PROPOSED STEYNSRUS PHOTOVOLTAIC SOLAR ENERGY FACILITY

Remainder of the Farm Kleindeel No. 1342, Remainder of the Farm Arbeid No. 2154, and Remainder of the Farm Weltevrede No. 2151, Free State Province

VISUAL IMPACT ASSESSMENT

Prepared as part of a Basic Assessment Process undertaken in terms of the National Environmental Management Act, 107 of 1998

8 AUGUST 2013

PROJECT NO: VIA_301112.SA

Produced for:

SunCorp

On behalf of:

Savannah Environmental (Pty) Ltd.

Produced by:

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1 INTRODUCTION

1.1 Background and Purpose of Report

Messrs SunCorp proposes to establish a commercial photovoltaic (PV) solar energy facility as well as associated infrastructure on a site approximately 2.5km north of Steynsrus in the Free State Province. Based on a pre-feasibility analysis and site identification, favourable areas have been identified for consideration and evaluation through a Basic Assessment process. The latter process was undertaken during December 2012 where four site alternatives were considered and assessed. This report specifically deals on the preferred site alternative, namely Option 1.

This Visual Impact Assessment (VIA) is undertaken as part of the Basic Assessment (BA) process being facilitated by Savannah Environmental (Pty) Ltd. in terms of the National Environmental Management Act 107 of 1998 (NEMA). As such, the purpose of this report is to assess the proposed activity for the site(s) in terms of the *Guidelines for Involving Visual and Aesthetic Specialists in the EIA Process* and the *NEMA EIA Regulations of 2010*.

1.2 Components of the Report

The aspects addressed in this report are as follows:

a) Description of the methodology adopted in preparing the report.
b) Description of the receiving environment.
c) Description of the view catchment area, view corridors, viewpoints and receptors.
d) Identification and evaluation of potential visual impacts associated with the proposed activity and the alternatives identified, by using the established criteria, including potential lighting impacts at night.
e) Identification in terms of best practical environmental option in terms of visual impact.
f) Addressing of additional issues such as:
    - Impact on skyline.
    - Negative visual impact.
    - Impact on aesthetic quality and character of place.
g) Assumptions made and uncertainties or gaps in knowledge.
h) Recommendations in respect of mitigation measures that should be considered by the applicant and competent authority.

1.3 Study Methodology

As stated previously, this VIA was undertaken in accordance with the *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes*, as issued by the Western

Cape Government's Department of Environmental Affairs and Development Planning during 2005[1].

The VIA was undertaken in distinct steps, each of which informed the subsequent steps. The figure below summarises the methodology adopted for undertaking the assessment.

