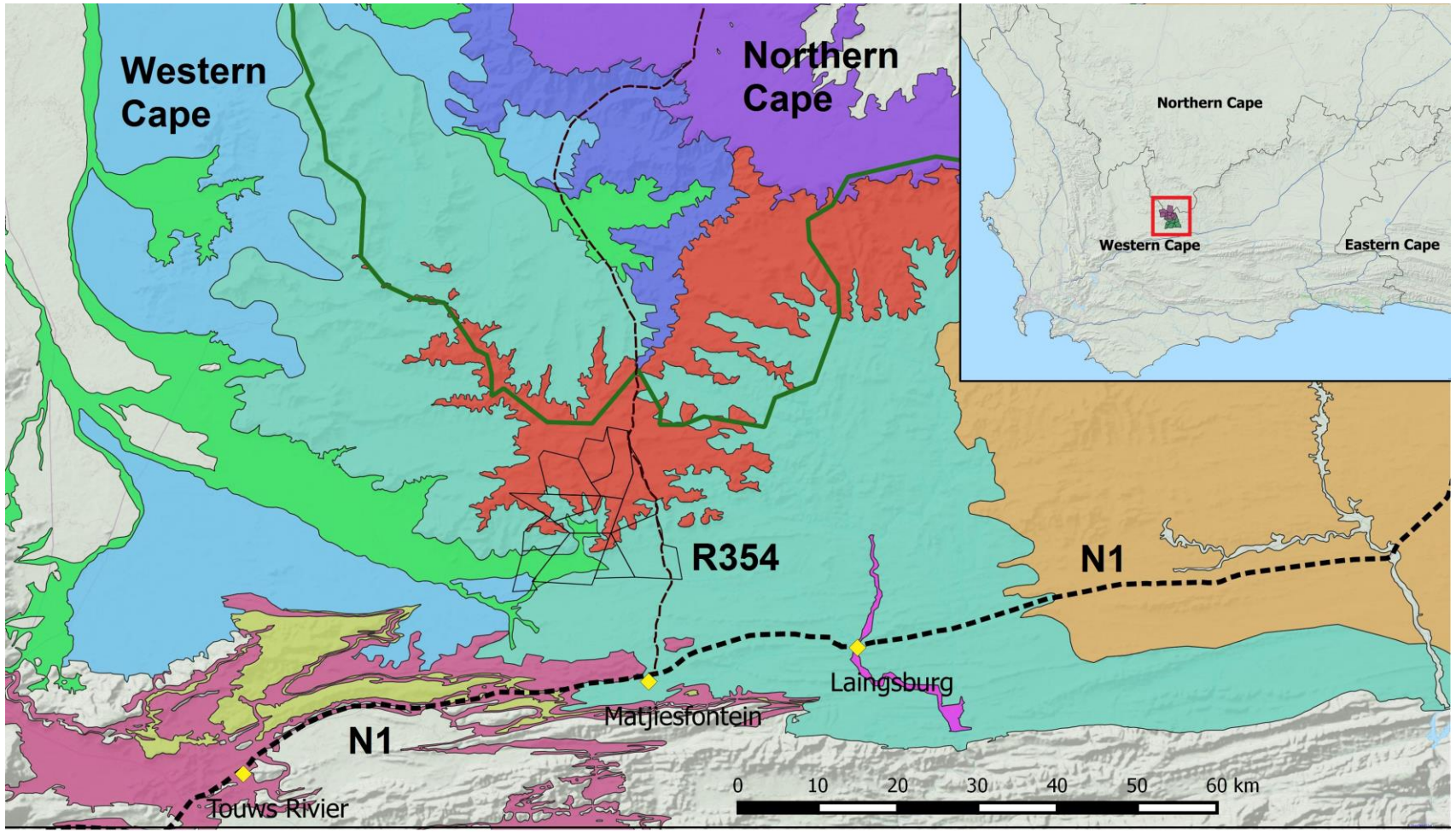

Figure 6-6: Vegetation map showing the vegetation classification of the proposed project area (Mucina and Rutherford, 2012).

