



# PROPOSED DEVELOPMENT OF THE BEAUFORT WEST SOLAR PHOTOVOLTAIC ENERGY FACILITY, BEAUFORT WEST, WESTERN CAPE

## SPECIALIST GEOTECHNICAL IMPACT ASSESSMENT REPORT

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**SYNOPSIS**

Desktop geotechnical investigation for the proposed development of the Beaufort West Solar Photovoltaic Energy Facility

**KEY WORDS:**

Geology, engineering geology, Solar PV plant, Subsoils

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**QUALITY VERIFICATION**

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO9001: 2015 which has been independently certified by DEKRA Certification



Verification	Capacity	Name	Signature	Date
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**NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)**

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
1. (1) A specialist report prepared in terms of these Regulations must contain-	Verification Page
a) details of- <ul style="list-style-type: none"> <li>i. the specialist who prepared the report; and</li> <li>ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;</li> </ul>	
b) A declaration that the specialist is independent in a form as may be specified by the competent authority	Appendix C
c) An indication of the scope of, and the purpose for which, the report was prepared;	1
(cA) An indication of the quality and age of base data used for the specialist report;	4, 5, 9
(cB) A description of existing impacts on the site of the proposed development and levels of acceptable change;	Table 3 and 4
d) The date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
e) A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	1
f) Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives	Appendix A, Figure 1, 2a, 2b, 3, 4, 5
g) An identification of any areas to be avoided, including buffers	Appendix A, Figure 1, 2, 3, 4, 5
h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Appendix A, Figure 1, 2a, 2b, 3, 4, 5
i) A description of any assumptions made and any uncertainties or gaps in knowledge	2
j) A description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities	3, 4, 5, 6, 7
k) Any mitigation measures for inclusion in the EMP	8

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# SPECIALIST GEOTECHNICAL IMPACT ASSESSMENT FOR THE PROPOSED BEAUFORT WEST SOLAR PHOTOVOLTAIC ENERGY FACILITY, BEAUFORT WEST, WESTERN CAPE

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## EXECUTIVE SUMMARY

This desktop level study presents the findings concluded for the proposed Beaufort West Solar Photovoltaic (SPV) Energy Facility. The proposed study area receives a relatively low mean annual precipitation of 230mm, with the warmest month being January. The study area is predominantly underlain by the Teekloof Formation of the Beaufort Group, which comprises mudstone, sandstone, thin greenish cherty beds near the base and occasional pink tuff beds with alluvium occurring along river channels. Regional hydrogeological information indicates the presence of a “d3” type, fractured aquifer underlying the site, with median borehole yields in the range of 0.5l/s to 2.0l/s. The desktop study indicates no fatal flaws from a preliminary and geological and geotechnical assessment. The impact of the development from a geotechnical perspective will be restricted to the removal and displacement of soil, boulders and bedrock. The impact assessment matrix impact of the Beaufort West Solar Photovoltaic (PV) Energy Facility was found to be “Negative Low Impact” (The anticipated impact will have minimal negative effects and will require minor mitigation). The site, from a desktop level geotechnical study is considered suitable for the proposed PV plant.



# SPECIALIST GEOTECHNICAL IMPACT ASSESSMENT FOR THE PROPOSED BEAUFORT WEST SOLAR PHOTOVOLTAIC ENERGY FACILITY, BEAUFORT WEST, WESTERN CAPE

## 1 INTRODUCTION

This geotechnical report presents the findings of a desktop study undertaken by JG Afrika (Pty) Ltd, for the proposed construction of the 415MWac Beaufort West SPV Energy Facility near Beaufort West in the Western Cape Province. It is understood that a desktop level geotechnical report is required as part of an environmental submission for an amended basic assessment (BA) report being undertaken by SRK Consulting (Pty) Ltd (SRK). The proposed development is to be located approximately 7km south-east of Beaufort West within the Beaufort West Local Municipality in the Western Cape Province and can be accessed via the N12 National Highway.

The Beaufort West SPV Energy Facility will include the following infrastructure:

- Solar arrays
- A 132/33kV substation (IPP Portion) – stepdown from 132kV to 32kV (~1 Ha)
- A BESS facility that will be located next to the 132/33kV Substation (~4 Ha)
- Internal 33kV lines connecting the substations to the facilities (either underground/above ground)
- An O&M building, construction camp, guard huts and temporary and permanent laydown areas.

### 1.1 Scope of Work

The investigation seeks to give a desktop evaluation of the proposed site focusing on the areas proposed for the construction of the Beaufort West SPV Energy Facility. The objectives of the desktop investigation were to assess the geological and geotechnical conditions across the development area.

This involved a literature review and a review of topographic, geological and hydrogeological maps. Consideration was given to, but not limited to the following from a desktop level:

- The influence of topography on site suitability.
- The envisaged geological and geotechnical influences on the competency of foundations for the construction of structures.
- Tectonic influences on overall stability, namely the presence of faults, lineaments and preferred discontinuity orientations.
- Comments regarding likely founding conditions, geotechnical constraints, problem areas and overall site stability from a desktop level.
- Recommendations regarding requirements for subsequent detailed geotechnical investigations.

The proposed solar PV plant is to be located on the following properties:

- Portion 0 of Farm Oude Volks Kraal No. 164; and



- Portion 0 of Farm Quaggas Fontein No. 166.

## 1.2 Terms of Reference

The appointment to proceed with the investigation is based upon JG Afrika's cost estimate email referenced, "Quotation to Undertake an Update to the Mulilo Beaufort West Solar Energy Facility Geotechnical Impact Assessment Report" dated 16<sup>th</sup> January 2025. JG Afrika received the appointment via a sub-consultancy agreement letter referenced, "20250121\_Subconsultance Agreement\_Jan Norris\_Geotechnical Impact".

## 1.3 Specialist Credentials

Ms. Subrayen is a professionally registered and qualified engineering geologist, attaining a Honours of Science Degree in Engineering Geology, from the University of KwaZulu-Natal (UKZN).

Ms. Subrayen holds the position of Engineering Geologist at JG Afrika's Durban branch. She has experience in the various fields of earth science and ground engineering, namely: engineering geology, geotechnical engineering, environmental geology and geohydrology.

## 1.4 Assessment Methodology

The investigation methodology included a literature review and a review of topographic, geological and hydrogeological maps. Consideration was given to the terrain, geology, hydrogeology and envisaged geotechnical constraints. Based on the results of the desktop study an Environmental Impact Assessment matrix, as provided by SRK Consulting, was completed.

## 1.5 Assumptions, Limitations, Uncertainties - Disclaimer

The interpretation of the overall geotechnical conditions across the site are based on observations and point information acquired from a desktop level. Subsurface and geotechnical conditions intermediate to these have been inferred by extrapolation, interpolation and professional judgement. The information and interpretations are given as a guideline only. There is no guarantee that the information given is totally representative of the entire area in every respect and no responsibility will be accepted for consequences arising out of the fact that actual conditions vary from those inferred.

# 2 TECHNICAL DESCRIPTION

## 2.1 Project Location

The proposed Beaufort West SPV Energy Facility is to be located approximately 7km south-east of town of Beaufort West in the Western Cape province. The site is buffered in the east and west by the R61 and N1 main roads respectively, with access into the study area via the N12 National Highway.

The location of the study area is indicated in Figure 1, **Appendix A**.

## 2.2 Topography and Land Use

The proposed development area is currently vacant with the exception of vegetation and trees (Figure 2a and 2b, **Appendix A**). The topography varies minimally across the site with the elevation ranging from 865 meters above mean sea level (mamsl) in the south-east to 840mamsl in the north-west. A slope category map depicting the topographic variation across the site is shown in Figure 3, **Appendix A**.



## 2.3 Climate

In accordance with the Köppen-Geiger climate classification Beaufort West is considered to be characterised by cold desert climate with a “Bwk” classification and received an average annual precipitation of 204.8mm per annum. The average lowest rainfall is received in July (15mm) and the highest in March (57mm), which is a seasonal variation of 42mm.

The average maximum midday temperature for Beaufort West ranges from 31.7°C in January to 18.0°C in July, which is a seasonal variation of 13.0°C.

Table 1 summarizes the climatic conditions.

*Table 1: Summary of Climatic Conditions, Beaufort West (Source: [www.climatic-data.org](http://www.climatic-data.org))*

Months	Average Rainfall (mm)	Temperature (°C)		
		Maximum	Minimum	Average
January	50	31.7	16.2	24.0
February	52	31.3	16.6	23.8
March	57	28.8	14.8	21.8
April	32	24.7	11.4	18.0
May	20	21.6	8.4	14.8
June	15	18.1	4.9	11.3
July	15	18.0	4.4	11.1
August	21	19.8	5.4	12.6
September	17	23.2	7.7	15.6
October	31	26.2	10.6	18.6
November	38	28.3	12.5	20.5
December	44	30.6	15.0	22.7

According to the regional contour map of climatic N-values for Southern Africa by Weinert (1980), the Weinert N-Value of the study is greater than 10 and is indicative of arid climatic conditions. Weathering of rock material is predominantly by mechanical processes.

