SERVICES REPORT

FOR

RENEWABLE ENERGY GENERATION PROJECT ON THE FARM RHODES 269 KURUMAN RD

RHODES 2 SOLAR PARK

May 2016 - rev.2

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Project No : 215/25

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1 INTRODUCTION

GMH/Tswelelo Consulting Engineers of Thabazimbi have been appointed as consulting engineers for the roads and civil services to the proposed **Rhodes 2 Solar Park.** The client is **Miko Energy (Pty) Ltd**. The solar park is to be developed on the central part of the **Farm Rhodes 269, Kuruman Registration Division**, 1810.8314 hectares in extent. The property is located in the Joe Morolong Local Municipality, part of the John Taolo Gaetsewe District Municipality in the Northern Cape Province of South Africa. The site is located 7 km North of Hotazel and 50 km North of Kathu. The property is currently being used for grazing purposes. This report sets out the methodology for the provision of civil services to the proposed development.

As indicated in the Locality Map attached to this report, the Rhodes 2 Solar Park may deliver the electrical energy either:

a) To the Eskom Hotazel substation, 5.5 km south of the project site, via a new 132 kV power line approximately 6.5 km long and running parallel to the existing Eskom "Hotazel - Heuningvlei" 132 kV power line (alternative connection 1) within a corridor of ±6,5 km long up to the already approved power line corridor (DEA Ref. No. 14/12/16/3/3/1/1426) of the East Power Line related to the approved East Solar Park (DEA Ref. No. 14/12/16/3/3/2/664); or

b) To the new Eskom Umtu substation, ±8.5 km south-west of the project site, via a new 132 kV power line approximately 11,5 km long and running parallel to the existing Eskom "Hotazel - Heuningvlei" 132 kV power line (for 5.3 km) and to the Eskom "Hotazel - Umtu" 132 kV power line (for ±6.2 km) (alternative connection 2). Not yet approved.

2 INTERNAL ROADS

It is proposed that gravel roads be constructed as required to access the PV power plant. The development will be contained inside a security area and the roads are not intended for public use.

2.1 Existing Roads

Very few roads exist on the development area. The existing roads consist of informal basic farm tracks traversing the area. These roads are typical of the roads used for farming purposes.

2.2 Access to the Project Site and Proposed Road Layout

The PV power plant is to be located on the central part of the Farm Rhodes 269, Kuruman Registration Division east of the Eskom "Hotazel - Heuningvlei" 132 kV power line that crosses the property. The footprint (fenced area) of the proposed development is approximately 210 ha.

Access to the PV plant will be from the secondary road (connecting to the R31) running along the Eastern boundary of the Farm Rhodes 269. A new access road, approximately 200m long and running at right angles to the Secondary Road heading towards the R31 - will link the secondary road to the proposed development area.

The proposed internal roads are indicated in ochre on the proposed layout plan attached to this report. All internal roads are to be gravel roads.

2.3 Typical Road Design

The internal roads will be designed with sufficient structural capacity in order to withstand the expected traffic loading required for the construction and maintenance of the PV power plant. It is proposed that these roads be constructed to a maximum width of 8.0m, which will allow slow moving heavy vehicles to pass each other. The road pavement will consist of roadbed preparation, fill where required, and a wearing course.

Due to the fact that all accessible material on site are not suitable for use in the roads, roads will have to be at least partially constructed using material imported from a local mine. The roadbed needs to be impact rolled in order to remove residual collapse potential while the wearing course will benefit from the mixing in of gravel material to create aggregate interlock.

The roads are expected to take minimal traffic once the solar farm is in operation and will mainly then be used for maintenance and inspections.

The central part of the property (where the development area is planned to be located) is underlain by a plain land facet with a gentle undulating to flat topography with a gradient of 1.5%. The average elevation is 1035 m amsl, with the lowest point 1030 m amsl and the highest point 1041 m amsl. The western portion of the property consist of undulating vegetated dunes with a elevation difference of 8 m over 250 m.

