Appendix H-1

AGRICULTURAL STUDY

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SITE SENSITIVITY VERIFICATION
AND
AGRICULTURAL AGRO-ECOSYSTEM SPECIALIST ASSESSMENT
FOR
THE PROPOSED IMPUMELELO WIND ENERGY FACILITY
NEAR SECUNDA IN MPUMALANGA PROVINCE

Report by
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15 February 2023

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EXECUTIVE SUMMARY

The key findings of this study are:

- The agricultural sensitivity of the site was verified as being high on lands that can currently be classified as croplands, which is less of the site than is indicated as such on the screening tool. The rest of the site was verified as being of medium agricultural sensitivity.
- Soils include dark coloured, clay-rich, vertic soils of the Arcadia soil form, which are suitable as cropland if they are deep enough. Other soils are generally not suitable as croplands and include shallow, stony soils on underlying bedrock, of the Mispah, Glenrosa, Milkwood, and Mayo soil forms, as well as shallow soils on underlying clay.
- Farmers in the area utilise suitable soil for grain production. Soil that is not suitable for grain production is used for cattle grazing.
- Two potential negative, direct agricultural impacts have been identified as loss of agricultural potential by occupation of land and loss of agricultural potential by soil degradation. The loss by occupation will exclude only a very small proportion of the land from agricultural production and will therefore have minimal impact on production potential.
- Three positive, indirect agricultural impacts have been identified as enhanced agricultural potential through increased financial security for farming operations; enhanced agricultural potential through improved security against stock theft and other crime; and an improved farm road network.
- The recommended mitigation measures are implementation of an effective system of storm water run-off control; and stripping, stockpiling and re-spreading of topsoil.
- The conclusion of this assessment is that the proposed development will not have an unacceptable negative impact on the agricultural production capability of the site. This is substantiated by the facts that the development will exclude only a very small proportion of the land from agricultural production and will therefore have minimal impact on production potential; the amount of agricultural land loss is well within the allowable development limits prescribed by the agricultural protocol; it offers improved financial security, as well as wider, societal benefits; it offers security benefits against stock theft and other crime; it poses a low risk in terms of causing soil degradation; and the loss by occupation is not permanent and land will become available again after the activity ceases.
- The proposed development is therefore acceptable from an agricultural impact point of view, and it is recommended that it be approved.

1 INTRODUCTION

Environmental authorisation is being sought for the proposed Impumelelo Wind Energy Facility WEF) near Secunda in Mpumalanga Province (see location in Figure 1). In terms of the National Environmental Management Act (Act No 107 of 1998)(NEMA), an application for environmental authorisation requires an agricultural assessment, in this case an Agricultural Agro-Ecosystem Specialist Assessment.

Johann Lanz was appointed as an independent agricultural specialist to conduct the agricultural assessment. The objective and focus of an agricultural assessment is to assess whether or not the proposed development will have an unacceptable agricultural impact, and based on this, to make a recommendation on whether or not it should be approved.

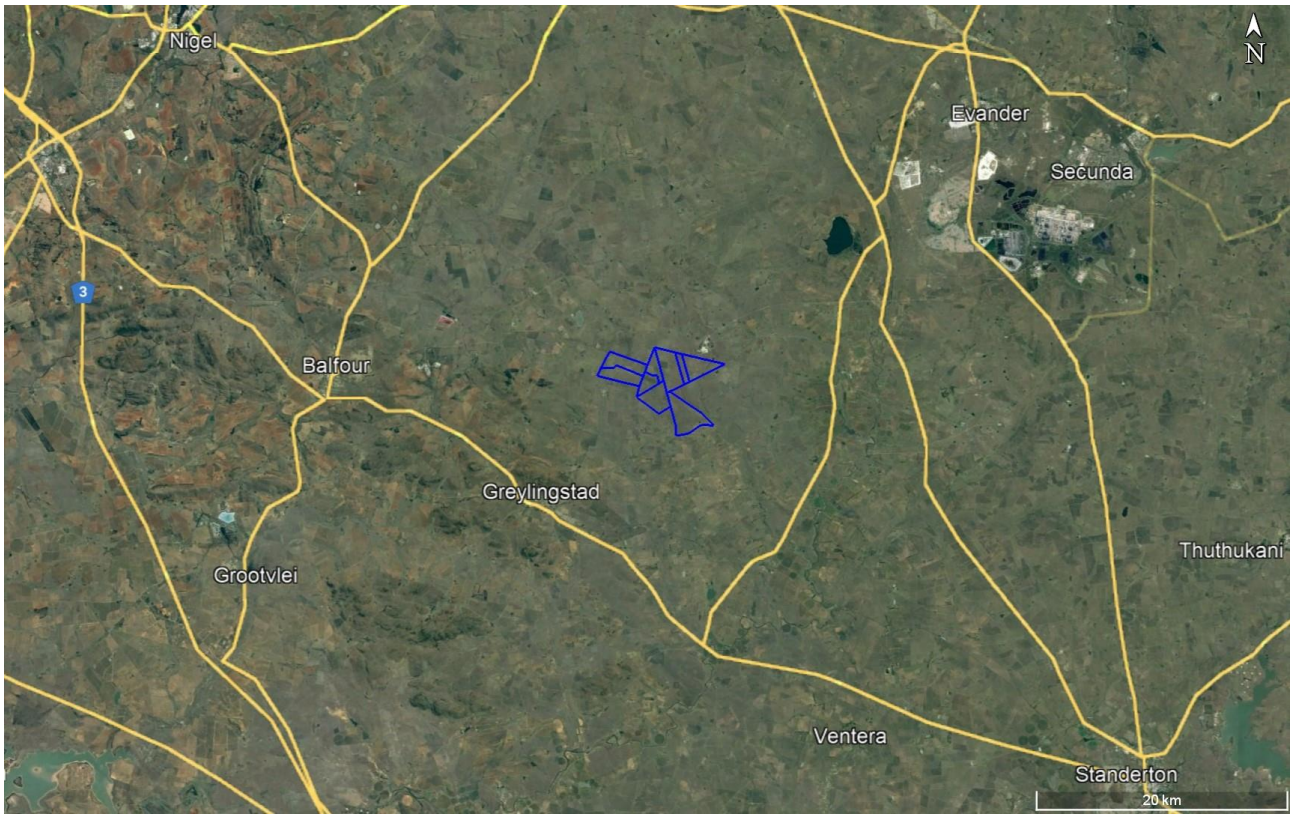

Figure 1. *Locality map of the cadastral boundary of the proposed energy facility (blue outlines) to the south-west of the town of Secunda.*

The whole idea behind including an agricultural component in Environmental Authorisation is to ensure that South Africa balances the need for development against the need to ensure the conservation of the natural agricultural resources, including land, required for agricultural production and national food security. The purpose is primarily to preserve scarce arable land for crop production, by ensuring that such land is not inappropriately used for non agricultural development or impacted to the extent that the crop production potential is reduced.

In this case, the small extent of land loss means that there is an insignificant affect on the crop production potential of the site.

2 PROJECT DESCRIPTION

The proposed facility will consist of the standard infrastructure of a wind energy facility including, up to approximately 28 turbines with foundations; crane pads per turbine; internal access roads; operations and maintenance building; battery storage; on-site substation; and temporary laydown areas and will have a total generating capacity of up to 200MW. The grid connection infrastructure is subject to a separate assessment and EA.