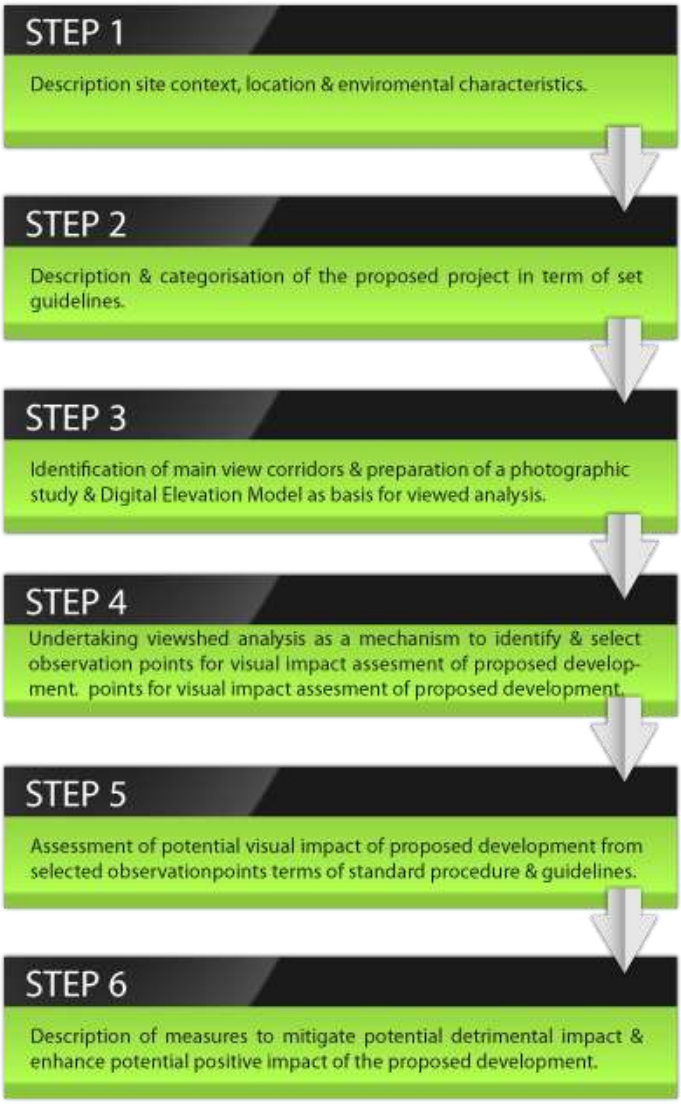

Figure 1: Methodology adopted for the VIA.

1.4 Supplementary Documentation

This report is to be read together with Annexure 2 (Selected observation point viewsheds and assessments), which provides an identification of selected observation points and visual assessment of the proposed activity from each of these points.

[1] No similar policy exists for the Free State Province. However, the Guideline is based upon universally accepted principles and is therefore applicable to the said project.

1.5 Gaps in Knowledge, Assumptions and Limitations

This assessment is based on the Background Information Document (BID) of December 2012 and additional information provided by Savannah Environmental (Pty) Ltd. on 10 December 2012, 11 June 2013 and 1 August 2013, respectively, for the mentioned project.

Assessments of this nature generally suffer from a number of defects that must be acknowledged:

- **Limited time:** A comprehensive assessment requires a systematic assessment of the environment at different times of the day. Such luxury is not always possible and therefore most assessments are based on observations made at a specific time of day. Educated estimates are made, where applicable, based on the knowledge of the area.
- **Availability of literature:** A thorough assessment requires that all relevant literature on the subject matter is studied, acknowledged and incorporated in the report. Due to a range of factors, forward planning documents are not always enviable for all spheres of government.

Notwithstanding the above, it is believed that this assessment identified all issues of likely importance from a visual perspective point of view.

2 SITE DESCRIPTION

2.1 Locality

The Steynsrus project site is located in the Moqhaka Local Municipality (FS201) in the Free State Province and is some 2.5km north of Matlwangtlwang and Steynsrus via the R76. The administrative capital of the Moqhaka Local Municipality is situated in Kroonstad approximately 80km northwest of the project site.

Matlwangtlwang was established as a satellite town to Steynsrus under the old apartheid era's urban geography. Matlwangtlwang is separated from Steynsrus by means of the R720 highway and is home to a large secondary school and a health centre.

Steynsrus was founded in 1910 and was named after the last presidents of the Orange Free State, Martinus Theunis Steyn. Apart from government services, agriculture is the main employer in this area and many residents commute every day to work on the surrounding farms.

As illustrated by Figure 2 below, Steynsrus is located on the R720 road between Kroonstad and Senekal. A fine sand stone Dutch Reformed Church, built in 1928, dominates the town and is its most notable architectural feature, sitting at the main axis. Steynsrus is a service centre and there is a branch of an agricultural cooperative, as well

as butchers, hardware and general goods stores, furniture and appliance retailers, a panel beating shop and a gas station.

Figure 2: Regional context of the subject property.

No national parks or nature reserves exist in close proximity to the project site. The nearest conservation area is the Willem Pretorius Nature Reserve, approximately 50km south of the project site. In addition, a Late Iron Age Archaeological Site is situated some 26km east of the project site en-route to Lindley. Both of these sites are too far from the project site to be influenced by the proposed activity.

2.1.1 Intrinsic Values of the Area

It is a common principle of planning that each place has a specific intrinsic, instrumental and systemic value and that such values need to be carefully considered when contemplating the current and future use of any particular place.

Broadly spoken, two different philosophical perspectives are possible when considering the value of any place or object, namely **what is it good for?** and **what is its own good?** The first question relates to its instrumental value, while the second deals with intrinsic value. Instrumental value use something as a '*means to an end'* while intrinsic value refers to being '*worthwhile in itself'* (Rolston, 1994).

Systemic value relates to the fact that '*things do not have their separate natures merely in, and for themselves, but they face outward and co-fit into broader natures. Value seeps out into the system and the individual lose its status as sole locus of value'* (Rolston, 1994:174). Systemic value refers to the relations that things have with other things, and to the role they play in larger wholes.

The value system of the northern Free State was determined in the various collaborative, participative processes undertaken during the drafting of forward planning documentation, policy and guidelines. As such, the intrinsic value of the area is found in the agrarian landscape with strong linkages to the natural environment.