The vertical alignment of the roads will therefore not present any significant challenges due to the flatness of the terrain and no deep cuts or fills will be required. Considering a road pavement thickness of 200 mm (wearing course) and an overall road surface approximately 100,000 m^2, the amount of imported material or fill is estimated to be approximately 12 000 m^3 based on the assumption that 60% of the wearing course will consist of imported material. Cut to fill quantities will be negligible.

Further items of earthworks would be required where temporary storage areas will be prepared for the storage of the photovoltaic modules and other equipment during construction of the solar park. Small earthworks terraces will be required for the installation of the medium-voltage stations, warehouse, control building and on-site high-voltage substation. None of these activities should require earthworks in excess of 500 mm cut or fill (the footprint will be up to 4000 m^2). In particular, it should be noted that the PV modules installation will not require earthworks, due to the flatness of the site.

Underground cables will be laid down along the internal roads.

Most of the site is characterized by microphyllous woodland that varies in density and species composition. No major drainage features occur on site, although the Kuruman and Gamagara Rivers occur to the north and west of the site, respectively. The planned footprint (approximately 210 ha) will be cleared from the existing shrubs and vegetation.

2.4 Road Building Materials

The deep sandy soils present on site is not suitable for use as aggregate for road construction. Discard material from the nearby manganese mines can be used for roads. Other aggregates should be sourced from commercial suppliers in the area. The soil is also non expansive but collapse potential exists due to the very low densities of the in situ materials.

3 STORMWATER DESIGN

The permeability of the sand is high, so the rainfall penetrates the soil readily. Sheet wash do occur along preferred flow path but the water sinks into the ground after some distance. No pans or wetland areas were identified on site. Sub surface drainage is expected to occur towards the Gamagara River.

Given the low rainfall, flat topography and low flow speed of run-off, no formal storm water structures are required as the proposed gravel roads will be developed at ground level so as not to disturb the natural flow of storm water. This means that run-off will not be concentrated and the existing drainage patterns will be left undisturbed.

4 WATER RETICULATION

A Geo-Hydrological Study was conducted in order to assess the water availability on the property.

As indicated in the Report, two boreholes are located on the property. At the present time the landowner uses the boreholes as a source of water for game and cattle. One borehole is located close to the homestead and will not be available for the project; the second borehole is located in the south eastern corner of the farm.

The Geo-Technical and Geo-Hydrological Study concluded that, should water for the project be sourced by means of groundwater abstraction, a new borehole should be drilled, as the existing on-site borehole is not suitable due to the low yield and poor water quality. It is recommended that the fractured rock aquifer located below the Kalahari sediments be targeted at depths between 80 and 120 m below surface as a source of water for the project. In this case, a Water Use License application would have be submitted to the Department of Water Affairs by Miko Energy.

Alternatively (preferred alternative - under investigation by Miko Energy) water can be sourced from the Vaal Gamagara Pipeline, which runs close to the project site.

The water required during the 15 months construction phase can be summarised as follows:

- water is required for the compaction of earthworks relating to the project. The surface area of the proposed gravel roads come to 164 400 m^2 and the water use is expected to be 50 l/m^2.
- The average number of workers expected to be employed on site during construction is 160, each of which is expected to require 50 litres of water per day over 15 months (330 working days).

It is possible that the connection agreement with Eskom may require a shorter construction period. For example, in the case where the construction works are planned to last only 6 months(132 working days), the average number of workers required on site during construction will be 400. Therefore, water consumption for sanitary use will be:

- 160 people x 50 l/person x 330 working days = 2 640 m^3 over 15 months, or:
- 400 people x 50 l/person x 132 working days = 2 640 m^3 over 6 months.
- Water will also be required for the production of concrete. The overall volume of concrete to be cast is 24 000 m^3, which will require 200l of water per m^3.
- The water requirement for the cleaning of vehicles and plant is expected to be negligible.