The exact nature of the different components making up a wind energy facility has absolutely no bearing on the significance of agricultural impacts and so is unnecessary to detail any further in this assessment. All that is of relevance is simply the layout and extent of the total footprint of the facility that excludes agricultural land use or impacts agricultural land, referred to as the agricultural footprint. Whether that footprint comprises a crane pad, a road or a building is irrelevant to agricultural impact.

3 TERMS OF REFERENCE

The terms of reference for this study is to fulfill the requirements of the *Protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources by onshore wind and/or solar photovoltaic energy generation facilities where the electricity output is 20 megawatts or more*, gazetted on 20 March 2020 in GN 320 (in terms of Sections 24(5)(A) and (H) and 44 of NEMA, 1998).

The site includes land that is classified by the national web-based environmental screening tool as high sensitivity for impacts on agricultural resources. The level of agricultural assessment required in terms of the protocol (and hence in terms of NEMA) is therefore an Agricultural Agro-Ecosystem Specialist Assessment. The terms of reference for such an assessment, as stipulated in the protocol, are listed below, and the section number of this report which fulfils each stipulation is given after it in brackets. The protocol also requires that a Site Sensitivity Verification be done.

1. The assessment must be undertaken by a soil scientist or agricultural specialist registered with the South African Council for Natural Scientific Professions (SACNASP). (Appendix 5)
2. The assessment must be undertaken on the preferred site and within the proposed development footprint. (Figure 3)
3. The assessment must be undertaken based on a site inspection as well as an investigation of the current production figures, where the land is under cultivation or has been within

the past 5 years, and must identify:

1. the extent of the impact of the proposed development on the agricultural resources (Section 9.12);
2. whether or not the proposed development will have an unacceptable negative impact on the agricultural production capability of the site (Section 10), and in the event where it does, whether such a negative impact is outweighed by the positive impact of the proposed development on agricultural resources.

4. The status quo of the site must be described, including the following aspects which must be considered as a minimum in the baseline description of the agro-ecosystem:
    1. The soil form/s, soil depth (effective and total soil depth), top and sub-soil clay percentage, terrain unit and slope (Sections 8.1 & 8.2);
    2. Where applicable, the vegetation composition, available water sources as well as agro-climatic information (Sections 8.3, 8.4 & 8.5);
    3. The current productivity of the land based on production figures for all agricultural activities undertaken on the land for the past 5 years, expressed as an annual figure and broken down into production units (Section 8.7;
    4. The current employment figures (both permanent and casual) for the land for the past 3 years, expressed as an annual figure (Section 8.8);
    5. Existing impacts on the site, located on a map where relevant (e.g. erosion, alien vegetation, non-agricultural infrastructure, waste, etc.)(Section 8.9).
5. Assessment of Impacts, including the following which must be considered as a minimum in the predicted impact of the proposed development on the agro-ecosystem:
    1. Change in productivity for all agricultural activities based on the figures of the past 5 years, expressed as an annual figure and broken down into production units (Section 9.12);
    2. Change in employment figures (both permanent and casual) for the past 5 years expressed as an annual figure (Section 9.12);
    3. Any alternative development footprints within the preferred site which would be of “medium” or “low” sensitivity for agricultural resources as identified by the screening tool and verified through the site sensitivity verification (Section 9.6).
6. The findings of the Agricultural Agro-Ecosystem Specialist Assessment must be written up in an Agricultural Agro-Ecosystem Specialist Report that contains as a minimum the following information:
    1. Details and relevant experience as well as the SACNASP registration number of the soil scientist or agricultural specialist preparing the assessment including a curriculum vita (Appendix 1);
    2. A signed statement of independence by the specialist (Appendix 2);
    3. The duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment (Section 4);
    4. A description of the methodology used to undertake the on-site assessment inclusive of

the equipment and models used, as relevant (Section 4);

5. A map showing the proposed development footprint (including supporting infrastructure) with a 50 m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool (Figure 2);
6. An indication of the potential losses in production and employment from the change of the agricultural use of the land as a result of the proposed development (Section 9.13);
7. an indication of possible long-term benefits that will be generated by the project in comparison to the benefits of the agricultural activities on the affected land (Section 9.7);
8. Additional environmental impacts expected from the proposed development based on the current status quo of the land including erosion, alien vegetation, waste, etc. (Section 9.8);
9. Information on the current agricultural activities being undertaken on adjacent land parcels (Section 8.6);
10. a motivation must be provided if there were development footprints identified as per point 5.3 above that were identified as having a medium or low agricultural sensitivity and that were not considered appropriate (not applicable);
11. Confirmation from the soil scientist or agricultural specialist that all reasonable measures have been considered in the micro-siting of the proposed development to minimise fragmentation and disturbance of agricultural activities (Section 9.9);
12. A substantiated statement from the soil scientist or agricultural specialist with regards to agricultural resources on the acceptability or not of the proposed development and a recommendation on the approval or not of the proposed development (Section 10);
13. Any conditions to which this statement is subjected (Section 10);
14. Where identified, proposed impact management outcomes or any monitoring requirements for inclusion in the Environmental Management Programme (EMPr) (Section 9.11);
15. A description of the assumptions made and any uncertainties or gaps in knowledge or data (Section 5).
16. calculations of the physical development footprint area for each land parcel as well as the total physical development footprint area of the proposed development (including supporting infrastructure) (Section 9.10);
17. confirmation whether the development footprint is in line with the allowable development limits set in Table 1 above, including where applicable any deviation from the set development limits and motivation to support the deviation, including (Section 9.10):

    a. where relevant, reasons why the proposed development footprint is required to exceed the limit; (not applicable)

    b. where relevant, reasons why this exceedance will be in the national interest; (not applicable) and

c. where relevant, reasons why there are no alternative options available including evidence of alternatives considered; (not applicable) and

18. a map showing the renewable energy facilities within a 50km radius of the proposed development (Appendix 3)

4 METHODOLOGY OF STUDY

The assessment was based on an on-site investigation of the soils and agricultural conditions and was also informed by existing soil and agricultural potential data for the site. The following sources of existing information were used:

- Soil data was sourced from the land type data set, of the Department of Agriculture, Forestry and Fisheries (DAFF). This data set originates from the land type survey that was conducted from the 1970's until 2002. It is the most reliable and comprehensive national database of soil information in South Africa and although the data was collected some time ago, it is still entirely relevant as the soil characteristics included in the land type data do not change within time scales of hundreds of years.
- Land capability data was sourced from the 2017 National land capability evaluation raster data layer produced by the DAFF, Pretoria.
- Field crop boundaries were sourced from Crop Estimates Consortium, 2019. *Field Crop Boundary data layer, 2019*. Pretoria. Department of Agriculture, Forestry and Fisheries
- Rainfall and evaporation data was sourced from the SA Atlas of Climatology and Agrohydrology (2009, R.E. Schulze) available on Cape Farm Mapper. Note that Cape Farm Mapper includes national coverage of climate, grazing and certain other data.
- Grazing capacity data was sourced from the 2018 DAFF long-term grazing capacity map for South Africa, available on Cape Farm Mapper.
- Satellite imagery of the site and surrounds was sourced from Google Earth.

The aim of the on-site Site Sensitivity Verification was to:

1. ground-truth cropland status and consequent agricultural sensitivity;
2. ground truth the land type soil data and achieve an understanding of the general range and distribution patterns of different soil conditions across the site;
3. gain an understanding of overall agricultural production potential across the site.