It is also recognised that tourism is becoming an increasingly important industry in the area. The Moqhaka Local Municipality Integrated Development Plan (2012-2017) recognises the dramatic increase in the tourism industry regarding weekend tourism destinations. Specific reference is also made to game ranches and guesthouses on farms. One of the province's main assets is its landscapes, which are relatively well-preserved. Even though not formally recognised as a key tourism area or which forms part of a tourism corridor, the area in the vicinity of Steynsrus could be treated as such.

2.2 Project Site Description

As illustrated by the figure below, the area considered for development consists of the three landholdings as listed below. The project site will straddle Farm Nos. 2154 and 2151:

Table 1: Properties considered for development.

FARM NO.	EXTENT
Remainder of the Farm Kleindeel No. 1342	86ha
Remainder of the Farm Arbeid No. 2154	172ha
Remainder of the Farm Weltevrede No. 2151	185ha

In total, the properties on which the proposed activity is to be undertaken constitute approximately 357ha, while the proposed activity is to be undertaken on approximately 30ha of the landholdings.

Figure 3: Extent of subject property and improvements.

The project site is bisected by the R76 en-route to Kroonstad in the northwest. In addition, the main railway line between Bethlehem in the east and Kroonstad in the northwest also crosses the project site in an east-west direction.

Immediately west of the project site, the Steynsrus Rural 132kV substation is situated on Farm No. 2134. A number of electrical transmission lines run along this substation from where electricity is again distributed to the wider region. Currently, a 31.0m wide servitude is registered for the Oosthuizen Traction-Komspruit Traction line, running in an east-west direction across the project site. A second transmission line of similar capacity (Alpha-Beta 2) run in a northeast-southwest direction over the project site.

The planned Steynsrus Solar Energy Facility will evacuate the generated power into the Eskom electricity grid at the Steynsrus Rural 132kV substation.

An area of approximately 440ha has provisionally been made available to establish the planned solar facility. The development area for the proposed Steynsrus Solar Energy Facility will however be in the order of 30ha. The provisional location of the preferred site option is indicated by the figure above.

2.2.1 Landscape Character

Agriculture dominates the landscape character of the Free State with cultivated land covering 32 000km² and natural veld and grazing a further 87 000km². The landscape character of the region in the vicinity of Steynsrus and the project site, in particular, is no different.

Open grass plains characterise the project site with commercial livestock (cattle) farming being the main form of farming. No topographical features of interest occur in the region which would require special attention from a visual perspective.

The area on average receives approximately 450mm of rain per annum, with most of the rainfall occurring during mid summer. The average midday temperatures range from approximately 16°C in June to 27.8°C in January. The region is the coldest during June when the mercury drops to 0°C on average during the night (http://www.saexplorer.co.za/south-africa/climate/steynsrus_climate.asp).

The project site has a generally flat terrain. The height variations of the project site vary between 1522m and 1546m above mean sea level over a distance of approximately 750m.

The area is dominated by the Central Free State Grassland (Gh6) vegetation type. According to Mucina and Rutherford (2006), Central Free State Grassland form part of the Grassland Biome which is found on the high central plateau of South Africa. Its distribution occurs in a broad zone from around Sasolburg in the north to Dewetsdorp in the south. The vegetation type occurs at an altitude between 1300m and 1640m above mean sea level on undulating plains supporting short grassland.

Central Free State Grasslands, in a good condition, are dominated by *Themedatriandra* while *Eragrostiscurvula* and *E. chloromelas* become dominant in degraded habitats. Dwarf karoo bushes establish in severely degraded clayey bottomlands while overgrazed and trampled low-lying areas with heavy clayey soils are prone to *Acacia karroo* encroachment.

Important taxa in the group include *Aristidaadscensionis (d), Cymbopogonpospischilii, Conyzapinnata*and *Felicia muricata (d),* to name a few. The specific vegetation type has been classified as vulnerable with only small portion enjoying statutory conservation (e.g. Willem Pretorius, Rustfontein and Koppies Dam Nature Reserces). Almost a quarter of the area has been transformed either for cultivation or by building of dams.

2.2.2 Solar Radiation

The portions of the Northern Cape that border on the Orange River and Namibia have the highest solar radiation intensity in the world (Northern Cape State of the Environment Report, 2005), while the north-eastern portions of the Free State Province have a moderate to high solar radiation intensity. This translates to a reasonable comparative economic advantage for this region. Figure 4 below illustrates the measured annual direct and diffuse solar radiation of the Free State Province in context of the country as a whole.