The overall water usage can be summarised as follows:

WATER REQUIREMENT DURING THE CONSTRUCTION PHASE		
DESCRIPTION	UNIT	TOTAL
Time frame of the construction activities	*months*	up to 15
Overall water consumption for internal roads	m^3	8 220
Overall water consumption for sanitary and other uses (over 330 working days)	m^3	2 640
Overall water consumption for concrete production	m^3	4 800
TOTAL WATER CONSUMPTION	***m^3***	**15 660**

After the construction phase, the water consumption will drop dramatically. Water will mainly be used for sanitary purposes by the core team on site, and for cleaning of the PV panels. It is expected that 25 persons will be on site during the daytime, and only 4 persons will be on site overnight. Assuming an average water consumption of 150 l/person/day, the 29 persons will require 4 350 l/day. The cleaning of the solar panels will be done twice a year when 1 litre of water will be required per m^2 of PV panel surface. 1 360 m^3 of water will be used for each cleaning cycle, which will last approximately two weeks (12 working days). Therefore, the overall water consumption for cleaning activities will be of 2 640 m^3/year (two cleaning cycles per annum).

The water consumption will increase from 4 350 l/day to 114 350 l/day only during the days when the solar panel cleaning is done (110 000 l/day for cleaning activity and 4 350 l/day for sanitary use). The PV modules are conceived as self-cleaning with rain, but it is possible that cleaning as set out above will be required during some years. It is proposed that 90 000l be stored on site in a reservoir for emergencies (like fire), and to tide the development over when pumps or water mains are maintained or repaired.

The water consumption during the operational phase can be summarised as follows:

WATER REQUIREMENT DURING THE OPERATIONAL PHASE		
DESCRIPTION	UNIT	TOTAL
Average daily water consumption for sanitary use	*l/day*	4 800
Average daily water consumption during cleaning activity (*)	*l/day*	110 000
Average monthly water consumption for sanitary use	*l/month*	130 500
Annual water consumption for sanitary use	***m^3/year***	**1 566**
Annual water consumption for PV modules cleaning cycles	***m^3/year***	**2 640**
ANNUAL WATER CONSUMPTION	***m^3/year***	**4 206**
DAILY WATER CONSUMPTION (average over 365 days)	***m^3/day***	**11.52**

(*) over 12 working days, twice per year

The water requirement during both the construction and operational phase of the proposed development is relatively low and it is expected that sufficient water will be available to serve the long term needs of the development.

4.1 Methodology of Water Reticulation

Potable water will be reticulated using HDPE water mains. In the case of groundwater abstraction, water will be pumped from the new on-site borehole by means of water mains. Water from this borehole will be used to fill storage tanks (proposed capacity of 90 000l) to be used for fire-fighting and purposes as set out above.

4.2 Fire Fighting Requirements

Fire will need to be contained over the whole of the property and it is therefore proposed that 90kl of water be stored on site. It is further proposed that suitable vehicle mounted water tanks suitably fitted with water pumps be available for this purpose, and that competent fire breaks be constructed and maintained. The "fire team" will be composed by the people for general maintenance, who will attend a comprehensive fire-fighting training program. After this training programme, the fire team will be able to drive/use/manage properly the fire-fighting equipment that will be available on the site. Firebreaks will be provided and maintained around the planned footprint. Firebreaks should comply with the National Veldt and Forest Fire Act, 1998 (Chapter 4: Duty to Prepare and maintain firebreaks).

5 SEWER RETICULATION/SYSTEM

It is foreseen that the sewer reticulation will be handled by the patented and commercially available Ballam Waterslot(or similar) sewer treatment system. The sewer system will therefore consist of an installation to serve the office in the control building. It is foreseen that the system will be installed in line with the requirements of the manufacturer. Most typical systems consist in essence of a conservancy tank (built underground on site), and a patented digester. Most systems require electricity to power the pumps and fans used in aeration process, although some systems use wind power (whirlybird). The only other item worth noting is the fact that some systems could require chlorine tablets available commercially, but systems where effluent is treated with ozone (like the Ballam Waterslot system) is getting more common and affordable.