## 2.4 Drainage

The proposed Beaufort West SPV Energy Facility is to be located within the J21A quaternary catchment and is anticipated to receive a mean annual precipitation of 230mm per annum over an area of 854m<sup>2</sup>.

The Gamka River, and its tributaries and Droer River are the only major surface drainage features in the immediate vicinity of the development area.

## 2.5 Vegetation

Vegetation in the area is characterised by Great Nama Karoo type shrubland and low fynbos, of the Nama Karoo Biome.

## 3 GEOLOGY

According to the 1: 250 000 scale geological map of Beaufort West (Map Reference 3222) (Council for Geoscience, 2000). The study area is predominantly underlain by mudstone, sandstone, thin



greenish cherty beds near the base and occasional pink tuff beds (Pt) of the Teekloof Formation. Alluvium characterises the river channels and with occasional outcrops of dolerite (Jd) occurring along the north-western and eastern extremities of the site. No structural lineaments in the form of dykes or faults were identified during a review of geological maps and aerial photography.

A geological map is presented as Figure 4, **Appendix A**.

#### 4 HYDROGEOLOGY

According to the 1: 500 000 scaled hydrogeological map series of Beaufort West (Map Reference: 3122). The study area is underlain by a “b3” type fractured aquifer with median borehole yields anticipated to be low to moderate and in the range of 0.5l/ to 2.0l/s. Regional groundwater quality test results indicate an electrical conductivity of between 70mS/m to 300mS/m.

A hydrogeological map is presented as Figure 5, **Appendix A**.

#### 5 ENGINEERING GEOLOGY

According to Brink (1979) the lithological units belonging to the South-western Karoo Basin predominantly underlie the Beaufort West area. Specifically, these include the mudrocks and subordinate sandstones of the Teekloof Formation of the Beaufort Group. Due to the arid climatic conditions the bedrock materials generally weather by mechanical disintegration with the mudrock prone to slaking on exposure to the elements. The sandstones typically breakdown to form granular or gravelly soils. The residual soil horizons are generally of limited thickness and grade into bedrock high up in the soil profile. The mudrock residuum is clayey or silty in nature and prone to swelling and is potentially expansive during changes to the soil's moisture content. The potential expansiveness of these subsoils generally vary from medium to high (Brink, 1979). The residual mudrocks subsoils are likely to be semi or impervious and exhibit a low shear-strength and poor compatibility.

Laboratory indicator tests performed on the residual mudrock subsoils indicate elevated plasticity indices and linear shrinkage values further iterating the probability of medium to high potential expansivity and the susceptibility to shrinkage on desiccation.

In the Beaufort West area, which is a relatively low rainfall region, weathering of the bedrock materials by chemical processes is not as prevalent. As such soluble bases are not leached out of the residual mudrock soil resulting in the formation of expansive clay minerals of which montmorillonite is the most common. This results in the clays exhibiting a medium to high potential expansiveness. Construction within these rock types will therefore likely be affected by changes in the soil's moisture content. Factors such as seepage, the presence of vegetation and the occurrence of human activities will play a key role in the overall behaviour of soil movement. It is therefore recommended that emphasis be placed on the drainage system and structural design if development is to occur in areas underlain by these rock units and that the earthworks being carefully controlled throughout the construction phase. Furthermore, it is advisable that heavier structures be founded on appropriately design foundations and be constructed within competent bedrock horizons. The sandstone residuum does not typically display these clayey and potentially expansive properties.

Due to the variable material properties of alluvial subsoils construction within this horizon should be avoided and developments should be founded deeper in the profile within the more competent bedrock horizons.



## 6 GEOTECHNICAL APPRAISAL

If underlain by residual mudrock subsoils the soil activity may be influenced by the presence of expansive soil conditions while the sandstones will likely be granular or gravelly and will not be significantly expansive. In accordance with Brink (1979) however, the residual soils tend to be shallow and will likely grade into mudrock or sandstone bedrock higher up in the soil profile. Additionally, both the mudrock residuum and bedrock has the ability to undergo shrinkage on desiccation on drying and slaking and degradation upon exposure to the elements.

Competent founding conditions can be anticipated within the mudrock and sandstone horizons. Due to the variable material characteristics of the alluvium, founding within this horizon is not recommended. Additionally, gravelly material from the mudstone, siltstone and shale may not be ideal for construction material. These factors will however have to be assessed during the invasive geotechnical investigation.

## 7 GEOTECHNICAL IMPACT ASSESSMENT MATRIX

From a preliminary geological and geotechnical assessment, no fatal flaws relating to the Beaufort West SPV Energy Facility amended layout have been identified. The impacts identified and the mitigation measures proposed for the authorised layout are applicable to this amendment.

### 7.1 Impacts of the Project from a Geotechnical Perspective and on the Geological Environment

The impact of the development from a geotechnical perspective will be restricted to the removal and displacement of soil, boulders and bedrock referred to in this report as “subsoils”. The levelling of areas to create building platforms will also result in the displacement and exposure of subsoils. These impacts will have a negative visual impact on the environment, which in some cases can be remediated.

The potential impact of the development on the terrain and geological environment, will include the increased potential for soil erosion, caused by construction activities and the removal of vegetation. Areas of concentrated surface flow conditions can be anticipated at the PV plan, resulting in gradual erosion of unconsolidated soil, during the operational life of the facility. This can result in the creation of preferential drainage features, unless remediated through proper engineering design (i.e. stormwater).

Based on the impact assessment matrix undertaken for this project, from a geotechnical perspective the impact of Beaufort West SPV Energy Facility was found to be “Negative Low Impact” (The anticipated impact will have minimal negative effects and will require little mitigation. The assessment impact assessment matrix is presented Table 4 and further details pertaining to the identified impacts and proposed mitigation measures are included in Table 3.

The impact assessment criteria as developed by SRK and is included in **Appendix B**.



Table 2: Geotechnical Impacts Assessment Matrix

Mulilo Beaufort West SPV					
Impact		Construction			
		Without mitigation		With mitigation	
Geotechnical Impacts					
G: The removal of subsoils (soil, rock)	Significance	Low	-3	Very Low	-2
	Extent	Local: Confined to project or study area or part thereof (e.g. site)	1	Local: Confined to project or study area or part thereof (e.g. site)	1
	Intensity	Medium: Functions and processes continue in a modified way	2	Medium: Functions and processes continue in a modified way	2
	Duration	Medium-term (2 to 15 years )	2	Medium-term (2 to 15 years )	2
	Consequence		5		5
	Probability	Probable (> 70% - 90% chance of occurring )	2	Possible (40% - 70% chance of occurring )	1
	Status	Negative	-1	Negative	-1
	Confidence	High		High	

Mulilo Beaufort West SPV					
Impact		Operation			
		Without mitigation		With mitigation	
Geotechnical Impacts					
G: The removal of subsoils (soil, rock)	Significance	Medium	-4	Low	-3
	Extent	Local: Confined to project or study area or part thereof (e.g. site)	1	Local: Confined to project or study area or part thereof (e.g. site)	1
	Intensity	Medium: Functions and processes continue in a modified way	2	Medium: Functions and processes continue in a modified way	2
	Duration	Long-term (>15 years)	3	Long-term (>15 years)	3
	Consequence		6		6
	Probability	Probable (> 70% - 90% chance of occurring )	2	Possible (40% - 70% chance of occurring )	1
	Status	Negative	-1	Negative	-1
	Confidence	High		High	

Mulilo Beaufort West SPV					
Impact		Decommissioning			
		Without mitigation		With mitigation	
Geotechnical Impacts					
G: The removal of subsoils (soil, rock)	Significance	Low	-3	Very Low	-2
	Extent	Local: Confined to project or study area or part thereof (e.g. site)	1	Local: Confined to project or study area or part thereof (e.g. site)	1
	Intensity	Medium: Functions and processes continue in a modified way	2	Medium: Functions and processes continue in a modified way	2
	Duration	Medium-term (2 to 15 years )	2	Medium-term (2 to 15 years )	2
	Consequence		5		5
	Probability	Probable (> 70% - 90% chance of occurring )	2	Possible (40% - 70% chance of occurring )	1
	Status	Negative	-1	Negative	-1
	Confidence	Medium		Medium	