This was achieved by a drive and walk-over investigation across the site. The site investigation was conducted on 13 October 2021.

The soil investigation was based on the investigation of existing excavations, soil auger samples as

well as indications of the surface conditions and topography. Soils were classified according to the South African soil classification system (Soil Classification Working Group, 1991). This level of soil assessment is considered entirely adequate for an understanding of on-site soil potential.

An assessment of soils and long-term agricultural potential is in no way affected by the season in which the assessment is made, and therefore the fact that the assessment was done in summer has no bearing on its results.

Interviews with the farmers Dawie van Jaarsveld and Lucas Klopper were conducted for information on farming activities on the site.

5 ASSUMPTIONS, UNCERTAINTIES OR GAPS IN KNOWLEDGE OR DATA

There are no specific assumptions, uncertainties or gaps in knowledge or data that affect the findings of this study.

6 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

A renewable energy facility requires approval from the National Department of Agriculture, Land Reform and Rural Development (DALRRD) if the facility is on agriculturally zoned land. There are two approvals that apply. The first is a No Objection Letter for the change in land use. This letter is one of the requirements for receiving municipal rezoning. It is advisable to apply for this as early in the development process as possible because not receiving this DALRRD approval is a fatal flaw for a project. Note that a positive EA does not assure DALRRD's approval of this. This application requires a motivation backed by good evidence that the development is acceptable in terms of its impact on the agricultural production potential of the development site. This assessment report will serve that purpose.

The second required approval is a consent for long-term lease in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA). If DALRRD approval for the development has already been obtained in the form of the No Objection letter, then SALA approval should not present any difficulties. Note that SALA approval is not required if the lease is over the entire farm portion. SALA approval (if required) can only be applied for once the Municipal Rezoning Certificate and Environmental Authorisation has been obtained.

Rehabilitation after disturbance to agricultural land is managed by the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA). A consent in terms of CARA is required for the cultivation of virgin land. Cultivation is defined in CARA as "any act by means of which the topsoil is disturbed mechanically". The purpose of this consent for the cultivation of virgin land is to ensure that only land that is suitable as arable land is cultivated. Therefore, despite the above definition of

cultivation, disturbance to the topsoil that results from the construction of a renewable energy facility and its associated infrastructure does not constitute cultivation as it is understood in CARA. This has been corroborated by Anneliza Collett (Acting Scientific Manager: Natural Resources Inventories and Assessments in the Directorate: Land and Soil Management of the Department of Agriculture, Land Reform and Rural Development (DALRRD)). The construction and operation of the facility will therefore not require consent from the Department of Agriculture, Land Reform and Rural Development in terms of this provision of CARA.

7 SITE SENSITIVITY VERIFICATION

In terms of the gazetted agricultural protocol, a site sensitivity verification must be submitted that:

1. confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;
2. contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity.

The whole idea behind including an agricultural component in Environmental Authorisation is to ensure that South Africa balances the need for development against the need to ensure the conservation of the natural agricultural resources, including land, required for agricultural production and national food security.

Agricultural sensitivity, as used in the national web-based environmental screening tool, is a direct function of the capability of the land for agricultural production. The general assessment of agricultural sensitivity that is employed in the national web-based environmental screening tool, identifies all arable land that can support viable crop production, as high (or very high) sensitivity. This is because there is a scarcity of arable production land in South Africa and its conservation for agricultural use is therefore a priority. Land which cannot support viable crop production is much less of a priority to conserve for agricultural use, and is rated as medium or low agricultural sensitivity.

The screening tool classifies agricultural sensitivity according to only two independent criteria – the land capability rating and whether the land is used for cropland or not. All cropland is classified as at least high sensitivity, based on the logic that if it is under crop production, it is indeed suitable for it, irrespective of its land capability rating.

The screening tool sensitivity categories in terms of land capability are based upon the Department of Agriculture's updated and refined, country-wide land capability mapping, released in 2016. The data is generated by GIS modelling. Land capability is defined as the combination of

soil, climate and terrain suitability factors for supporting rain fed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land, based on its soil, climate and terrain. The higher land capability values (≥8 to 15) are likely to be suitable as arable land for crop production, while lower values are only likely to be suitable as non-arable grazing land.

A map of the proposed development overlaid on the screening tool sensitivity is given in Figure 2, below. The land capability of the site on the screening tool is predominantly 8, but varies from 5 to 9. The small scale differences in land capability across the project area are not very significant and are more a function of how the land capability data is generated by modelling, than actual meaningful differences in agricultural potential on the ground. Values of 5 translate to a low agricultural sensitivity, values of 6 to 8 translate to a medium agricultural sensitivity, and values of 9 translate to a high agricultural sensitivity. However, there are only a few, isolated pixels across the site that are of a land capability value of 9, and they are therefore not very significant.

The allocation of high sensitivity to parts of the site (red in Figure 2) are because these parts are classified as cropland in the data set used by the screening tool. However, that data set is outdated and not always accurate. The field-verified and updated indication of which lands should be classified as croplands is given in Figure 3. The other lands in Figure 2 are no longer or have never been used as cropland. Instead, as can be seen from Figure 5 and the latest Google Earth image, they are used for grassland grazing that is burnt or mowed from time to time, so can appear on satellite images as cropland.