The effluent from these systems will be suitable for irrigation of the vegetation buffer zone, or re-use in the offices as water for the flushing of toilets, or for fire fighting purposes. This will reduce the overall water requirement of the development substantially.

6 ELECTRICAL CONNECTION

Electricity is available in the site and it is expected that a suitable connection can be applied for, in order to meet the internal consumption of the solar park (offices in the control building, lighting and video-surveillance systems, electrical devices on stand-by during the night, etc.).

7 REFUSE REMOVAL

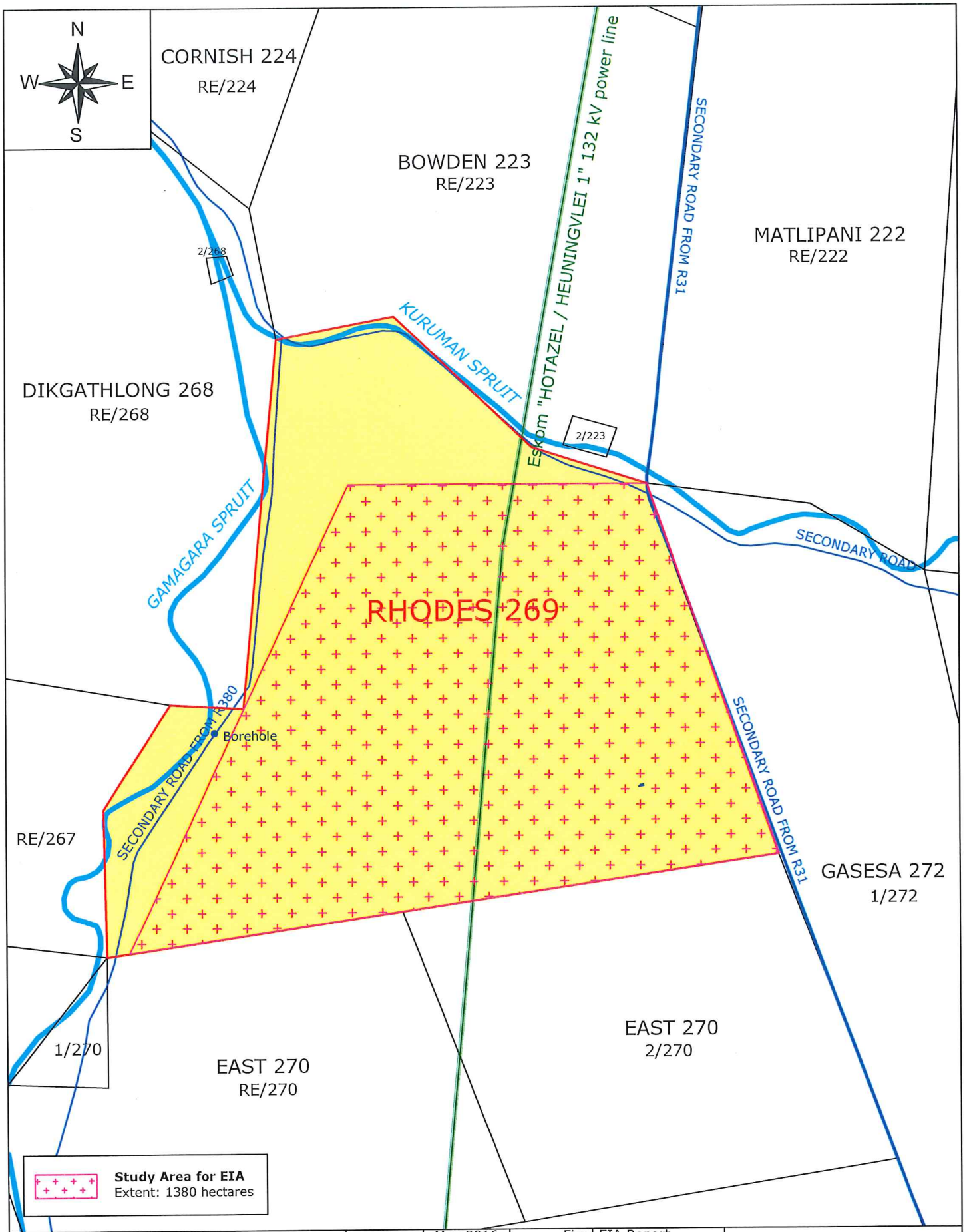
It is foreseen that an agreement will be entered into with the Joe Morolong Local Municipality for accepting refuse from the solar farm. This refuse shall be transported to the appropriate site by the developer. It is not proposed that any refuse be buried or incinerated on site.