*Table 3: Impacts and Recommended Mitigation Measures*

PHASE	ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	RECOMMENDED MITIGATION MEASURES
<b>CONSTRUCTION PHASE</b>	Removal of subsoils (soil, rock)	Displacement of natural earth material and overlying vegetation. 1) Increase in soil and wind erosion due to clearing of vegetation. 2) Construction and earthmoving vehicles may displace soil during operations. 3) Creation of drainage paths along access tracks. 4) Potential oil spillages from heavy plant. 6) Excessive dust.	Identify protected areas prior to construction. 1) Construction of temporary berms and drainage channels to divert surface water. 2) Minimize earthworks and fills. 3) Use existing road network and access tracks. 4) Rehabilitation of affected areas (such as regrassing, mechanical stabilization). 5) Correct engineering design and construction of gravel roads and water crossings. 6) Correct construction methods for foundation installations. 7) Vehicle repairs to be undertaken in designated areas. 8) Control stormwater flow 9) Dust suppression.
<b>OPERATIONAL PHASE</b>	Removal of subsoils (soil, rock)	Displacement of natural earth material . 1) Increase in soil erosion due to concentrated flow received off hardstand areas. 2) Potential oil spillages from maintenance vehicles. 3) Sedimentation of non-perennial features caused by soil erosion.	1) Use of existing roads and tracks. 2) Rehabilitation of affected areas (such as erosion control mats). 3) Correct engineering design and construction of roads, water crossings and hardstand areas. 4) Vehicle repairs to be undertaken in designated areas. 5) Design of and maintenance of stormwater system.
<b>DECOMMISSIONING PHASE</b>	Removal of subsoils (soil, rock)	Decommissioning of the structure will disturb the geological environment. 1) Increase in soil and wind erosion due to clearance of structures. 2) Construction and earthmoving vehicles will displace the soil. 3) Creation of drainage paths. 4) Potential oil spillages from vehicles. 5) Excessive sediments in non-perennial features.	1) Use of temporary berms and drainage channels to divert surface water during flooding. 2) Minimize earthworks and demolish footprints. 3) Use of existing roads and tracks. 4) Rehabilitation of affected areas (such as regrassing). 5) Develop a chemical spill response plan. 6) Develop dust and demolition fly suppression plan. 7) Vehicle repairs to be undertaken in designated areas. 8) Reinststate channelized drainage features.



## 8 GEOTECHNICAL COMPARATIVE ASSESSMENT

Layout alternatives specifically relating to Fence 4 and the solar arrays within Fence 4 were considered and assessed as part of this geotechnical report. For ease of reference the comparative assessments of alternatives are provided below and shown in Figure 2a and 2b, **Appendix A**.

It should be noted that the Fence 4 and solar array preferred and alternative configurations in both the Preferred and Alternative layouts vary minimally.

### 8.1 FENCE 4

- **Fence 4 Preferred and Alternative (Preferred Layout)**
  - The Fence 4 preferred route encloses PV1 and PV5 and runs along drainage feature that transects the site.
  - The Fence 4 alternative encloses PV1 and PV5 footprints along with the transecting drainage feature.
- **Fence 4 Preferred and Alternative (Alternative Layout)**
  - The Fence 4 preferred route encloses PV1 and PV5 and runs along drainage feature that transects the site. This fenceline extends the PV1 area in a south westerly direction towards the Kwagga River.
  - The Fence 4 alternative encloses PV1 and PV5 footprints along with the transecting drainage feature and extends the PV1 area in a south westerly direction towards the Kwagga River.

### 8.2 SOLAR ARRAYS

- **Solar Arrays Preferred and Alternative (Preferred Layout)**
  - The solar array configuration within PV1 does not extend in a south western direction.
- **Solar Arrays Preferred and Alternative (Alternative Layout)**
  - The solar array configuration within PV1 extends in a south western direction.

*Table 4: Comparative Assessment Criteria*

<b>PREFERRED</b>	The alternative will result in a low impact / reduce the impact / result in a positive impact
<b>FAVOURABLE</b>	The impact will be relatively insignificant
<b>LEAST PREFERRED</b>	The alternative will result in a high impact / increase the impact
<b>NO PREFERENCE</b>	The alternative will result in equal impacts



Table 5: Geotechnical Comparative Assessment of Alternatives

Alternative	Preference	Reasons (incl. potential issues)
<b>Preferred Layout</b>		
Fence 4 and Solar Array (Preferred)	<b>PREFERRED</b>	<ul style="list-style-type: none"> <li>The fence line and solar arrays are underlain by the Teekloof Formation with the south eastern portion underlain by alluvium.</li> <li>The fence line separates PV1, PV5 and runs along the drainage feature crossing where slopes are most shallow and between 0.001 and 4.4%.</li> <li>The fence line and solar arrays will generally be located on shallow slopes of between 0.001 to 21%.</li> </ul>
Fence 4 and Solar Array (Alternative)	<b>FAVOURABLE</b>	<ul style="list-style-type: none"> <li>The fence line and solar arrays are underlain by the Teekloof Formation with the south eastern portion underlain by alluvium.</li> <li>This fence line encloses PV1, PV5 and the drainage feature and crosses the drainage feature to the south west where slopes are generally steeper than 4.4%.</li> <li>The fence and solar arrays will generally be located on shallow slopes of between 0.001 to 21% with minimal earth works. The fence line crosses the drainage feature where slopes are between 4.4 and 11.3%.</li> </ul>
<b>Alternative Layout</b>		
Fence 4 and Solar Array (Preferred)	<b>FAVOURABLE</b>	<ul style="list-style-type: none"> <li>The fence line and solar arrays are underlain by the Teekloof Formation with the south eastern portion underlain by alluvium.</li> <li>This fence line separates PV1, PV5 and runs along the drainage feature and crosses this feature where slopes are shallow at between 0.001 and 4.4%.</li> <li>The fence line enclosing PV1 and the solar arrays extend in a south westerly direction towards the Kwagga River.</li> <li>The fence line and solar arrays are will generally be located on slopes of between 0.001 to 21%.</li> </ul>
Fence 4 and Solar Array (Alternative)	<b>FAVOURABLE</b>	<ul style="list-style-type: none"> <li>The fence line and solar arrays are underlain by the Teekloof Formation with the south eastern portion underlain by alluvium.</li> <li>This fence line separates PV1, PV5 and runs along the drainage feature and crosses this feature where slopes are shallow at between 4.4 and 21%.</li> <li>The fence line enclosing PV1 and the solar arrays extend in a south westerly direction towards the Kwagga River.</li> <li>The fence line and solar arrays are will generally be located on slopes of between 0.001 to 21%.</li> </ul>



Both the preferred and alternative layouts have been assessed and are suitable for development.

## 9 CONCLUSIONS AND RECOMMENDATIONS

The foregoing report presents the findings concluded from a desktop study undertaken for the proposed Beaufort West SPV Energy Facility.

**No fatal flaws** from a geotechnical perspective were identified during this desktop study. The conclusions presented in this report will have to be more accurately confirmed during the detailed geotechnical investigation phase. The impact of the SPV facility was generally found to be “Negative Low Impact” and will require little minimal mitigation. The site, from a desktop level geotechnical study, is considered suitable for the proposed Beaufort West SPV Energy Facility.

It recommended that a detailed geotechnical investigation be undertaken during the detailed design phase of the project. The detailed geotechnical investigation must entail the following:

- The profiling and sampling of exploratory trial pits to determine founding conditions for the substations and powerline infrastructure;
- Thermal resistivity and electrical resistivity geophysical testing for electrical design and ground earthing requirements;
- Groundwater sampling of existing boreholes to establish a baseline of the groundwater quality for construction purposes.

### 9.1 Impact Statement

**No fatal flaws** from a geotechnical perspective were identified during this desktop study. The conclusions presented in this report will have to be more accurately confirmed during the detailed geotechnical investigation phase. The impact of the SPV facility and associated infrastructure was generally found to be “Negative Low Impact” (The anticipated impact will have minor negative effects and will require minimal mitigation). The site, from a desktop level geotechnical study, is considered suitable for the proposed Beaufort West SPV Energy Facility.