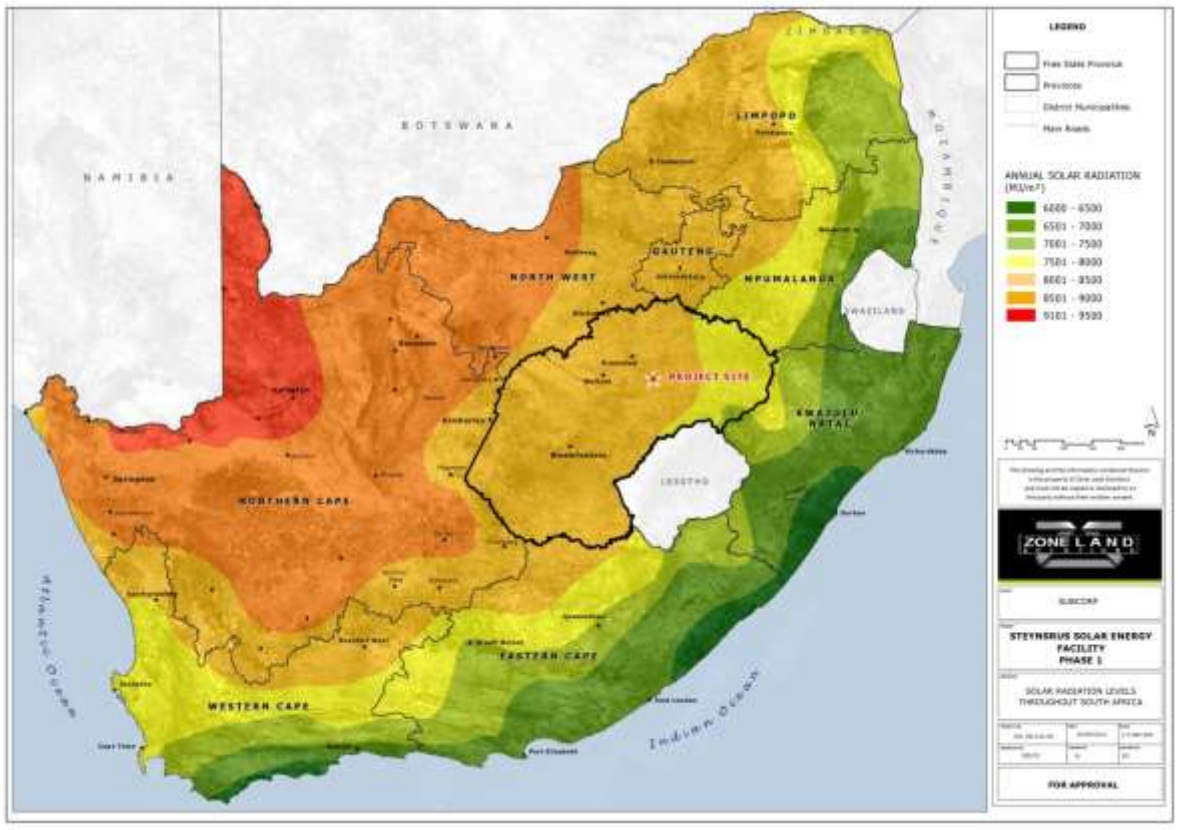

Figure 4: Solar radiation levels for South Africa.

3 PROJECT DESCRIPTION AND INSTALLATIONS

The proposed solar energy facility will include PV solar panels and associated infrastructure with a total generating capacity of approximately19.5MW. The facility will be known as the Steynsrus Solar Energy Facility.

The overall aim of the design and layout of the facilities is to maximise electricity production through exposure to the solar radiation, while minimising infrastructure, operation and maintenance costs, and social and environmental impacts. The use of solar energy for power generation can be described as a non-consumptive use of natural resources which emits zero greenhouse gas emissions.

3.1 Project Components

The proposed Steynsrus Solar Energy Facility would typically comprise of the following infrastructure:

- Arrays of photovoltaic panels with an installed capacity of up to 19.5MW;
- Overhead power lines connecting to the existing Steynsrus Rural 132kV substation.
- Inverter/transformer enclosures;
- Cabling between the project components, to be lain underground where practical;
- Mounting structures (either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels);
- Internal access roads and fencing; and
- A workshop area for maintenance and storage, and office.