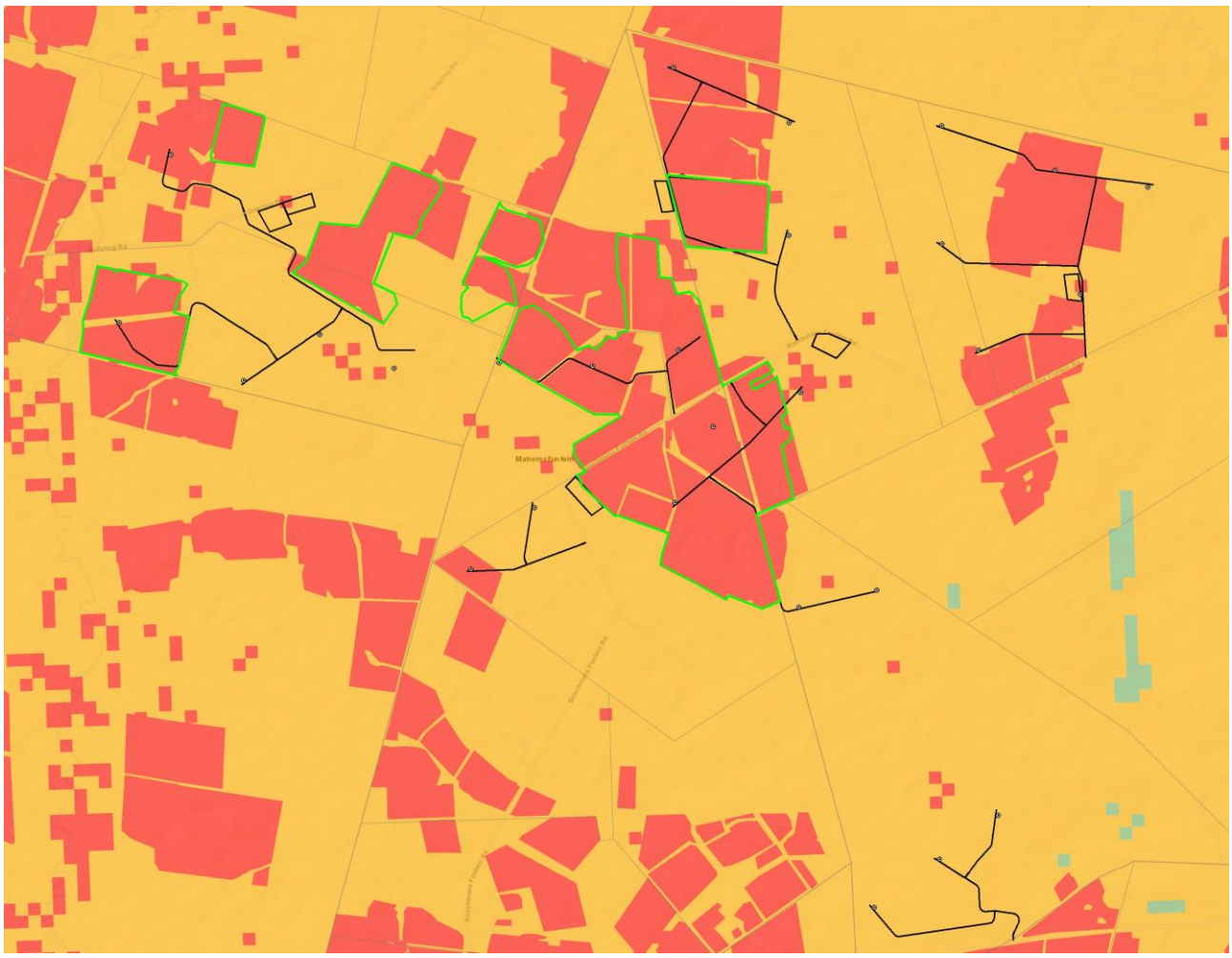

Figure 2. *The proposed development footprint (black outline) overlaid on agricultural sensitivity, as given by the screening tool (green = low; yellow = medium; red = high). Green outlines show the current, verified high agricultural sensitivity areas (croplands).*

This site sensitivity verification verifies those parts of the site that are indicated as cropland in Figure 3 as being of high agricultural sensitivity and the rest of the site as being of medium agricultural sensitivity.

8 BASELINE DESCRIPTION OF THE AGRO-ECOSYSTEM

A satellite image map of the proposed footprint of the facility is shown in Figure 3 and photographs of site conditions are shown in Figures 4 to 7.

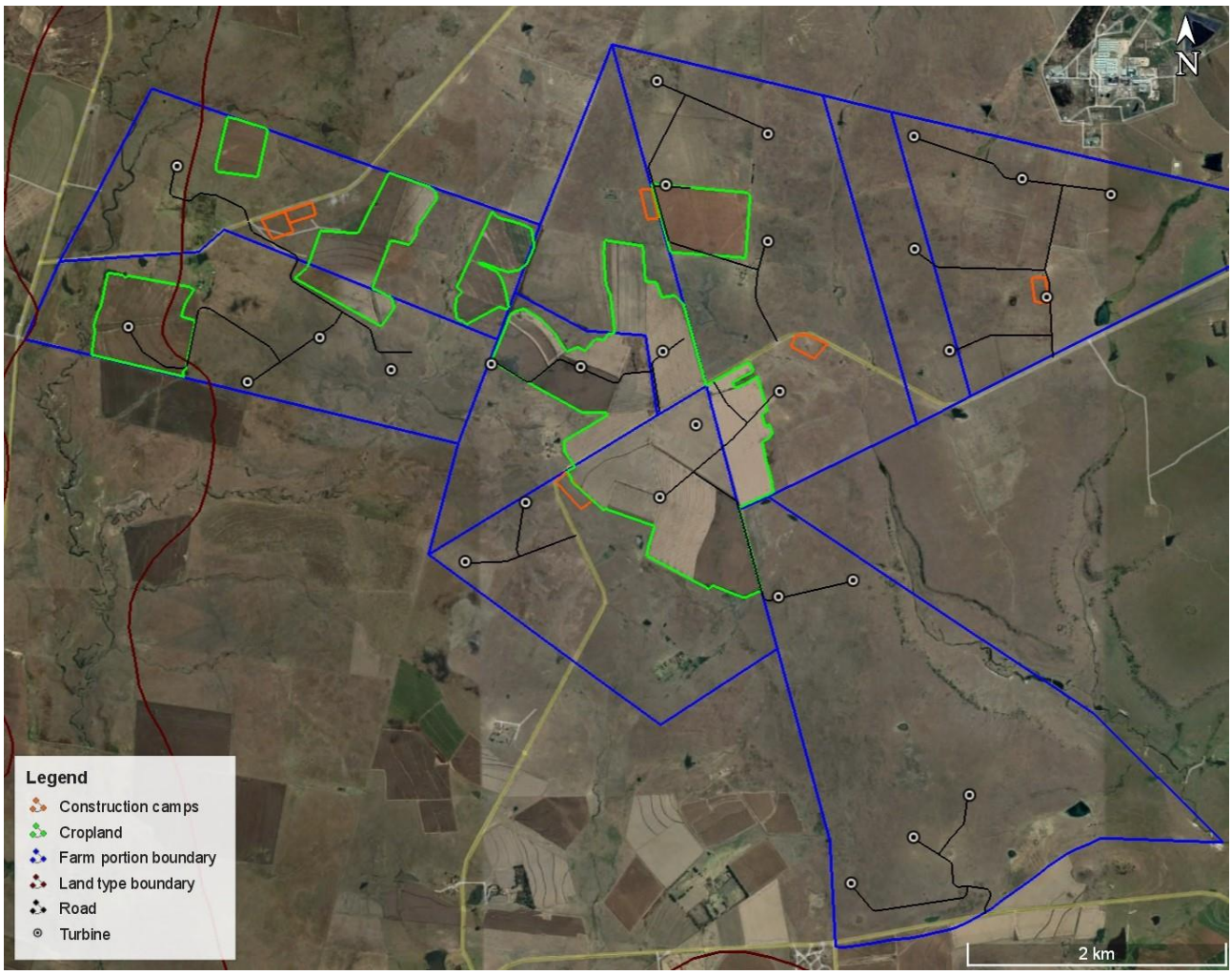

Figure 3. *Satellite image map of the proposed footprint of the facility.*

8.1 Soils

Almost the entire site falls within one land type, Ea20 (see table of soil data in Appendix 4). The geology is Karoo dolerite suite. The soils include three broad types. The first are dark coloured, clay-rich, vertic soils of the Arcadia soil form, which are suitable as cropland if they are deep enough. The second are shallow, stony soils on underlying bedrock, of the Mispah, Glenrosa, Milkwood, and Mayo soil forms. Rock outcrops also occur. The third are predominantly shallow soils on underlying clay. The second and third groups of soils are generally not suitable as croplands.

Figure 4. *View of typical lands not used for crop production but used for grazing.*

Figure 5. *Grassland grazing that is burnt or mowed from time to time, so can appear on satellite images as cropland.*

Figure 6. *Typical soil conditions where shallow, rocky soils occur and depth is limited by underlying dolerite bedrock.*

Figure 7. *Croplands on dark, vertic soils of sufficient depth which typically occupy the higher lying parts of the site.*

8.2 Terrain and slope

The site is situated on elevated, slightly hilly terrain at an altitude of between 1,620 and 1,650 metres and gentle slopes up to about 3%.

8.3 Available water sources

There is no irrigation anywhere on the farms.