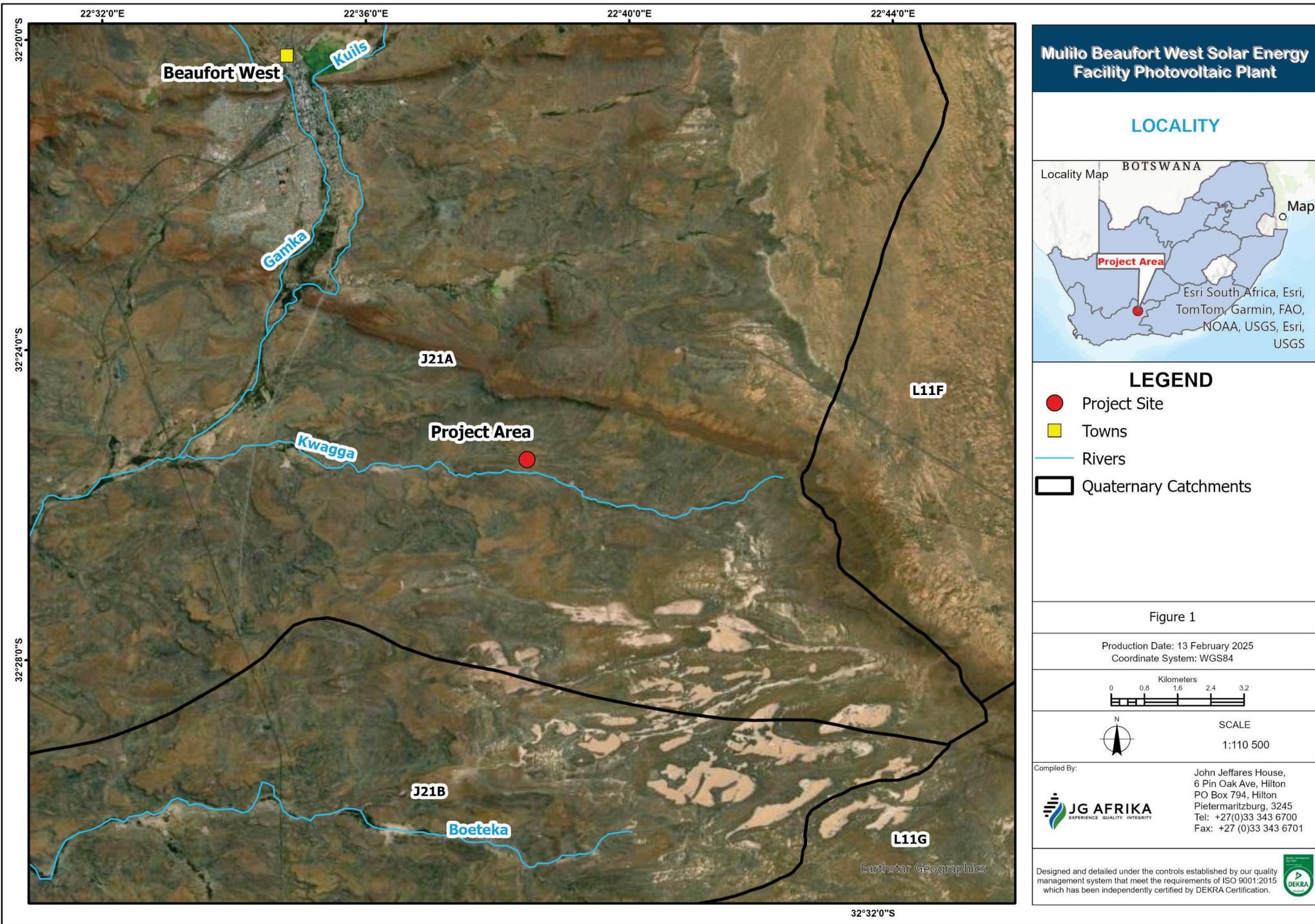
## 10 SELECTED BIBLIOGRAPHY

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- Climatic Data, Beaufort West. Accessed October 2022 from: <https://en.climate-data.org>
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- 1: 250 000 Geological Map Series (3222 Beaufort West). Published by the Council of Geoscience (2000).
- 1: 3 000 000 Groundwater Harvest Potential of the Republic of South Africa. Published by the Department of Water Affairs and Forestry.



## *Appendix A: Figures*







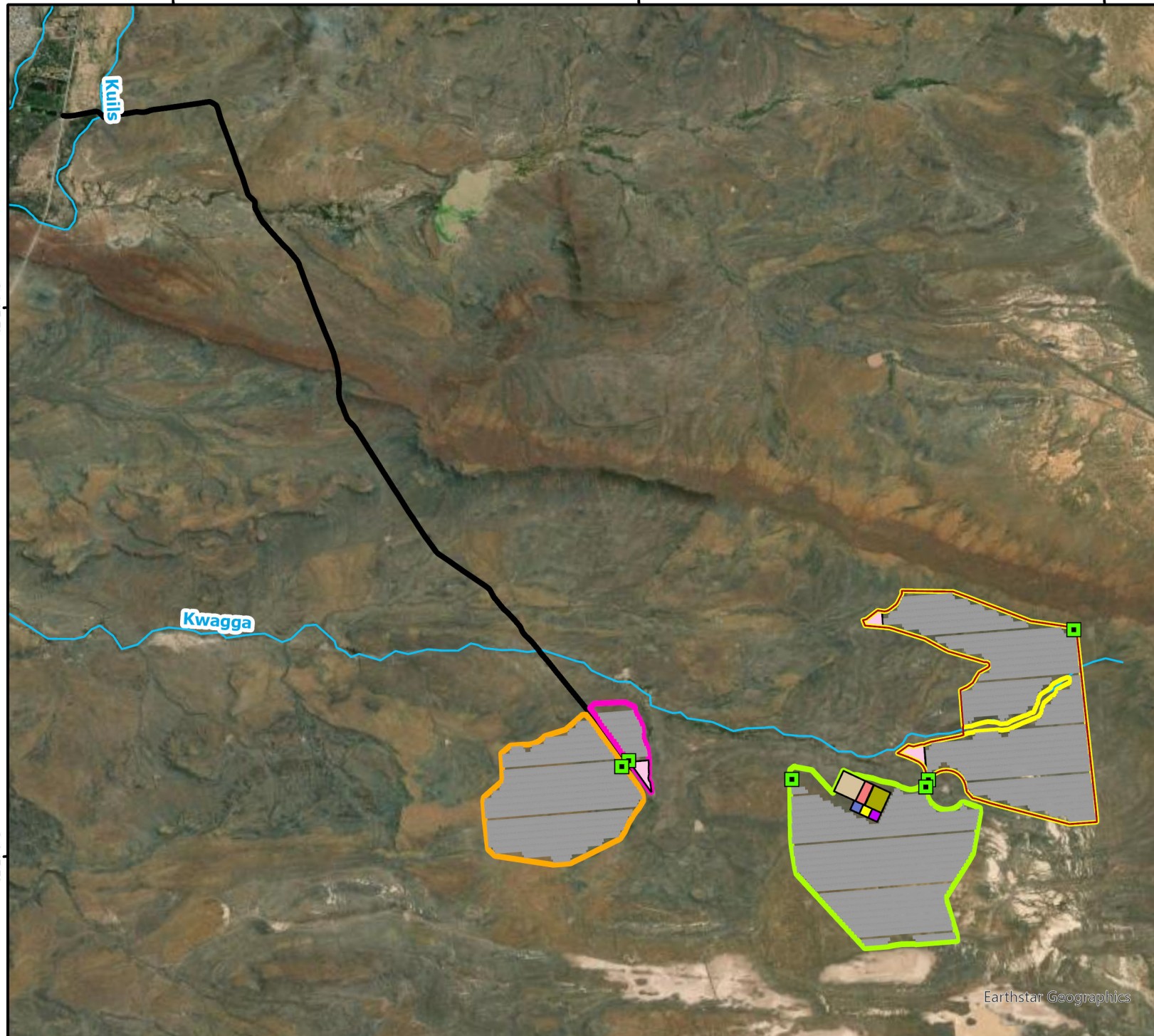
22°36'0"E

22°39'0"E

22°42'0"E

32°24'0"S

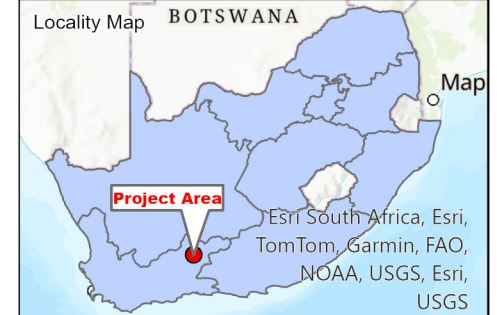
32°27'0"S



Earthstar Geographics

## Mulilo Beaufort West Solar Energy Facility Photovoltaic Plant

### SITE PLAN- PREFERRED LAYOUT

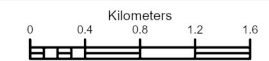


### LEGEND

- |                         |                             |
|-------------------------|-----------------------------|
| BESS Area               | Existing Road               |
| Laydown Area            | Civil Fence 1               |
| Laydown Area-Satellite  | Civil Fence 2               |
| O&M Buildings           | Civil Fence 3               |
| Eskom Switching Station | Civil Fence 4 (Preferred)   |
| Construction Camp       | Civil Fence 4 (Alternative) |
| IPP Substation          | Rivers                      |
| Solar Arrays            |                             |
| Security Hut            |                             |