3.2 Renewable Energy Technology Proposed

Various renewable energy technologies are available for electricity generation. Renewable energy technologies offer an alternative to fossil fuels, thereby reducing the amount of CO2 emissions into the atmosphere.

3.2.1 Photovoltaic Technology

Solar energy facilities, such as those using PV panels use the energy of the sun to generate electricity through a process known as Photovoltaic Effect. This effect refers to photons of light colliding with electrons, and therefore placing the electrons into a higher state of energy to create electricity.

Photovoltaic systems use solar panels to convert sunlight into electricity. The system is made up of one or more solar panels, usually a controller or power converter, and the interconnections and mounting for the other components.

Individual ground-mounted PV panels (also referred to as free-field or stand-alone arrays) will be connected into a 'string' of panels of up to 3.4m in height. The 'string' will be attached to a steel support structure set at an angle so to receive the maximum amount of solar radiation. The angle of the panel is dependent on the latitude of the proposed facility and the angles may be adjusted to optimise for summer or winter solar radiation characteristics.

The photovoltaic cells to be used consist of a thin film technology or polycrystalline silicone cell which acts as a semiconductor used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic panel.

The photovoltaic effect produces electricity in direct current. Therefore an inverter must be used to change it to alternating current.

The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

Figure 5: Illustration of photovoltaic panels (Source: Savannah Environmental [Pty] Ltd.).

4 POTENTIAL 'TRIGGERS' OR KEY ISSUES

A 'trigger' is a characteristic of either the receiving environment or the proposed project which indicates that visibility and aesthetics are likely to be key issues and may require further specialist involvement (DEA&DP, 2005).

The 'triggers', as it relates to the proposed project refer to the following:

Table 2: Potential triggers.

KEY ISSUE	FOCAL POINTS	DESCRIPTION
a) Nature of the receiving environment:	*Areas lying outside a defined urban edge line.*	The proposed activity is situated outside the demarcated urban edge of Steynsrus and will be assessed accordingly.
b) Nature of the project:	*A change in land use from the prevailing use.*	The prevailing use will change on approximately 30ha. Should the proposed mitigation measures be implemented, the prevailing use could be retained to a degree.

	Possible visual intrusion in the landscape.	The proposed activity will form an integral part of the future landscape character. The extent and significance of a possible visual impact is to be determined through this VIA.

4.1 Development Category

Based upon the 'triggers' and key issues and the environmental context summarised above, the proposed activity is categorised as a **Category 4 Development**.

This categorisation is based upon the *Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes*, which lists the following categories of development:

Box 3: KEY TO CATEGORIES OF DEVELOPMENT

Category 1 Development: e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.

Category 2 Development: e.g. low-key recreation/resort/residential type development, small-scale agriculture/nurseries/narrow roads and small-scale infrastructure.

Category 3 Development: e.g. low density residential/resort type development, golf or polo estates, low to medium-scale infrastructure.

Category 4 Development: e.g. medium density residential development, sport facilities, small-scale commercial faculties/office parks, one-stop petrol stations, light industry, medium-scale infrastructure.

Category 5 Development: e.g. high density township/residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agriculture land and commercial tree plantations. Quarrying and mining activities with related processing plants.

Based upon the above categorization and the assessment criteria provided in the *Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes* it is expected that the visual impact of the proposed activity would be classified as **'moderate'** (refer to the table on the following page).

The objectives of the VIA described in this report is to:

a) determine whether such broad impact categorisation is appropriate and if not, to determine an appropriate category of impact;
b) formulate and implement measures or interventions that would mitigate any detrimental impacts to the extent that the activity will be acceptable.

Table 3: Categorization of expected visual impact (DEA&DP, 2005).

Type of environment	Type of development				
	Category 1	**Category 2**	**Category 3**	**Category 4**	**Category 5**
Protected/wild areas of international or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural, historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural or historical significance/disturbed	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	**Moderate visual impact expected**	High visual impact expected
Disturbed or degraded sites / run-down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

5 VIEWSHED ANALYSIS

5.1 Dominant View Corridors

As a first step of this VIA, a survey was undertaken to determine the existence of significant view corridors associated with the project site. A view corridor is defined as *'a linear geographic area, usually along movement routes, that is visible to users of the route'* (DEA&DP, 2005). Accordingly, two dominant *view corridors* were identified, namely:

a) **R76-** The main movement corridor between Steynsrus in the east and the N1 and Kroonstad in the west.

b) **R720-** A local distributor that link the towns of Senekal and Steynsrus with Edenville in the north.