8.4 Vegetation

Natural vegetation of the site is Soweto Highveld Grassland, which has been disturbed by agricultural activities.

8.5 Agro-climatic information

The site has a summer rainfall with a mean annual rainfall of between 660 and 690 mm and a mean annual evaporation of approximately 1,320 mm.

8.6 Land use and development on and surrounding the site

The site is located 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 utilise all suitable soil for grain production. Only soil that is not suitable for grain production is used for cattle grazing. 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 grazing lands are *rooigras* (*Themeda triandra*) grasslands. Grass fields are burned or mowed from time to time.

8.7 Agricultural potential and productivity

Because of the favourable climate, grain yields are fairly high but are constrained by the generally shallower soils. Average maize yields are around 5 tons per hectare. The long-term grazing capacity of the farm is fairly high at 5 hectares per large stock unit.

8.8 Agricultural employment

The farms on the site operate with only a small number of labourers.

8.9 Existing impacts on the site

There are no existing impacts on the site that are relevant to agricultural impact.

9 ASSESSMENT OF AGRICULTURAL IMPACT

9.1 What constitutes and agricultural impact?

An agricultural impact is a temporary or permanent change to the future production potential of land. If a development will not change the future production potential of the land, then there is no agricultural impact. A decrease in future production potential is a negative impact and an increase is a positive impact. The significance of the agricultural impact is directly proportional to the extent of the change in production potential.

9.2 The significance of agricultural impact and the factors that determine it

The purpose of an agricultural component in Environmental Authorisation is to ensure that South Africa balances the need for development against the need to ensure the conservation of the natural agricultural resources, including land, required for agricultural production and national food security.

When the agricultural impact of a development involves the permanent or long term loss/ non-agricultural use of potential agricultural land, as it does in this case, the focus and defining question of the agricultural impact assessment is:

> Does the loss of future agricultural production potential that will result from this development, justify keeping the land solely for potential agricultural production and therefore not approving the development?

If the loss is small, then it is unlikely to justify non approval. If the loss is big, then it is likely to justify it.

The extent of the loss is a direct function of two things, firstly the amount of land that will be lost and secondly, the production potential of the land that will be lost. In the case of wind farms, the first factor, amount of land loss, is so small that the total extent of the loss of future agricultural production potential is insignificantly small, regardless of how much production potential the land has. This is because the required spacing between turbines means that the amount of land actually excluded from agricultural use is extremely small in relation to the surface area over which a wind farm is distributed. Wind farm infrastructure (including all associated infrastructure and roads) typically occupies less than 2% of the surface area, according to the typical surface area

requirements of wind farms in South Africa (DEA, 2015). Most wind energy facilities, for which I have recently done assessments, occupy less than 1% of the surface area. All agricultural activities are able to continue unaffectedly on all parts of the farmland other than this small agricultural footprint and the actual loss of production potential is therefore insignificant.

It is also important to note that renewable energy facilities have both positive and negative affects on the production potential of land (see Section 9.3) and so it is the net sum of these positive and negative affects that determines the extent of the change in future production potential.
The significance of the small loss of production potential is reduced even more because it is compensated by the positive impacts that enhance production potential.

A study done to measure the impact of existing wind farms on agricultural production potential (Lanz, 2018) is highly informative of the extent of the agricultural impact that is likely for this proposed development. Although the study was done in a different agricultural environment, it is similar in terms of being a highly productive and intensively farmed environment with cultivation. There is no reason that the results obtained in that study would not be applicable to the area in this assessment. The overall conclusion of the study was that, although wind farms have been established within an area of cultivated farmland that supports intensive and productive farming, it is highly unlikely that this has caused a reduction in agricultural production. Small amounts of production land have been lost, but the consequence of this for agricultural production has been negligible. It is likely that the positive financial impacts of wind farming have outweighed the negative impacts and that wind farming has benefited agriculture and agricultural production in the area.

9.3 Impact identification

There is ultimately only ever a single agricultural impact of a development and that is a change to the future agricultural production potential of the land. This impact occurs by way of different mechanisms some of which lead to a decrease in production potential and some of which lead to an increase. It is the net sum of positive and negative effects that determines the overall agricultural impact.

Two direct mechanisms have been identified that lead to decreased agricultural potential by:

3. **occupation of land** - Agricultural land directly occupied by the development infrastructure will become restricted for agricultural use, with consequent potential loss of agricultural productivity for the duration of the project lifetime. As has been discussed above, the small and widely distributed nature of the agricultural footprint of the facility means that only an insignificant proportion of the available agricultural land is impacted in this way.
4. **soil erosion and degradation –** Erosion can occur as a result of the alteration of the land

surface run-off characteristics, predominantly through the establishment of hard surface areas including roads, and through the disturbance of existing contour bank systems that control erosion. Soil erosion is completely preventable. The storm water management that will be an inherent part of the road engineering on site and standard, best practice erosion control measures recommended and included in the EMPr, are likely to be effective in preventing soil erosion. Loss of topsoil can result from poor topsoil management during construction related excavations.

Three indirect mechanisms have been identified that lead to increased agricultural potential through:

1. **increased financial security for farming operations -** Reliable and predictable income will be generated by the farming enterprises through the lease of the land to the energy facility. This is likely to increase their cash flow and financial security and could improve farming operations and productivity through increased investment into farming.
2. **improved security against stock theft and other crime** due to the presence of security infrastructure and security personnel at the energy facility.
3. **an improved road network**, with associated storm water handling system. The wind farm will construct turbine access roads of a higher standard than the existing farm roads which will give farming vehicles better access to farmlands. This will be especially relevant during wet periods when access to croplands for spraying etc is limited by the current farm roads.

Considering what is detailed in Section 9.2 above, the extent to which any of these mechanisms is likely to actually affect levels of agricultural production is small and the overall impact of a change in agricultural production potential is therefore small.

There are two additional effects, but because they are highly unlikely to have an impact on agricultural production, they are not considered further. They are:

- **Prevention of crop spraying by aircraft over land occupied by turbines** – ground based or using drones for spraying are effective, alternative methods that can be used without implications for production or profitability.
- **Interference with farming operations** - Construction (and decommissioning) activities are likely to have some nuisance impact for farming operations but are highly unlikely to have an impact on agricultural production.

9.4 Cumulative impacts

The cumulative impact of a development is the impact that development will have when its impact is added to the incremental impacts of other past, present or reasonably foreseeable future activities that will affect the same environment.

The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the impact of the proposed development will lead directly to the sum of impacts of all developments causing an acceptable level of change to be exceeded in the surrounding area. If the impact of the development being assessed does not cause that level to be exceeded, then the cumulative impact associated with that development is not significant.

The potential cumulative agricultural impact of importance is a regional loss (including by degradation) of agricultural land, with a consequent decrease in agricultural production. The defining question for assessing the cumulative agricultural impact is this:

> What level of loss of agricultural land use and associated loss of agricultural production is acceptable in the area, and will the loss associated with the proposed development, when considered in the context of all past, present or reasonably foreseeable future impacts, cause that level in the area to be exceeded?

DFFE requires compliance with a specified methodology for the assessment of cumulative impacts. This is positive in that it ensures engagement with the important issue of cumulative impacts. However, the required compliance has some limitations and can, in the opinion of the author, result in an over-focus on methodological compliance, while missing the more important task of effectively answering the above defining question.

DFFE compliance for this project requires quantifying the impact of all renewable energy applications within a 55 km radius. There are a total of six renewable energy project applications within this radius of the proposed site. These are listed in Appendix 3 of this report.