8 SUMMARY

We believe that adoption of the abovementioned proposals will result in acceptable and sustainable civil engineering services to be available to the proposed Rhodes 2 Renewable Energy Generation Project.

.....xxxxx.....

LOCALITY MAP AND CONNECTION ALTERNATIVES



FARM RHODES 269 Kuruman RD
Joe Morolong Local Municipality
John Taolo Gaetsewe District Municipality
Northern Cape Province
LPI code:C041000000002690000
Extent: 1,810.8314 hectares
27° 08' 00" S ; 22° 57' 45" E

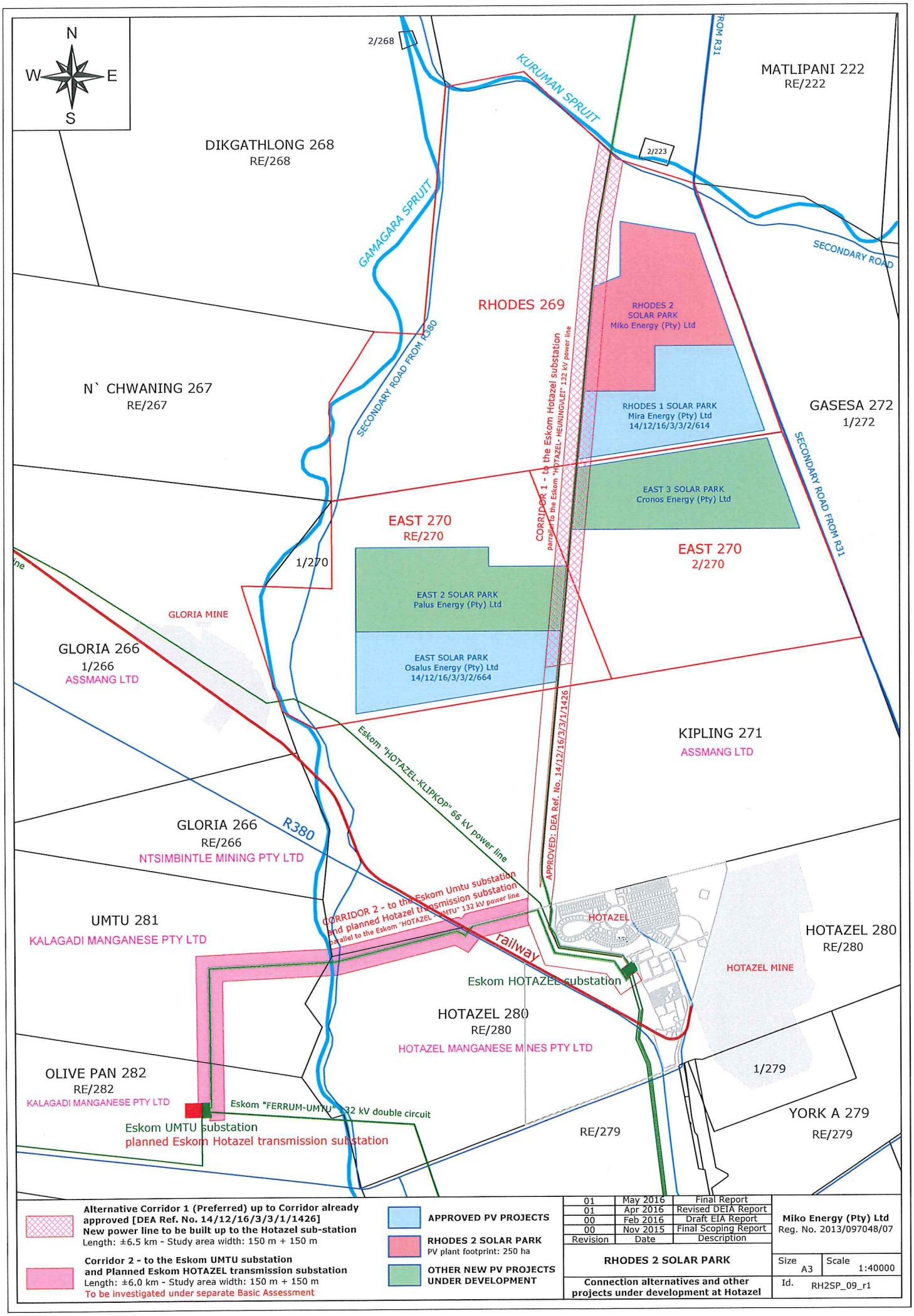
Revision	Date	Description
00	May 2016	Final EIA Report
00	April 2016	Revised Draft EIA Report
00	Febr 2016	Draft EIA Report
00	Nov 2015	Final Scoping Report