Figure 2a

Production Date: 13 February 2025  
Coordinate System: WGS84



SCALE  
1:55 000

Compiled By:



John Jeffares House,  
6 Pin Oak Ave, Hilton  
PO Box 794, Hilton  
Pietermaritzburg, 3245  
Tel: +27(0)33 343 6700  
Fax: +27 (0)33 343 6701

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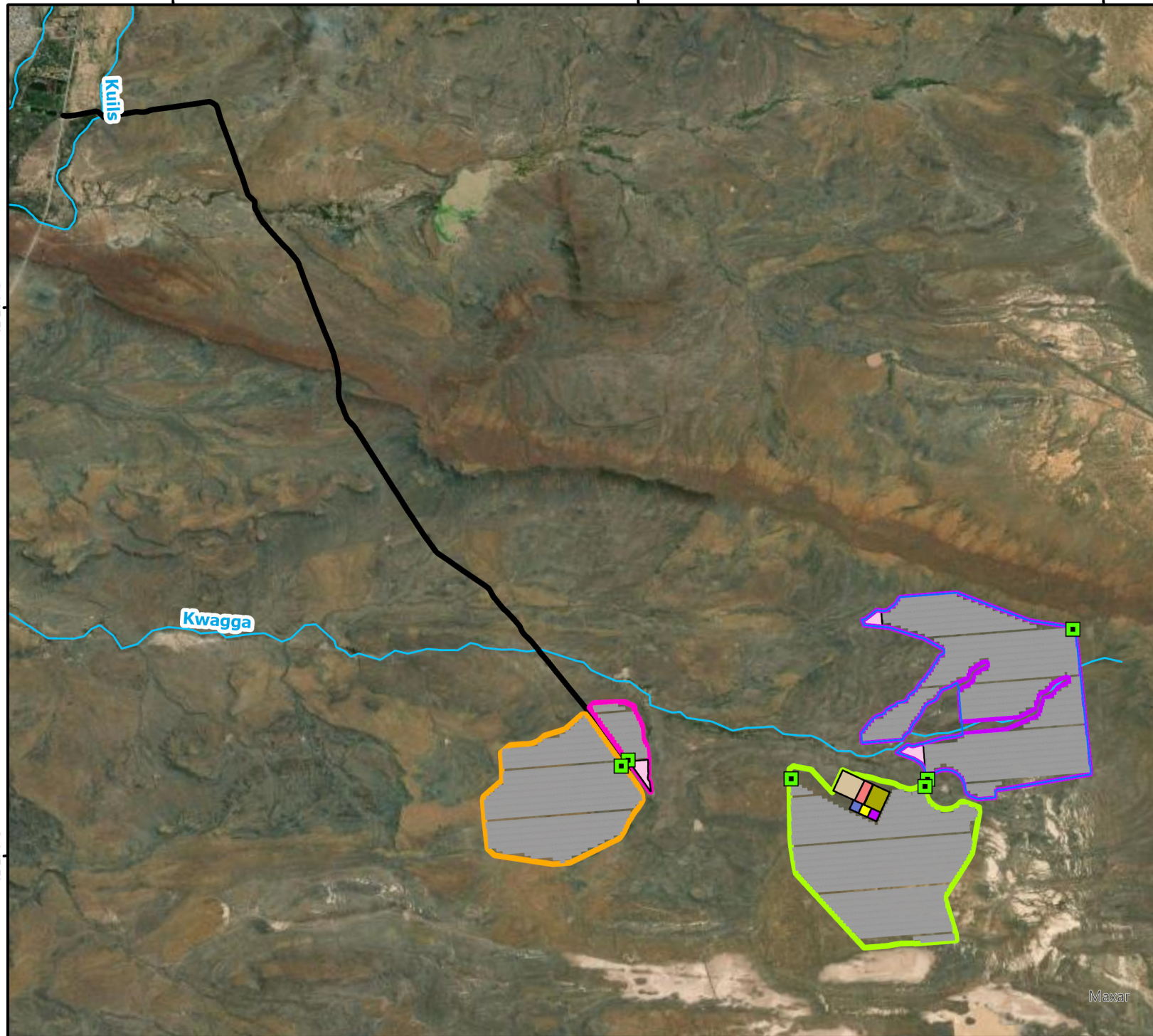
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22°42'0"E

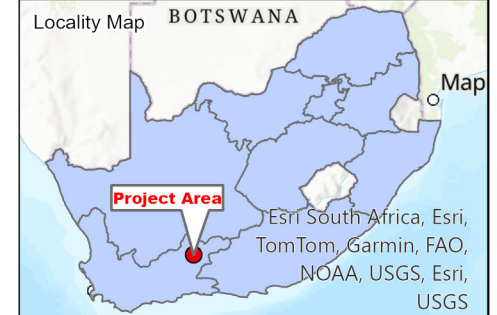
32°24'0"S

32°27'0"S



## Mulilo Beaufort West Solar Energy Facility Photovoltaic Plant

### SITE PLAN- ALTERNATIVE LAYOUT

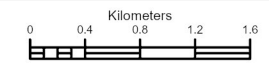


### LEGEND

- |                         |                             |
|-------------------------|-----------------------------|
| BESS Area               | Existing Road               |
| Laydown Area            | Civil Fence 1               |
| Laydown Area-Satellite  | Civil Fence 2               |
| O&M Buildings           | Civil Fence 3               |
| Eskom Switching Station | Civil Fence 4 (Preferred)   |
| Construction Camp       | Civil Fence 4 (Alternative) |
| IPP Substation          | Rivers                      |
| Solar Arrays            |                             |
| Security Hut            |                             |

Figure 2b

Production Date: 13 February 2025  
Coordinate System: WGS84



SCALE  
1:55 000

Compiled By:



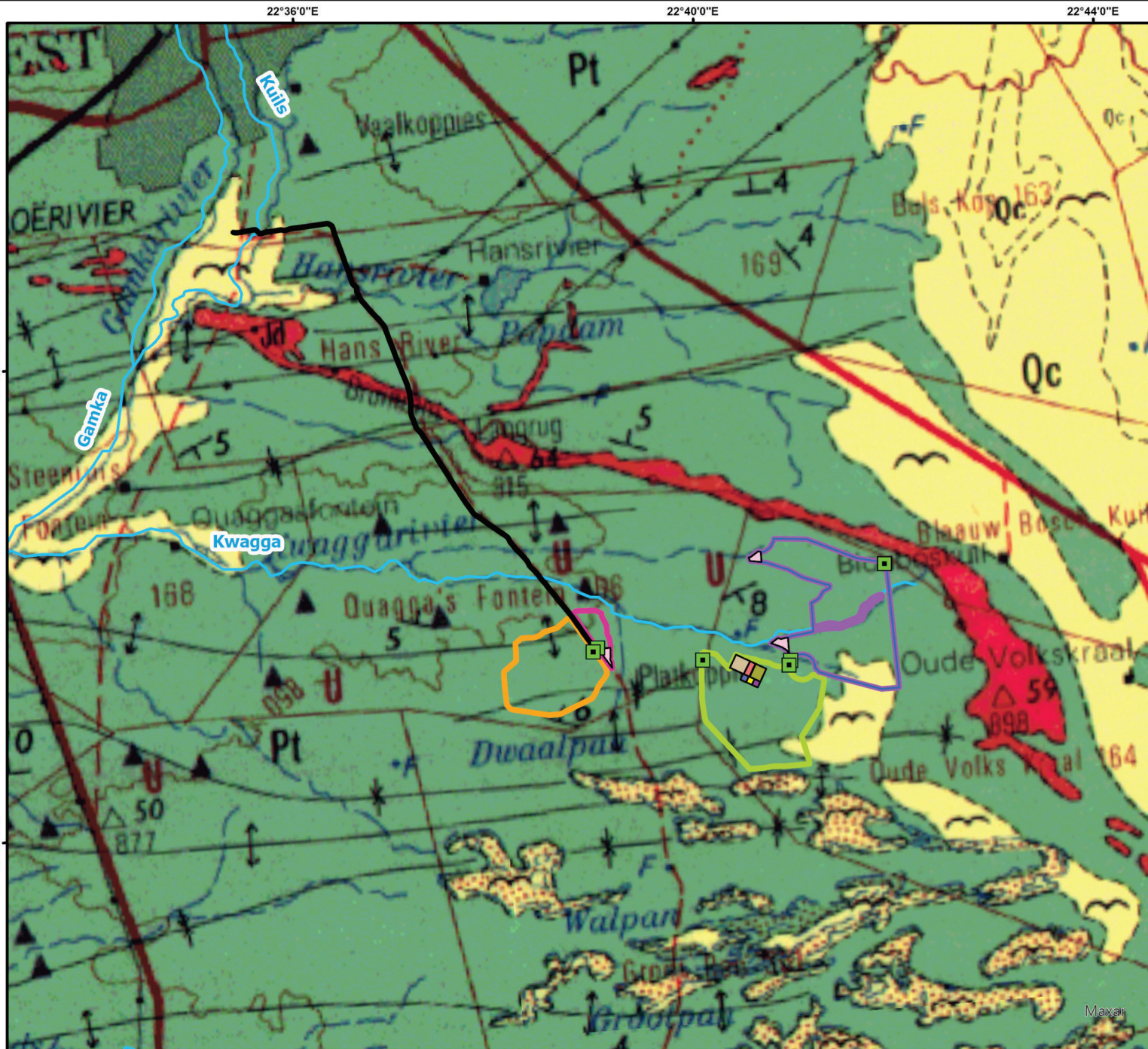
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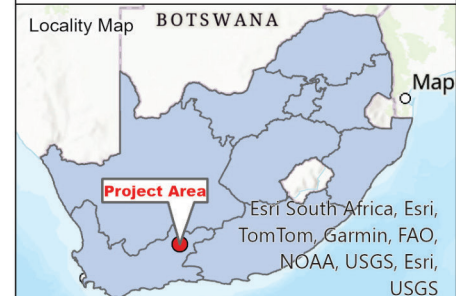
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## Mulilo Beaufort West Solar Energy Facility Photovoltaic Plant