In quantifying the cumulative impact, the area of land taken out of agriculture as a result of the six developments (total generation capacity of 1041 MW) will amount to a total of approximately 1503 hectares. This is calculated using the industry standards of 2.5 and 0.3 hectares per megawatt for solar and wind energy generation respectively, as per the Department of Environmental Affairs (DEA) Phase 1 Wind and Solar Strategic Environmental Assessment (SEA) (2015). As a proportion of the total area within a 55 km radius (approximately 950,300 ha), this amounts to 0.16% of the surface area. That is considered to be well within an acceptable limit in terms of loss of agricultural land.

All of these projects have the same agricultural impacts in a very similar agricultural environment, and therefore the same mitigation measures apply to both.

As discussed above, the risk of a loss of agricultural potential by soil degradation is low and can effectively be mitigated for renewable energy developments. If the risk for each individual development is low, then the cumulative risk is also low.

Due to all of the considerations discussed above, the cumulative impact of loss of agricultural land use will not have an unacceptable negative impact on the agricultural production capability of the area. The proposed development is therefore acceptable in terms of cumulative impact, and it is therefore recommended that it be approved.

9.5 Impacts of the no-go alternative

The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. There are no agricultural impacts of the no-go alternative.

The development offers an additional income source to agriculture, without excluding agriculture from the land. Therefore, the negative agricultural impact of the no-go alternative is more significant than that of the development, and so, purely from an agricultural impact perspective, the proposed development is the preferred alternative between the development and the no-go. In addition, the no-go option would prevent the proposed development from contributing to the environmental, social and economic benefits associated with the development of renewable energy.

9.6 Alternative development footprints and comparative assessment of alternatives

The agricultural protocol requires identification of any alternative development footprints within the preferred site which would be of “medium” or “low” sensitivity for agricultural resources as identified by the screening tool and verified through the site sensitivity verification.

It can be seen in Figure 3 that some of the turbines are located within croplands. This is because the turbines require the higher lying land for viability, which often coincides with cropland. The positioning of turbines in a wind farm is complex and there are multiple, interacting factors that determine the locations that will ensure the viability of the wind farm. Each turbine influences the amount of wind that the other turbines receive. Therefore, the location of one turbine cannot simply be shifted without requiring other turbines to be shifted as well, in order to retain the viability of all the turbines. Turbines cannot therefore simply be shifted off the cropland. However, as has been discussed above, the agricultural impact of these turbines within croplands is so small

that it does not make sense to compromise the viability of the wind farm, to make only an insignificant change to the agricultural impact.

Design and layout alternatives are unlikely to make any material difference to the significance of the agricultural impacts. The same applies to technology alternatives, and there are therefore no preferred alternatives from an agricultural impact perspective. All alternatives are considered acceptable.

9.7 Long term project benefits versus agricultural benefits

The development will generate a significant and reliable additional income for the farming enterprise, without compromising the existing farming income. It will also generate additional income and employment in the local economy. In addition, it will contribute to the country's need for energy generation, particularly renewable energy that has lower environmental and agricultural impact than existing, coal powered energy generation.

9.8 Additional environmental impacts

There are no additional environmental impacts of the proposed development that are relevant to agriculture.

9.9 Micro-siting to minimize fragmentation and disturbance of agricultural activities

The agricultural protocol requires confirmation that all reasonable measures have been taken through micro-siting to minimize fragmentation and disturbance of agricultural activities. One aspect of wind farm layout that can cause unnecessary fragmentation of croplands is the location of turbine access roads within croplands. This aspect can only be confirmed once the road layout is available.

9.10 Impact footprint

The agricultural protocol achieves its purpose, in relation to renewable energy developments on agricultural land, by imposing allowable development limits on different agricultural sensitivity categories of land. The allowable development footprint is the area of a particular sensitivity category of land that can be directly occupied by the physical footprint of a renewable energy development. There are six different allowable development footprints, defined according to a combination of land capability and cropping status, as specified in Table 1, below.

Table 1: Allowable development limits as specified in the agricultural protocol.

Allowable footprint category	Agricultural sensitivity on screening tool	Allowable footprint (ha/MW)	Definition of category
1	Very high	0.00	Land capability of 11-15; or irrigated land; or dryland horticulture or viticulture
2	High	0.20	Land capability of 8-10 on existing field crops
3	High	0.25	Land capability of 6-7 on existing field crops
4	High	0.30	Land capability of 1-5 on existing field crops
5	High	0.35	Land capability of 9-10 outside of existing field crops
	Medium		Land capability of 8 outside of existing field crops
6	Medium	2.5	Land capability of 6-7 outside of existing field crops
	Low		Land capability of 1-5 outside of existing field crops

For the purposes of the calculation, the proposed wind farm is considered to be distributed over only 2 of the above categories, categories 2 and 6. This is justified because those areas identified as viable cropland will be category 2 and all non-cropland, which is of insufficient capability to be viable as cropland, will fall into category 6. The calculation of the compliance of the proposed wind farm to the development limits, is detailed in Table 2. Wind farm infrastructure that take up the largest areas have been included in the table, so the majority of the wind farm footprint is represented. Small additions to the footprint from additional infrastructure that is not included here (for example the widening of existing roads) will not significantly increase the total hectares of the wind farm as it is given in the table.

Table 2. Calculation of the extent to which the proposed 200 MW WEF footprint is within the allowable development limits of the site.

Infrastructure	Unit size	Category 2		Category 6		Total hectares
		Quantity	ha	Quantity	ha	
Crane pads	0.5	5	2.50	23	11.50	14.00
New roads	6.0	4,757	2.85	18,726	11.24	14.09
Total footprint			**5.35**		**22.74**	**28.09**
Allowable ha/MW			0.20		2.50	
Sum of utilised MW			**26.77**		**9.09**	**35.87**

Total project area (hectares)	2858
Footprint as % of area	**0.98**

The proposed facility has a generation capacity of 200 MW. The results of the calculation in Table 2 confirm that the agricultural footprint of the proposed wind farm is well within the allowable development limits set by the agricultural protocol. In fact it is only utilising about one fifth of its allowable footprint limit.

The agricultural footprint is calculated as 36 hectares in Table 2. This means that the wind farm excludes only 36 hectares out of a total farmland of approximately 2858 hectares, which is a mere 0.98% of the farmland. Even if some additional infrastructure, not included in Table 2, increases the footprint slightly, it will still be approximately 1%. This is an insignificantly small amount of farmland.

9.11 Mitigation measures

Mitigation measures are all inherent in the project design and / or are standard, best-practice for construction sites.

- A system of storm water management, which will prevent erosion, will be an inherent part of the road engineering on site. As part of this system, the integrity of the existing contour bank systems of erosion control on croplands, where they occur on steeper slopes, must be kept in tact. Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there.

- Any excavations done during the construction phase, in areas that will be re-vegetated at the end of the construction phase, must separate the upper 30 cm of topsoil from the rest of the excavation spoils and store it in a separate stockpile. When the excavation is back-filled, the topsoil must be back-filled last, so that it is at the surface. Topsoil should only be stripped in areas that are excavated. Across the majority of the site, including construction lay down areas, it will be much more effective for rehabilitation, to retain the topsoil in place. If levelling requires significant cutting, topsoil should be temporarily stockpiled and then re-spread after cutting, so that there is a covering of topsoil over the entire cut surface.