RHODES 2 SOLAR PARK

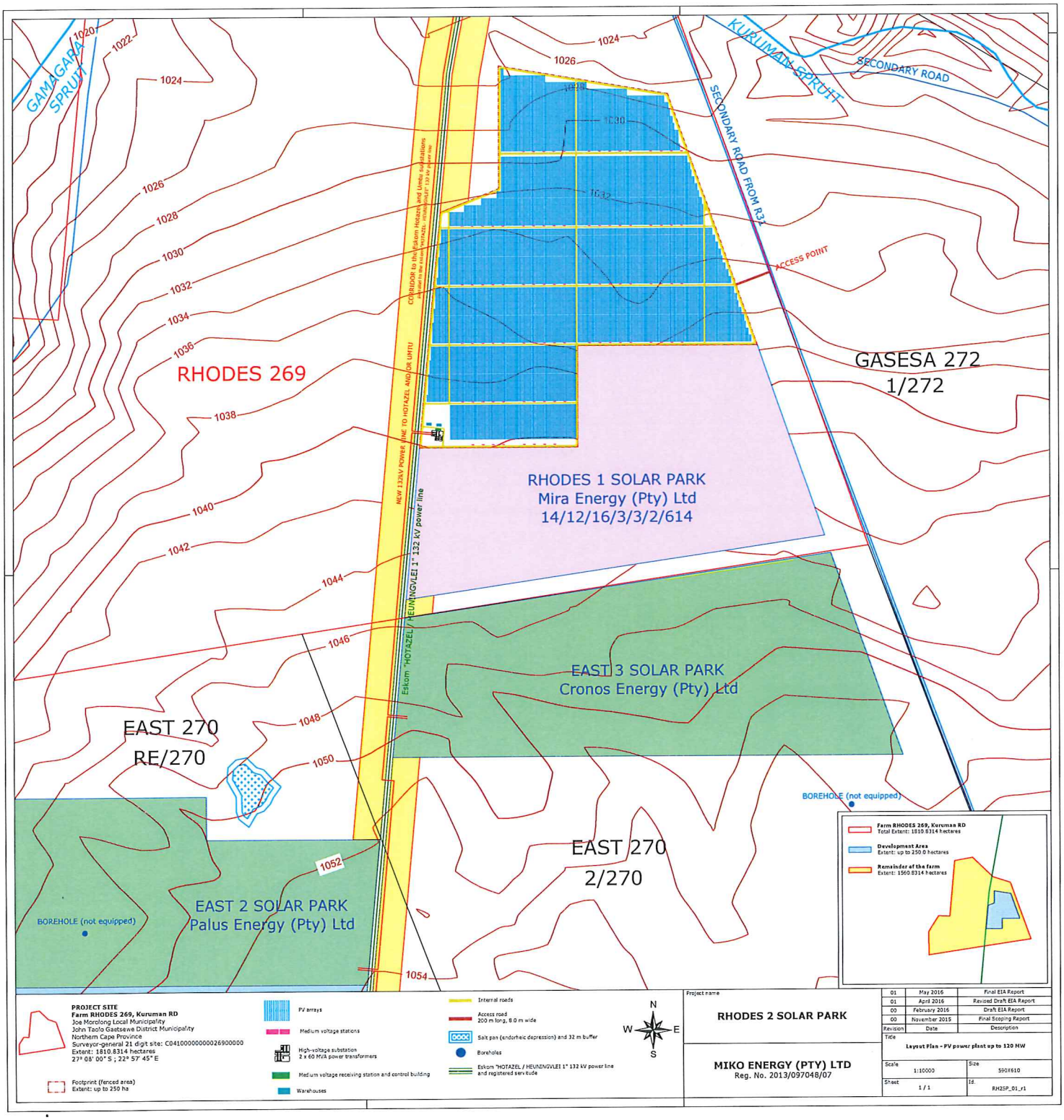
LOCALITY MAP AND STUDY AREA FOR EIA

MIKO ENERGY (PTY) LTD
Registration No: 2013/097048/07

Scale 1:40000
Size A4
Sheet 1 / 1
Id. RH2SP_00.1_r0


N
W
E
S
2/268
KURUMAN SPRUIT
FROM R31
MATLIPANI 222
RE/222
DIKGATHLONG 268
RE/268
2/223
GAMAGARA SPRUIT
SECONDARY ROAD
RHODES 269
RHODES 2
SOLAR PARK
Miko Energy (Pty) Ltd
RHODES 1 SOLAR PARK
Mira Energy (Pty) Ltd
14/12/16/3/3/2/614
SECONDARY ROAD FROM R380
CORRIDOR 1 - to the Eskom Hotazel substation
parrallel to the Eskom "HOTAZEL- HEUNINGVLEI" 132 kV power line
N` CHWANING 267
RE/267
GASESA 272
1/272
EAST 3 SOLAR PARK
Cronos Energy (Pty) Ltd
SECONDARY ROAD FROM R31
EAST 270
RE/270
EAST 270
2/270
1/270
EAST 2 SOLAR PARK
Palus Energy (Pty) Ltd
GLORIA MINE
EAST SOLAR PARK
Osalus Energy (Pty) Ltd
14/12/16/3/3/2/664
GLORIA 266
1/266
ASSMANG LTD
KIPLING 271
ASSMANG LTD
Eskom "HOTAZEL-KLIPKOP" 66 kV power line
APPROVED: DEA Ref. No. 14/12/16/3/3/1/1426
GLORIA 266
RE/266
NTSIMBINTLE MINING PTY LTD
R380
UMTU 281
KALAGADI MANGANESE PTY LTD
CORRIDOR 2 - to the Eskom Umtu substation
and planned Hotazel transmission substation
parallel to the Eskom "HOTAZEL - UMTU" 132 kV power line