### GEOLOGY



### LEGEND

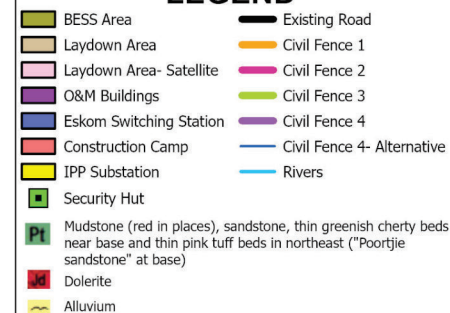


Figure 3

Production Date: 13 February 2025  
Coordinate System: WGS84



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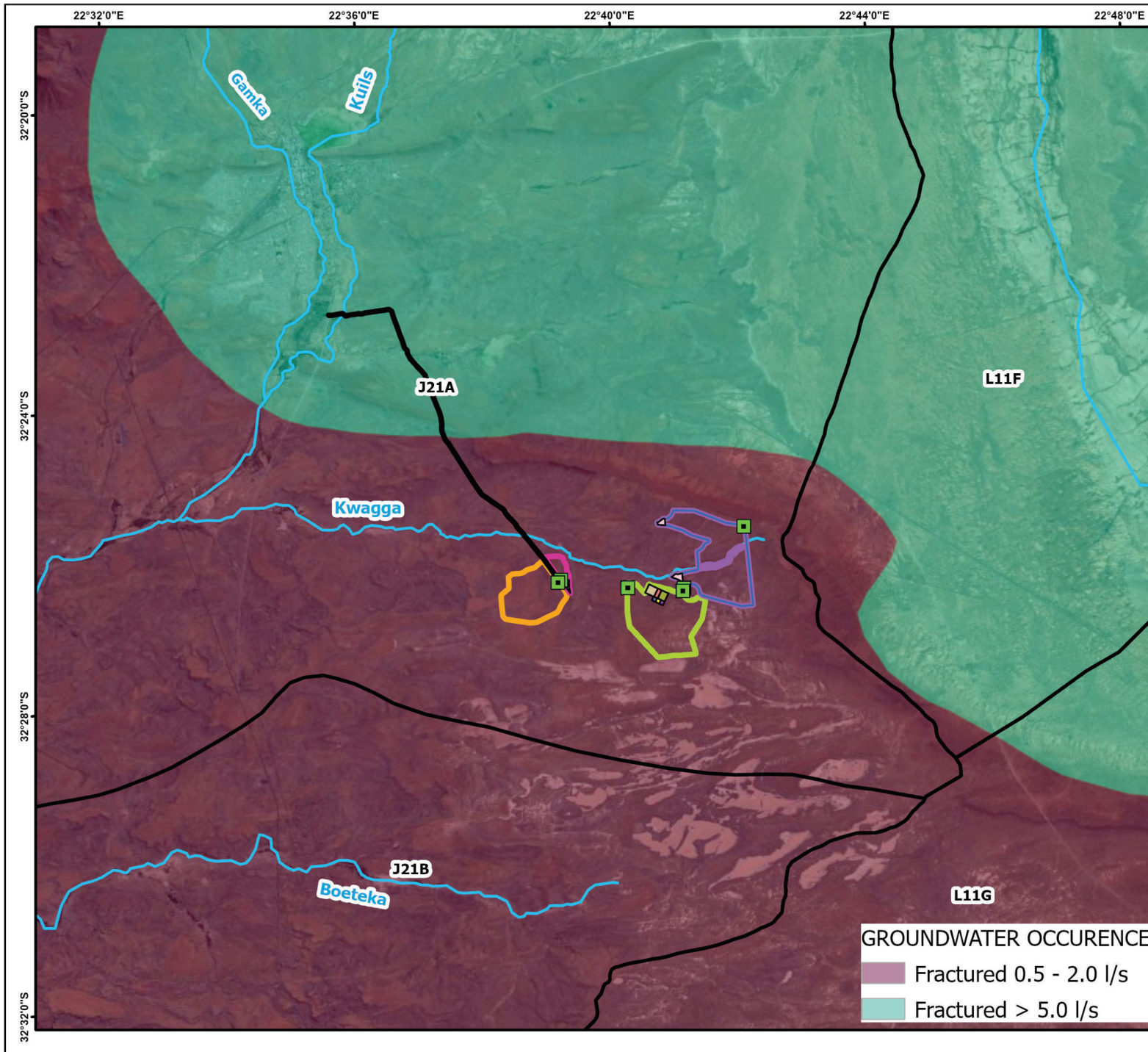


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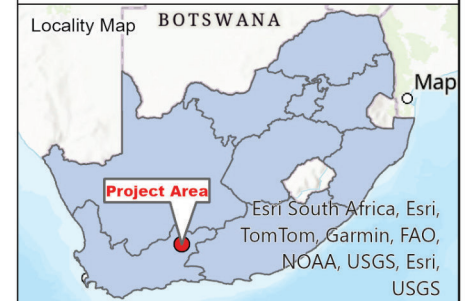






## Mulilo Beaufort West Solar Energy Facility Photovoltaic Plant

### HYDROGEOLOGY

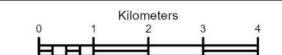


### LEGEND

- |                         |                           |
|-------------------------|---------------------------|
| BESS Area               | Existing Road             |
| Laydown Area            | Civil Fence 1             |
| Laydown Area-Satellite  | Civil Fence 2             |
| O&M Buildings           | Civil Fence 3             |
| Eskom Switching Station | Civil Fence 4             |
| Construction Camp       | Civil Fence 4-Alternative |
| IPP Substation          | Rivers                    |
| Security Hut            |                           |