9.12 Impact assessment

An Agricultural Agro-Ecosystem Specialist Assessment is required by the protocol to identify the extent of the impact of the proposed development on agricultural resources. The assessment of impacts in an environmental impact assessment is done according to a prescribed, semi-quantitative rating methodology that is supposed to cover all specialist disciplines and allow comparison of the impacts across them. However, the system was designed for biological components of the ecosystem such as plants and animals and does not rate agricultural impacts in a sensible or particularly useful way. As has been discussed above, the significance of the agricultural impact is simply the degree to which the future agricultural production potential of the site will be changed and that is predominantly a function of the size of the area of land that is impacted and the production potential of that impacted land. The dominant factor in this case is the small size of the area of land that is impacted. The prescribed methodology is presented below for compliance purposes but is not really an effective indication of the significance of the agricultural impact.

However, other aspects of agricultural impact, such as compliance with the prescribed allowable development limits, are much more important and relevant than the table below for determining the significance of the agricultural impact.

Aspect:	Agricultural production potential
Description:	Decrease in agricultural production potential
Stage:	There is only one agricultural impact and it occurs for the duration of the project life time. To differentiate between the different phases of the project does not really make sense, but for compliance purposes the impact, as assessed below, can be considered to be identical across the construction, operation and decommissioning phases of the project.
Character:	Negative

Ease of mitigation:	High

	Without mitigation	**With mitigation**
Magnitude (M)	very low (1)	very low (1)
Extent (E)	site only (1)	site only (1)
Reversibility (R)	Reversible (1)	Reversible (1)
Duration (D)	Long term (4)	Long term (4)
Probability (P)	Low probability (2)	Low probability (2)
Significance (S)	N1 – Very low (14)	N1 – Very low (14)

Mitigation measures against soil degradation are standard best practice for construction sites and renewable energy facilities, but will not change the significance rating as assessed above.

9.13 Impacts on agricultural production and employment

The agricultural protocol requires an indication of the potential losses in production and employment from the change of the agricultural use of the land as a result of the proposed development. As this assessment has shown, the agricultural use of the land will be integrated with the renewable energy facility and it will continue with no discernible change in terms of production. The expected losses in production and employment will therefore be zero.

10 CONCLUSIONS

The agricultural sensitivity of the site was verified as being high on lands that can currently be classified as croplands, which is less of the site than is indicated as such on the screening tool. The rest of the site was verified as being of medium agricultural sensitivity. Soils include dark coloured, clay-rich, vertic soils of the Arcadia soil form, which are suitable as cropland if they are deep enough. Other soils are generally not suitable as croplands and include shallow, stony soils on underlying bedrock, of the Mispah, Glenrosa, Milkwood, and Mayo soil forms, as well as shallow soils on underlying clay.

Farmers in the area utilise suitable soil for grain production. Soil that is not suitable for grain production is used for cattle grazing.

Two potential negative, direct agricultural impacts have been identified as loss of agricultural potential by occupation of land and loss of agricultural potential by soil degradation. The loss by occupation will exclude only a very small proportion of the land from agricultural production and will therefore have minimal impact on production potential. Three positive, indirect agricultural

impacts have been identified as enhanced agricultural potential through increased financial security for farming operations; enhanced agricultural potential through improved security against stock theft and other crime; and an improved farm road network.

The conclusion of this assessment is that the proposed development will not have an unacceptable negative impact on the agricultural production capability of the site. This is substantiated by the facts that the development will exclude only a very small proportion of the land from agricultural production and will therefore have minimal impact on production potential; the amount of agricultural land loss is within the allowable development limits prescribed by the agricultural protocol; it offers improved financial security, as well as wider, societal benefits; it offers security benefits against stock theft and other crime; it poses a low risk in terms of causing soil degradation; and the loss by occupation is not permanent and land will become available again after the activity ceases.

The proposed development is therefore acceptable from an agricultural impact point of view, and it is recommended that it be approved.

The conclusion of this assessment on the acceptability of the proposed development and the recommendation for its approval is not subject to any conditions other than implementation of the recommended mitigation measures.

11 REFERENCES

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Soil Classification Working Group. 1991. Soil classification: a taxonomic system for South Africa. Soil and Irrigation Research Institute, Department of Agricultural Development, Pretoria.

APPENDIX 1: SPECIALIST CURRICULUM VITAE

Johann Lanz
Curriculum Vitae

Education

M.Sc. (Environmental Geochemistry)	University of Cape Town	1996 - 1997
B.Sc. Agriculture (Soil Science, Chemistry)	University of Stellenbosch	1992 - 1995
BA (English, Environmental & Geographical Science)	University of Cape Town	1989 - 1991
Matric Exemption	Wynberg Boy's High School	1983

Professional work experience

I have been registered as a Professional Natural Scientist (Pri.Sci.Nat.) in the field of soil science since 2012 (registration number 400268/12) and am a member of the Soil Science Society of South Africa.

Soil & Agricultural Consulting **Self employed** **2002 - present**

Within the past 5 years of running my soil and agricultural consulting business, I have completed more than 170 agricultural assessments (EIAs, SEAs, EMPRs) in all 9 provinces for renewable energy, mining, electrical grid infrastructure, urban, and agricultural developments. I was the appointed agricultural specialist for the nation-wide SEAs for wind and solar PV developments, electrical grid infrastructure, and gas pipelines. My regular clients include: Zutari; CSIR; SiVEST; SLR; WSP; Arcus; SRK; Environamics; Royal Haskoning DHV; ABO; Enertrag; WKN-Windcurrent; JG Afrika; Mainstream; Redcap; G7; Mulilo; and Tiptrans. Recent agricultural clients for soil resource evaluations and mapping include Cederberg Wines; Western Cape Department of Agriculture; Vogelfontein Citrus; De Grendel Estate; Zewenwacht Wine Estate; and Goedgedacht Olives.

In 2018 I completed a ground-breaking case study that measured the agricultural impact of existing wind farms in the Eastern Cape.

Soil Science Consultant **Agricultural Consultors International (Tinie du Preez)** **1998 - 2001**

Responsible for providing all aspects of a soil science technical consulting service directly to clients in the wine, fruit and environmental industries all over South Africa, and in Chile, South America.

Contracting Soil Scientist **De Beers Namaqualand Mines** **July 1997 - Jan 1998**

Completed a contract to advise soil rehabilitation and re-vegetation of mined areas.

Publications

- Lanz, J. 2012. Soil health: sustaining Stellenbosch's roots. In: M Swilling, B Sebitosi & R Loots (eds). *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: SunMedia.
- Lanz, J. 2010. Soil health indicators: physical and chemical. *South African Fruit Journal*, April / May 2010 issue.
- Lanz, J. 2009. Soil health constraints. *South African Fruit Journal*, August / September 2009 issue.
- Lanz, J. 2009. Soil carbon research. *AgriProbe*, Department of Agriculture.
- Lanz, J. 2005. Special Report: Soils and wine quality. *Wineland Magazine.*

I am a reviewing scientist for the *South African Journal of Plant and Soil*.