HOTAZEL
railway
HOTAZEL 280
RE/280
HOTAZEL MINE
Eskom HOTAZEL substation
HOTAZEL 280
RE/280
HOTAZEL MANGANESE MINES PTY LTD
1/279
OLIVE PAN 282
RE/282
KALAGADI MANGANESE PTY LTD
Eskom "FERRUM-UMTU" 132 kV double circuit
YORK A 279
RE/279
Eskom UMTU substation
planned Eskom Hotazel transmission substation
RE/279
Alternative Corridor 1 (Preferred) up to Corridor already approved [DEA Ref. No. 14/12/16/3/3/1/1426]
New power line to be built up to the Hotazel sub-station
Length: ±6.5 km - Study area width: 150 m + 150 m
Corridor 2 - to the Eskom UMTU substation and Planned Eskom HOTAZEL transmission substation
Length: ±6.0 km - Study area width: 150 m + 150 m
To be investigated under separate Basic Assessment
APPROVED PV PROJECTS
RHODES 2 SOLAR PARK
PV plant footprint: 250 ha
OTHER NEW PV PROJECTS UNDER DEVELOPMENT
Revision | Date | Description
01 | May 2016 | Final Report
01 | Apr 2016 | Revised DEIA Report
00 | Feb 2016 | Draft EIA Report
00 | Nov 2015 | Final Scoping Report
RHODES 2 SOLAR PARK
Connection alternatives and other projects under development at Hotazel
Miko Energy (Pty) Ltd
Reg. No. 2013/097048/07
Size A3
Scale 1:40000
Id. RH2SP_09_r1