Figure 4

Production Date: 13 February 2025  
Coordinate System: WGS84



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1:130 000

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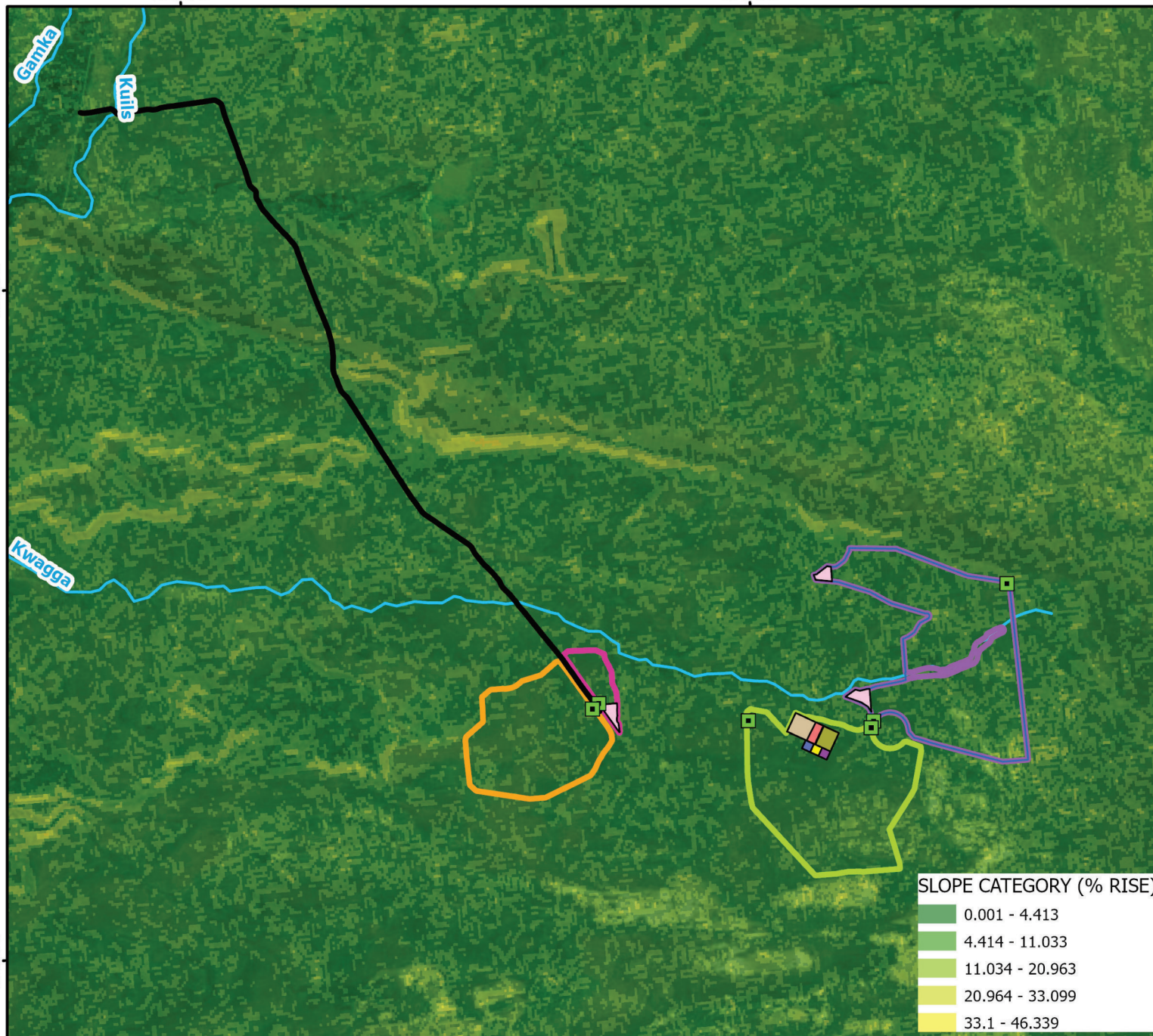


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22°40'0"E

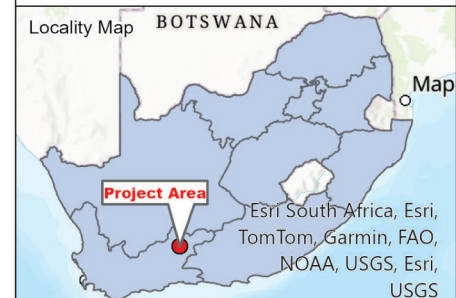
32°24'0"S

32°28'0"S



## Mulilo Beaufort West Solar Energy Facility Photovoltaic Plant

### SLOPE

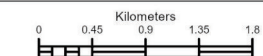


### LEGEND



Figure 5

Production Date: 13 February 2025  
Coordinate System: WGS84



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## *Appendix B: SRK Impact Assessment Methodology*

# 1 Impact Rating Methodology

The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring, including possible irreversibility of impacts and/or loss of irreplaceable resources, and the **probability** that the impact will occur.

The criteria used to determine impact consequence are presented in Table 1-1 below.

**Table 1-1: Criteria used to determine the consequence of the impact**

Rating	Definition of Rating	Score
<b>A. Extent</b> – the area over which the impact will be experienced		
Local	Confined to project or adjacent areas	1
Regional	Affecting the region (e.g. District Municipality or Province)	2
(Inter) national	Affecting areas beyond the Province	3
<b>B. Intensity</b> – the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered and/or irreplaceable resources <sup>1</sup> are lost	3
<b>C. Duration</b> – the timeframe over which the impact will be reversed		
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years or irreversible	3

The combined score of these three criteria corresponds to a **Consequence Rating**, as follows:

**Table 1-2: Method used to determine the consequence score**

Combined Score (A+B+C)	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

Once the consequence is derived, the probability of the impact occurring is considered, using the probability classifications presented in Table 1-3 below.

**Table 1-3: Probability classification**

<b>Probability</b> – the likelihood of the impact occurring	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall **significance** of impacts is determined by considering consequence and probability using the rating system prescribed in Table 1-4 below.

---

<sup>1</sup> Defined as important cultural or biological resource which occur nowhere else, and for which there are no substitutes.



**Table 1-4: Impact significance ratings**

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	INSIGNIFICANT	INSIGNIFICANT	VERY LOW	VERY LOW
	Low	VERY LOW	VERY LOW	LOW	LOW
	Medium	LOW	LOW	MEDIUM	MEDIUM
	High	MEDIUM	MEDIUM	HIGH	HIGH
	Very High	HIGH	HIGH	VERY HIGH	VERY HIGH

Finally the impacts are also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in Table 1-5 below.

**Table 1-5: Impact status and confidence classification**

<i>Status of impact</i>	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
<i>Confidence of assessment</i>	
The degree of confidence in predictions based on available information, SRK's judgment and/or specialist knowledge.	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **Insignificant:** the potential impact is negligible and will not have an influence on the decision regarding the proposed activity.
- **Very Low:** the potential impact is very small and should not have any meaningful influence on the decision regarding the proposed activity.
- **Low:** the potential impact may not have any meaningful influence on the decision regarding the proposed activity.
- **Medium:** the potential impact should influence the decision regarding the proposed activity.
- **High:** the potential impact will affect the decision regarding the proposed activity.
- **Very High:** The proposed activity should only be approved under special circumstances.

Practicable mitigation and optimisation measures are recommended and impacts are rated in the prescribed way both without and with the assumed effective implementation of mitigation and optimisation measures. Mitigation and optimisation measures are either:

- **Essential:** measures that must be implemented and are non-negotiable; and
- **Best Practice:** recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the proponent if not implemented.



## *Appendix C: Specialist's CV and Specialist Declaration*



## PRIANTHA SUBRAYEN (MOONSAMY)

### Summary

Priantha is a professionally registered natural scientist with the South African Council for Natural Scientific Professions. She currently occupies the position of Engineering Geologist at JG Afrika and has a combined 8 years of experience in the fields of Geotechnical Engineering and Groundwater. She currently has a BSc Honours in Engineering Geology from the University of KwaZulu-Natal and a Higher Certificate in Advanced Project Management from the University of Cape Town.

A part of both the Geotechnical and Groundwater Divisions in JG Afrika she has experience in Engineering Geology, Renewable Energy, Geohydrology, Water Quality Analysis and Auditing and Geographical Information Systems (GIS). Experience has also been obtained in compilation of contract documentation, tenders and cost estimates.

Apart from numerous projects in South Africa, Priantha also has also been involved in projects in Mozambique and Lesotho.

### Professional Registrations & Institute Memberships

<b>PrSciNat</b>	Registered with the South African Council of Natural. Scientific Professions - Registration No 400066/16
<b>NHBRC</b>	Certified Competent Person with National Home Builders Registration Council.
<b>GAKZN</b>	Member of the Groundwater Association of KwaZulu-Natal.

### Education

<b>2010</b>	BSc (Geological Sciences) – University of KwaZulu-Natal
<b>2011</b>	BSc (Hons) (Environmental and Engineering Geology) – University of KwaZulu-Natal.
<b>2011</b>	Higher Certificate Advanced Project Management – University of Cape Town.

#### Profession

Engineering Geologist

#### Position in Firm

Engineering Geologist

#### Area of Specialisation

Geotechnical Engineering and Groundwater

#### Qualifications

BSc Honours Engineering Geology

#### Years of Experience

8 Years

#### Years with Firm

6.5 Years





## Specific Experience

---

### JG Afrika (Pty) Ltd

#### 2022 – Current

**Position** – Engineering Geologist/ Geohydrologist (Groundwater)

**Hydra B Resistivity Survey** – Resistivity surveys for nine solar energy facilities in the Northern Cape. Client: AfriCoast Investments (Pty) Ltd.

**Western Cape DLG Groundwater Supply Project** – Geohydrological investigations for groundwater supply to various municipalities in the Western Cape Province. Client: Western Cape Department of Local Governance.

**ERWAT Water Quality Auditing** – Water quality compliance auditing for various water treatment facilities in Gauteng. Client: ERWAT.

**OR Tambo Borehole Programme** – Geohydrological investigations for groundwater supply to various local municipalities in the OR Tambo District Municipality. Client: SZC Consulting an Isilimela Project Managers JV.

**La Lucia Mall Groundwater Supply Project** – Geohydrological Investigation for groundwater harvesting at the La Lucia Mall in KwaZulu-Natal. Client: GrowthPoint.