In addition to the above, several other smaller farm roads (and the railway line) are present in the study area. These are however not major transportation routes but rather just access routes to individual farms. Due to their nature, these roads have not been classified as dominant view corridors.

When determining dominant view corridors, one has to take into consideration the class of the road and dominance and nature of the town/settlement in which direction it

travels. In this regard, Steynsrus could be regarded as a third order town with an agricultural nature. As such, the R76 is primarily regarded as a movement route for agricultural produce between Steynsrus and Kroonstad and the N1 National Route between Cape Town and Johannesburg, to the west.

5.2 Relevant Topographic and Physical Characteristics

A further key aspect affecting the potential visual impact of any proposed activity is the topography of the project site and the surrounding environment and the existence of prominent biophysical features from where the project site is visible. The topography and the major ridgelines of the area were subsequently determined and mapped by using a *Digital Elevation Model*[2].

As illustrated by the DEM above, the project site is located at a mean elevation of approximately 1527m above sea level. The project site is essentially flat in nature and as the DEM shows, there are virtually no prominent topographical manifestations in close proximity to the project site from which the proposed activity would be visually exposed. Furthermore, the project site is located below any ridgeline. The proposed activity will therefore not impact on the skyline.

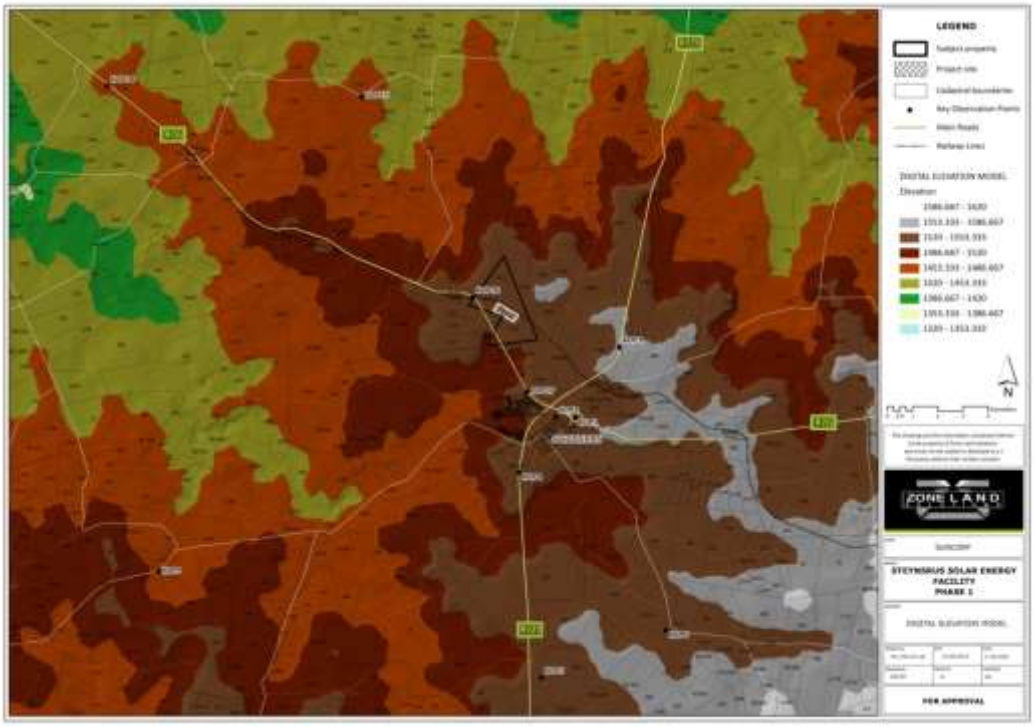

Figure 6: Digital Elevation Model illustrating the topography and the dominant view corridors in the sub-region.

[2] A Digital Elevation Model (DEM) is a geographic information system-based outcome generated from contours for a specific area. In this instance, 20m contour intervals for reference sheet nos. 2727cd, 2727dc, 2827ab and 2827ba were used to calculate the DEM for the region.

5.3 Photographic Study as Supplementary Component

In order to quantify and assess the visibility and potential impact of the proposed activity and to provide a basis for selecting appropriate observation points outside of the project site, a photographic study and analysis was undertaken in the vicinity of the project site. The analysis and ground-truthing identified several observation points with similar characteristics and assessments outcomes. A selection of Key Observation Points is therefore included under Annexure 2. The figure below illustrates the nature of the landscape in the vicinity of the project site.