PROPOSED LAYOUT OF THE RHODES 2 SOLAR PARK
PV Power Plant up to 120 MW


GAMAGARA SPRUIT
KURUMAN SPRUIT
SECONDARY ROAD
SECONDARY ROAD FROM R31
ACCESS POINT
CORRIDOR to the Eskom Hotazel and Umtu substations
NEW 132kV POWER LINE TO HOTAZEL AND/OR UMTU
Eskom "HOTAZEL / HEUNINGVLEI 1" 132 KV power line
RHODES 269
GASESA 272
1/272
RHODES 1 SOLAR PARK
Mira Energy (Pty) Ltd
14/12/16/3/3/2/614
EAST 3 SOLAR PARK
Cronos Energy (Pty) Ltd
EAST 270
RE/270
EAST 270
2/270
EAST 2 SOLAR PARK
Palus Energy (Pty) Ltd
BOREHOLE (not equipped)
BOREHOLE (not equipped)
1020
1022
1024
1026
1028
1030
1032
1034
1036
1038
1040
1042
1044
1046
1048
1050
1052
1054
Farm RHODES 269, Kuruman RD
Total Extent: 1810.8314 hectares
Development Area
Extent: up to 250.0 hectares
Remainder of the farm
Extent: 1560.8314 hectares
PROJECT SITE
Farm RHODES 269, Kuruman RD
Joe Morolong Local Municipality
John Taolo Gaetsewe District Municipality
Northern Cape Province
Surveyor-general 21 digit site: C0410000000026900000
Extent: 1810.8314 hectares
27° 08' 00" S ; 22° 57' 45" E
Footprint (fenced area)
Extent: up to 250 ha
PV arrays
Medium voltage stations
High-voltage substation
2 x 60 MVA power transformers
Medium voltage receiving station and control building
Warehouses
Internal roads
Access road
200 m long, 8.0 m wide
Salt pan (endorheic depression) and 32 m buffer
Boreholes
Eskom "HOTAZEL / HEUNINGVLEI 1" 132 kV power line
and registered servitude
N
W
E
S
Project name
RHODES 2 SOLAR PARK
MIKO ENERGY (PTY) LTD
Reg. No. 2013/097048/07
01 May 2016 Final EIA Report
01 April 2016 Revised Draft EIA Report
00 February 2016 Draft EIA Report
00 November 2015 Final Scoping Report
Revision Date Description
Title
Layout Plan - PV power plant up to 120 MW
Scale 1:10000
Size 590X610
Sheet 1 / 1
Id. RH25P_01_r1