**National Water Balance Perspectives** – A determination of the groundwater availability for various catchments in South Africa using ArcGIS, AFYM, NIWIS AND GRA2 recharge data. Client: Department of Water and Sanitation.

**Zambia Aquifer Mapping** – Aquifer mapping using ArcGIS to generate a groundwater recharge tool for Zambia. Client: OneWorld.

**Wessels Mine Geohydrological Investigation and Waste Classification** – Geohydrological Investigation for the Wessels Mine in the Northern Cape. Client: South 32.

**City of Cape Town** – Water Quality interpretation at City of Cape Town Landfill Sites and reporting including GIS mapping and interpretation. Client: City of Cape Town.

**USAID Resilient Waters Programme** – Geohydrological Investigation for the Twickenham/ Der Brochen and Amandenbult Villages in the North West including desktop and feasibility reporting. Client: Tshikululu Investments and Anglo American.

**Kwangoza High School** - Geohydrological Investigation for water supply to the Kwangoza High School including GIS mapping and feasibility reporting. Client: PCU Consultants.

**Orasecom Water Quality Monitoring System** – Establishment of basin wide transboundary resource quality objectives. Client: Ground Truth.

**Upper Orange Reserve Determination Study** – A reserve determination study for the Upper Orange Catchment including reporting and GIS mapping. Client: GroundTruth.

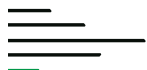
**Fish to Tsitsikamma Reserve Determination Study** - A reserve determination study for the Fish to Tsitsikamma Catchment including reporting and GIS mapping. Client: GroundTruth.

**Specialist Desktop Geotechnical Assessments for Renewable Energy Facilities** – Site Sensitivity Verification assessment and Geotechnical Impact Assessment for the Mayogi PV Facility including GIS mapping. Client: SiVest

**Specialist Geotechnical Investigation (NHBC Site Classifications)** – A determination of the appropriate founding depth and foundation type for single storey structures residential developments. Client: Gates Estate

**Specialist Desktop Geotechnical Assessments for Renewable Energy Facilities** – Site Sensitivity Verification assessment and Geotechnical Impact Assessment for the Kareebosch OHPL and WEF including GIS mapping. Client: WSP

**Specialist Desktop Geotechnical Assessments for Renewable Energy Facilities** – Geotechnical Verification for the Brandvalley WEF. Client: Terramanzi (Pty) Ltd.





**Pre-Feasibility Geotechnical Investigation** – Pre-feasibility, desktop geotechnical investigation for the Hendrina OHPL. Client: Enertrag.

**Geotechnical Investigation (Bridges)** – Deep invasive geotechnical investigation and GIS mapping for the Mhlali River Bridge. Client: MNA Engineers.

**Geotechnical Investigation (Elevated Tank)** – Invasive geotechnical investigation for the Toyota Elevated Water Tank and GIS mapping. Client: MNA Engineers.

**Geotechnical Investigation (Light Structures)** – Invasive geotechnical investigation for the South32 filtration plant, internal road and culvert. Client: JG Afrika (Water Department).

**Geotechnical Investigation (NHBRC Site Classifications)** – A determination of the appropriate founding depth and foundation type for single storey structures residential developments including site class designation and GIS mapping. Client: Gates Estate.

### JG Afrika (Pty) Ltd

2013 – 2016

**Position** – Engineering Geologist (Geotechnical Engineering)

**Lesotho Highlands Phase II Water Project** – Information database management, site data analysis, interpretation and compilation, reporting. Client: Lesotho Highlands Development Authority.

**Geotechnical Investigations (Quarry Rock Mass Ratings Determination – Afrimat Quarries)** – Slope stability and rock quality assessments at various Afrimat Quarries in KwaZulu-Natal. Client: Afrimat.

**Geotechnical Investigations (Single Storey Structures)** – A determination of the appropriate founding depth and foundation type for single storey structures. These included residential developments, multi-purpose buildings and poultry farm sheds. Client: Various.

**Geotechnical Investigations (Irrigation Schemes and Related Infrastructure)** – Shallow site investigations to determine the suitability of a site for various irrigation scheme infrastructure, including pipes, reservoirs and pump stations. Client: Various.

**Geotechnical Investigations (Industrial Developments)** – Shallow geotechnical investigations for small and large scale industrial developments, to determine the founding depths and appropriate foundation types for various heavily loaded industrial structures. Client: Various.

**Geotechnical Investigations (Cemetery Site Selection)** – Shallow geotechnical investigations to determine site suitability for the development of a cemetery and related infrastructure. Client: Msunduzi Municipality.

**Geotechnical Investigations (Roads and Related Infrastructure)** – Road centreline investigations for the upgrade of lightly to moderately trafficked roads, borrow pit evaluation and bridge and culvert foundation assessments. Client: Naidu Consulting (Pty) Ltd.

**Geotechnical Investigations (Low-Cost Housing Developments)** – Shallow geotechnical investigations and NHBRC site classifications for numerous low-cost housing developments within South Africa. Client: Various.

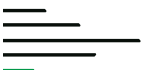
### SRK Consulting (Pty) Ltd

2012 – 2013

**Position** – Junior Engineering Geologist (Geotechnical Engineering)

**Geotechnical Investigations (Multi- Storey Structures)** – Small scale, deep geotechnical investigations for multi-storey buildings in Pietermaritzburg. Client: Msunduzi Municipality.

**Geotechnical Investigations (Roads and Related Infrastructure)** – Road centreline investigations, borrow pit evaluation and culvert and over-topping structure founding condition inspections. Client: Naidu Consulting (Pty) Ltd.





**Geotechnical Investigations (Low-Cost Housing Developments)** – Shallow geotechnical investigations and site classifications for numerous low-cost housing developments within South Africa. Client: various.

**Geotechnical Investigations (Heavily Loaded Structures -Vopak Tank Storage Farm)** – Deep geotechnical investigations to determine the suitability of the site and founding conditions for tank storage reservoirs within the Richards Bay Port: Vopak.

**Mutamba Titanium Dioxide Feedstock Project** – CPT Monitoring and evaluation, mineral resource estimation and orebody modelling. Client: RioTinto.

## Continued Professional Development

---

### COURSES

- |             |  |
|-------------|--|
| <b>2012</b> | LeapFrog Geo   |
| <b>2013</b> | SAIEG Soil, Rock and Chip Logging                          |
| <b>2014</b> | Kaytech Engineered Fabrics - Introduction to Geosynthetics |

## Personal Details

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**Nationality** – South African

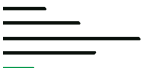
**Date of Birth** – 1989-12-20

**Domicile** – Durban, South Africa

### Languages

English – Excellent

Afrikaans – Good





**herewith certifies that**

**Priantha Moonsamy**

Registration Number: 400066/16

**is a registered scientist**

in terms of section 20(3) of the Natural Scientific Professions Act, 2003  
(Act 27 of 2003)

in the following field(s) of practice (Schedule 1 of the Act)

Earth Science (Professional Natural Scientist)

Effective **9 March 2016**

Expires **31 March 2025**



A handwritten signature in black ink, likely belonging to the Chairperson.

Chairperson

A handwritten signature in black ink, likely belonging to the Chief Executive Officer.

Chief Executive Officer





## environmental affairs

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA

### DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

File Reference Number:	(For official use only)
NEAS Reference Number:	DEA/EIA/
Date Received:	

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

Beaufort West Solar Energy Facility Photovoltaic Plant

#### Kindly note the following:

1. 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.
2. 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>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. 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.
5. 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](mailto:EIAAdmin@environment.gov.za)

## 1. SPECIALIST INFORMATION

Specialist Company Name:	JG Afrika (Pty) Ltd		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	1	Percentage Procurement recognition
Specialist name:	Priantha Subrayen		
Specialist Qualifications:	BSc. Honours (Engineering Geology)		
Professional affiliation/registration:	SACNASP (40066/16)		
Physical address:	6 Pin Oak Avenue, Hilton, 3201		
Postal address:	PO Box 794, Hilton, 3245		
Postal code:	3201	Cell:	074 473 6439
Telephone:	033 343 6700	Fax:	033 343 6701
E-mail:	subrayenp@jgafrika.com		

## 2. DECLARATION BY THE SPECIALIST

I, Priantha Subrayen, 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

JG Afrika (Pty) Ltd

Name of Company:

24/02/2025

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

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

*P Subrayen*

Signature of the Specialist

JG Afrika (Pty) Ltd

Name of Company

24/02/2025

Date

*DJBurgin*

Signature of the Commissioner of Oaths

COMMISSIONER OF OATHS  
DAWN JANET BURGIN  
9/1/8/2 (R/O) KZN (PIETERMARITZBURG)  
6 PIN OAK AVENUE, HILTON

24/02/2025

Date