Figure 7: Photograph illustrating the nature of the environment in the vicinity of the project site.

6 DIGITAL VIEWSHED ANALYSIS

The photographic study summarised above was supplemented with a digital viewshed analysis based upon the Digital Elevation Model (refer to Figure 6). As stated previously, the purpose of these two steps was to provide a basis for the identification and selection of appropriate observation points outside the project site for the VIA.

The viewshed[3] analysis was undertaken in accordance with the *Guideline Document for involving Visual Specialists in EIA Processes*. Geographic Information Systems (GIS) technology was used to analyse and map information in order to understand the relationships that exist between the observer and the observed view. Key aspects of the viewshed are as follows:

- It is based on a *single viewpoint* from the highest point of each of the individual basic assessment site.
- It is calculated at 5.0m above the natural ground level to reflect the highest point of the PV panels.
- It represents a '*broad-brush' designation*, which implies that the zone of visual influence may include portions that are located in a view of shadow and it is therefore not visible from the project site and *vice versa*. This may be as a result of landscape features such as vegetation, buildings and infrastructure not taken into consideration by the DEM.
- The viewshed generated from each of the selected observation points referred to in Annexure 2 is calculated at 1.7m above the natural ground level to reflect the average height of person either walking or sitting in a vehicle.

As illustrated by the generated viewshed (refer to the yellow shading illustrated on Figure 8 below) for Option 1, the primary *zone of visual influence*[4] is located in a southern direction up to ±25km from the project site. The viewshed is loosely grouped into three distinct 'pockets'. The 'pocket' closest to the project site extends up to 5km from the site and includes the town of Steynsrus. The primary receptors will be located in this area.

The other two 'pockets' are associated with agricultural lands and associated infrastructure.

It is important to note that the GIS-generated viewshed illustrates a theoretical *zone of visual influence*. This does not mean that the proposed activity would be visible from all observation points in this area. The *zone of visual influence* is closely associated with the most prominent topographical features to the southeast.

6.1 Key Aspects of the Viewshed

The distance between the observer and the observed activity is an important determinant of the magnitude of the visual impact. This is due to the visual impact of an activity diminishing as the distance between the viewer and the activity increases. Viewsheds are categorised into three broad categories of significance, namely:

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[3] A viewshed is defined as *'the outer boundary defining a view catchment area, usually along crests and ridgelines. Similar to a watershed'*. A Viewshed Analysis is therefore the study into the extent to which a defined area is visible to its surroundings.

[4] Zone of visual influence is defined as *'An area subject to the direct visual influence of a particular project'.*

a) Foreground: The foreground is defined as the area within 1km from the observer within which details such as colour, texture, styles, forms and structure can be recognised. Objects in this zone are highly visible unless obscured by other landscape features, existing structures or vegetation.

b) Middle ground: The middle ground is the area between 1km and 3km from the observer where the type of detail which is clearly visible in the foreground becomes indistinguishable. Objects in the middle ground can be classified as visible to moderately visible, unless obscured by other elements within the landscape.

c) Background: the background stretches from approximately 3km onwards. Background views are only distinguishable by colour and lines, while structures, textures, styles and forms are often not visible (SRK Consulting, 2007).

The distance radii indicating the various viewing distances from the project site are illustrated by Figure 8 below. Also illustrated by the figure is the town of Steynsrus in the *middle ground* of the project site. Steynsrus represents the area where most of the visual receptors would be located. Also located in the *fore-* and *middle ground* are the two main view corridors, namely the R76and R720.