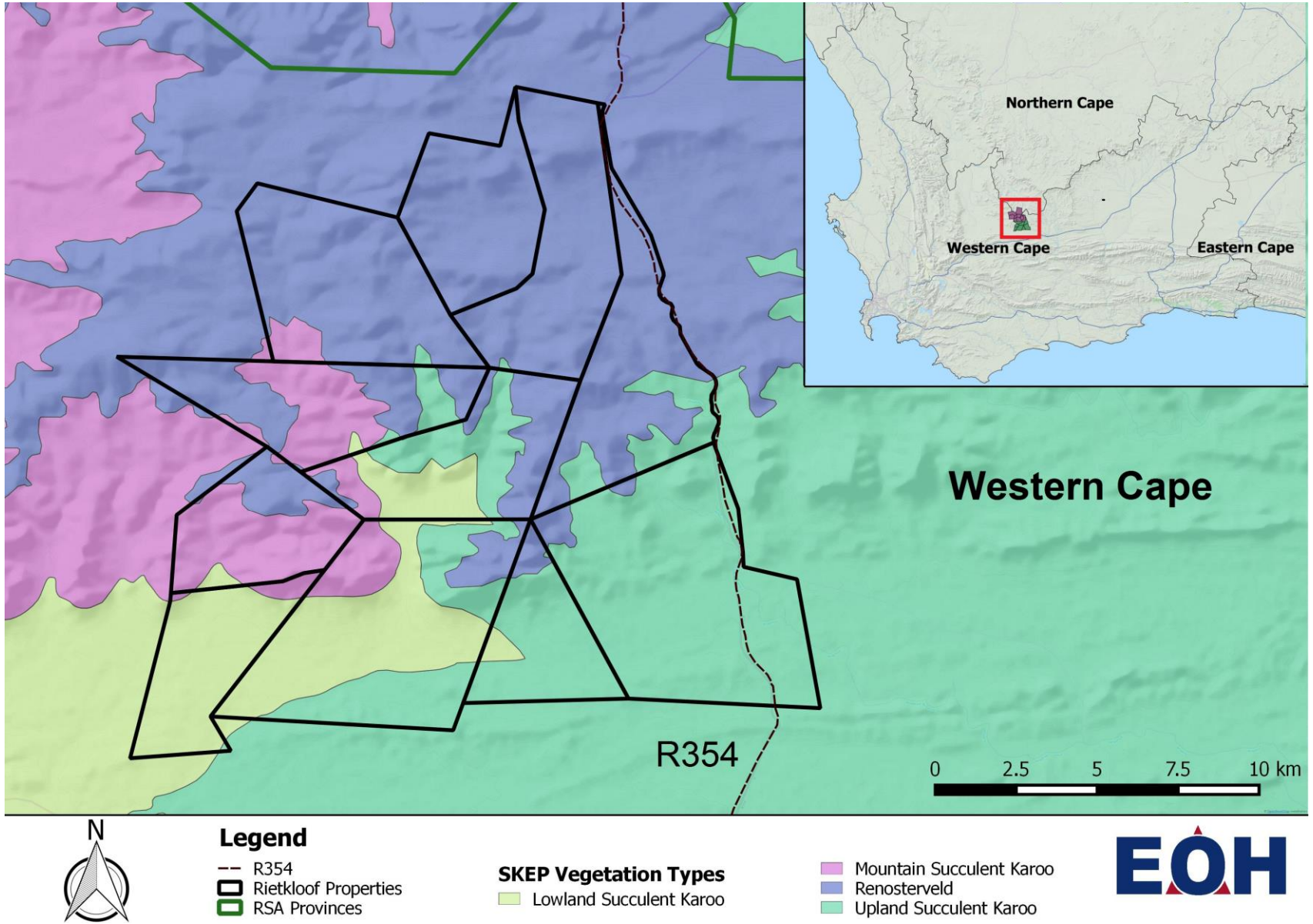

Figure 6-7: Vegetation map showing the SKEP vegetation groups of the proposed project area.

Consultation of historical records for the quarter degree square (QDS) (3220CD, 3220DC, 3320AB, 3320BA) within which the project area falls indicates that there are seventy-six species of conservation concern that may occur within the study area (Table 6-2) (SIBIS, 2016). Table 6-3 below provides a list of plant species of conservation concern status, as per the National Red List and IUCN.

Table 6-2: A summary of the number of plant species that occur on the SA Red Data list and IUCN.