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

APPENDIX 2: DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

THE PROPOSED IMPUMELELO WIND ENEERGY FACILITY NEAR SECUNDA IN MPUMALANGA PROVINCE

Kindly note the following:

- This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
- This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
- A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
- All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
- All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address: Department of Environmental Affairs, Attention: Chief Director: Integrated Environmental Authorisations, Private Bag X447, Pretoria, 0001
Physical address: Department of Environmental Affairs, Attention: Chief Director: Integrated Environmental Authorisations, Environment House, 473 Steve Biko Road, Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	Johann Lanz – Soil Scientist			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Johann Lanz			
Specialist Qualifications:	M.Sc. (Environmental Geochemistry)			
Professional affiliation/registration:	Registered Professional Natural Scientist (Pr.Sci.Nat.) Reg. no. 400268/12 Member of the Soil Science Society of South Africa			
Physical address:	1a Wolfe Street, Wynberg, Cape Town, 7800			
Postal address:	1a Wolfe Street, Wynberg, Cape Town, 7800			
Postal code:	7800	Cell:	082 927 9018	
Telephone:	082 927 9018	Fax:	Who still uses a fax? I don't	
E-mail:	johann@johannlanz.co.za			

2. DECLARATION BY THE SPECIALIST

I, **Johann Lanz**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

Johann Lanz – Soil Scientist (sole proprietor)

Name of Company:

Date 13/01/2023

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, **Johann Lanz**, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

Johann Lanz – Soil Scientist (sole proprietor)

Name of Company

13/01/2023

Date

Signature of the Commissioner of Oaths

Date

SUID-AFRIKAANSE POLISIEDIENS
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STATION WYNBERG
SOUTH AFRICAN POLICE SERVICE

APPENDIX 3: PROJECTS INCLUDED IN CUMULATIVE ASSESSMENT

Table 3**:** Table of all renewable energy applications within a 55 km radius of the proposed development, that were included in the cumulative impact assessment.

DFFE Reference	Project name	Technology	Status	Capacity (MW)
14/12/16/3/3/2/754	Tutuka	Solar	authorised	65.9
12/12/20/2060	Grootvlei	Solar	authorised	75
	Vhuvhili	Solar	proposed	300
14/12/16/3/3/2/315	Farm Heartsease No 420	Solar	authorised	100*
Total		**Solar**		**541**
	Impumelelo	Wind	proposed	200
	Mukondeleli	Wind	proposed	300
Total		**Wind**		**500**
Grand Total				**1041**

* Capacity unknown so have used 100 MW as an estimation.

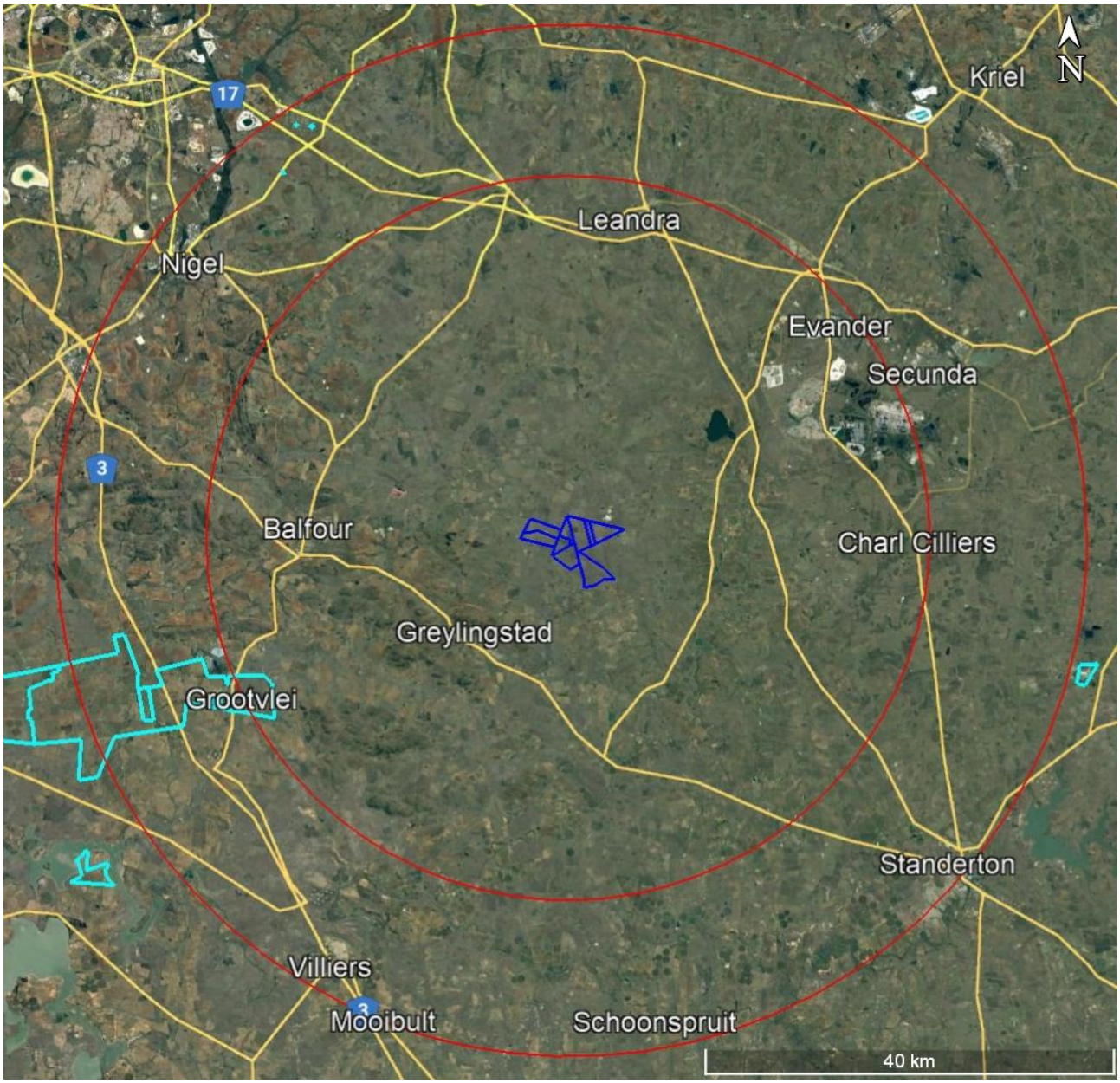

Figure 8. *35 km and 50 km radius around the site showing all renewable energy projects in light blue outline.*

APPENDIX 4: SOIL DATA OF LAND TYPES

Land type	Soil series (forms)	Depth (mm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
Ea20	Ar	300 - 600	45 - 70		so,H	29
Ea20	Ms / Gs / Sd	200 - 300	20 - 30		H,so	11
Ea20	Mw / My	200 - 300	30 - 45		H,so,lc	11
Ea20	Sw	250 - 400	20 - 30	35 - 45	vp	11
Ea20	Av	600 - 900	20 - 30	25 - 40	sp	9
Ea20	Va	250 - 400	20 - 35	40 - 50	vp,gc	7
Ea20	We	300 - 400	20 - 30	35 - 50	sp	6
Ea20	R					5
Ea20	Rg / Wo	400 - 600	30 - 70		gc	4
Ea20	Es	300 - 500	10 - 20	35 - 50	pr	3
Ea20	Ss	250 - 400	15 - 20	35 - 50	pr	3
Ea20	S					1
Ea20	Bo	900 > 1200	30 - 45	30 - 45	so,lc	1

SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

Johan Lanz

Registration Number: 400268/12

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)

Soil Science (Professional Natural Scientist)

Effective **15 August 2012** Expires **31 March 2023**

Botha

Chairperson

Chief Executive Officer

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