Conservation Body	IUCN	Number of Species
IUCN	Vulnerable	1
	Near Threatened	1
SA Red Data List	Critically Endangered[5]	4
	Endangered[6]	6
	Vulnerable[7]	22
	Near Threatened[8]	12
	Rare[9]	28
	Declining[10]	2

Table 6-3: Species of Conservation Concern that are likely to occur within the study site (SIBIS, 2016).

Family	Scientific Name	SA Red List	IUCN Red List
RUTACEAE	*Acmadenia argillophila*	NT	-
CRASSULACEAE	*Adromischus humilis*	Rare	-
CRASSULACEAE	*Adromischus liebenbergii*	Rare	-
CRASSULACEAE	*Adromischus mammillaris*	EN	-
CRASSULACEAE	*Adromischus phillipsiae*	Rare	-
RUTACEAE	*Agathosma adenandriflora*	NT	-
FABACEAE	*Amphithalea spinosa*	VU	-
FABACEAE	*Amphithalea tomentosa*	NT	-
FABACEAE	*Amphithalea villosa*	VU	NT
MESEMBRYANTHEMACEAE	*Antimima hamatilis*	VU	-
FABACEAE	*Aspalathus intricata subsp. anthospermoides*	Rare	-
ASPHODELACEAE	*Astroloba herrei*	VU	-

[5] Critically Endangered (CR) – a CR taxon is considered to be facing an extremely high risk of extinction in the wild.

[6] Endangered (EN) – an EN taxon is considered to be facing a very high risk of extinction in the wild.

[7] Vulnerable (VU) – a VU taxon is considered to be facing a high risk of extinction in the wild

[8] Near Threatened (NT) - A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future

[9] Rare A species is Rare when it meets at least one of four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria.

[10] Declining A species is Declining when it does not meet or nearly meet any of the five IUCN criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline of the species.

Family	Scientific Name	SA Red List	IUCN Red List
IRIDACEAE	*Babiana sambucina var. longibracteata*	EN	-
ORCHIDACEAE	*Bartholina etheliae*	LC	VU
AMARYLLIDACEAE	*Boophone disticha*	Declining	-
AMARYLLIDACEAE	*Brunsvigia josephinae*	VU	-
ASPHODELACEAE	*Bulbine torta*	Rare	-
ANTHERICACEAE	*Chlorophytum lewisiae*	Rare	-
ASTERACEAE	*Cineraria lobata subsp. lasiocaulis*	Rare	-
MESEMBRYANTHEMACEAE	*Cleretum lyratifolium*	Rare	-
CRASSULACEAE	*Crassula alpestris subsp. massonii*	Rare	-
CRASSULACEAE	*Crassula roggeveldii*	Rare	-
CRASSULACEAE	*Crassula rupestris subsp. commutata*	Rare	-
HYACINTHACEAE	*Drimia altissima*	Declining	-
APOCYNACEAE	*Duvalia parviflora*	VU	-
POACEAE	*Ehrharta eburnea*	NT	-
ASTERACEAE	*Eriocephalus grandiflorus*	Rare	-
EUPHORBIACEAE	*Euphorbia nesemannii*	NT	-
ASTERACEAE	*Euryops namaquensis*	VU	-
ASPHODELACEAE	*Gasteria disticha*	CR	-
ASPHODELACEAE	*Gasteria disticha var. disticha*	CR	-
IRIDACEAE	*Geissorhiza inaequalis*	Rare	-
IRIDACEAE	*Geissorhiza karooica*	VU	-
SCROPHULARIACEAE	*Globulariopsis wittebergensis*	Rare	-
MESEMBRYANTHEMACEAE	*Glottiphyllum fergusoniae*	NT	-
MESEMBRYANTHEMACEAE	*Glottiphyllum linguiforme*	VU	-
ASPHODELACEAE	*Haworthia fasciata*	NT	-
ASTERACEAE	*Helichrysum tricostatum*	NT	-
APOCYNACEAE	*Hoodia pilifera subsp. pilifera*	NT	-
IRIDACEAE	*Ixia linearifolia*	Rare	-
IRIDACEAE	*Ixia oxalidiflora*	VU	-
IRIDACEAE	*Ixia parva*	VU	-
IRIDACEAE	*Ixia rapunculoides var. flaccida*	VU	-
HYACINTHACEAE	*Lachenalia martinae*	VU	-
HYACINTHACEAE	*Lachenalia maximiliani*	Rare	-
MESEMBRYANTHEMACEAE	*Lampranthus amoenus*	EN	-
PROTEACEAE	*Leucadendron teretifolium*	NT	-
FABACEAE	*Lotononis comptonii*	EN	-
FABACEAE	*Lotononis densa subsp. congesta*	VU	-
FABACEAE	*Lotononis gracilifolia*	EN	-
FABACEAE	*Lotononis venosa*	VU	-
IRIDACEAE	*Moraea aspera*	VU	-
POLYGALACEAE	*Muraltia karroica*	VU	-
POLYGALACEAE	*Muraltia montana*	Rare	-
MESEMBRYANTHEMACEAE	*Octopoma tanquanum*	VU	-
SCROPHULARIACEAE	*Oftia glabra*	Rare	-
OXALIDACEAE	*Oxalis tenuipes var. tenuipes*	Rare	-

Family	Scientific Name	SA Red List	IUCN Red List
GERANIACEAE	*Pelargonium denticulatum*	Rare	-
GERANIACEAE	*Pelargonium torulosum*	Rare	-
MESEMBRYANTHEMACEAE	*Phyllobolus herbertii*	VU	-
ASTERACEAE	*Phymaspermum schroeteri*	Rare	-
PROTEACEAE	*Protea convexa*	CR	-
PROTEACEAE	*Protea lepidocarpodendron*	NT	-
ASTERACEAE	*Pteronia hutchinsoniana*	Rare	-
ASTERACEAE	*Relhania tricephala*	NT	-
IRIDACEAE	*Romulea eburnea*	VU	-
MESEMBRYANTHEMACEAE	*Ruschia altigena*	Rare	-
SCROPHULARIACEAE	*Selago albomontana*	Rare	-
ASTERACEAE	*Senecio scaposus*	EN	-
AMARYLLIDACEAE	*Strumaria karooica*	Rare	-
AMARYLLIDACEAE	*Strumaria pubescens*	Rare	-
MESEMBRYANTHEMACEAE	*Tanquana archeri*	VU	-
MESEMBRYANTHEMACEAE	*Tanquana hilmarii*	CR	-
ASPHODELACEAE	*Trachyandra sanguinorhiza*	Rare	-
COLCHICACEAE	*Wurmbea capensis*	VU	-

6.1.6 Fauna

Consultation of historical records for the quarter degree square (QDS) (3220CD, 3220DC, 3320AB, 3320BA) and habitat distribution maps indicate potential faunal species of conservation concern that may occur within the site.

Amphibians and Reptiles

Amphibians and reptiles are well represented in sub-Saharan Africa. However, distribution patterns in southern Africa are uneven both in terms of species distribution and in population numbers (du Preez and Carruthers, 2009). Climate, centres of origin and range restrictions are the three main factors that determine species distribution. The eastern coast of South Africa has the highest amphibian diversity and endemicity while reptile diversity is generally highest in the north eastern extremes of South Africa and declines to the south and west (Alexander and Marais, 2010).

There are 350 species of reptile in South Africa, comprising 213 lizards, 9 worm lizards, 105 snakes, 13 terrestrial tortoises, 5 freshwater terrapins, 2 breeding species of sea turtle and 1 crocodile (Branch, 1998).

Amphibians are important in wetland systems, particularly where fish are excluded or of minor importance. In these habitats, frogs are dominant predators of invertebrates. Reports of declining amphibian populations continue to increase globally, even in pristine protected areas. These declines are not simple cyclic events; for example, frogs have been identified as bio-indicator species that reflect the wellbeing of aquatic ecosystems. Frog abundance and diversity is a poignant reflection of the general health and well-being of aquatic ecosystems.

According to historical records (SAFAP, 2015), there are five (5) amphibian species likely to occur in the project area. All five species are listed as Schedule II[11] species according to the Western Cape PNCO. These are listed in Table 6-4 below.

[11] According to the Northern Cape PNCO, Schedule II species are Protected species. Whilst in the Western Cape PNCO, Schedule II species are Protected Wild animals.