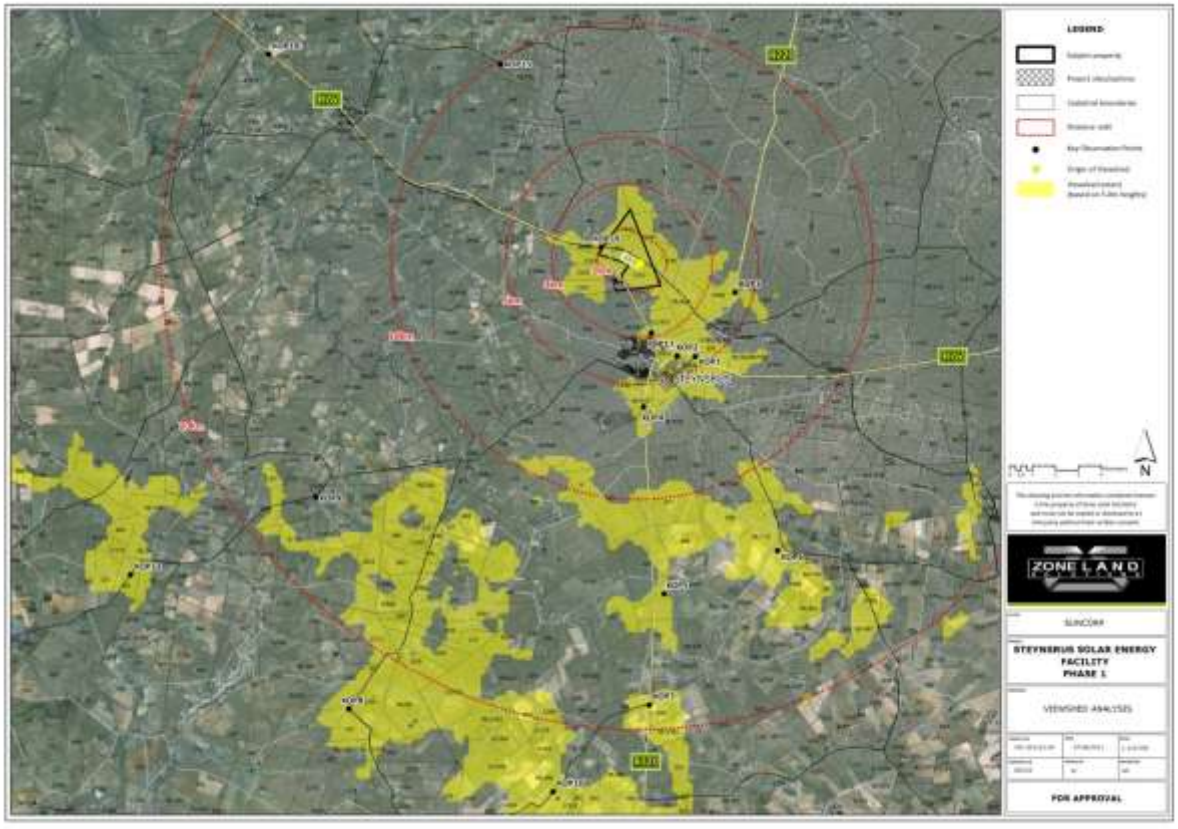

Figure 8: Viewshed generated from the highest point of the project site.

7 VISUAL IMPACT ASSESSMENT

7.1 Selection of Observation Points

A total of 20 Key Observation Points (KOPs) were provisionally identified and selected within the defined viewshed for the visual assessment in accordance with the selection criteria stipulated in the Visual Guidelines. These KOPs correspond with movement routes, the major farmsteads, and tourism facilities in the region. As a result of the similarity in the assessment results of the KOPs, the description and assessment of only five KOPs are included in Annexure 2.

KOPs selected for the assessment are generally located at the intersection between the zone of visual influence and the defined view corridors (refer to Sections 5.1 and 6 above). The view corridors are those areas that are accessible to the general observer.

7.2 Assessment Process

The identified *observation points* were categorised and assessed as summarised in the table below.

Table 4: VIA methodology and process.

KEY	DESCRIPTION
NUMBER	Each observation point was allocated a reference number.
CO-ORDINATES	The co-ordinates of each of the observation points are provided.
ALTITUDE	The altitude of the observation point was provided in meters above sea level.
DESCRIPTION	A brief description where the observation point is located is provided.
TYPE	Each observation point is categorized according to its location and significance rating. These criteria include the following: a) Tourist-related areas. b) Corridors, including linear geographical areas visible to users of a route or vantage points. c) Residential Areas/Farmstead. d) Areas of cultural significance.
PHOTOGRAPH	A photograph was taken from each observation point in the direction of the project site to verify the digitally-generated viewshed.
PROPERTY LOCATION	The location of the property was described a *foreground*, *middle ground* or *background*.

PROXIMITY	The distance between the observation point and the project site was provided in kilometres.
VISUAL SENSITIVITY OF RECEPTORS	The visual impact considered acceptable is dependent on the type of receptors. A *high* (i.e. residential areas, nature reserves and scenic routes or trails), *moderate* (e.g. sporting or recreational areas, or places or work), or *low* sensitivity (e.g. industrial, mining or degraded areas) was awarded to each observation point.
VISUAL EXPOSURE	Exposure or visual impact tends to diminish exponentially with distance. A *high* (dominant or clearly visible), *moderate* (recognisable to the viewer) or *low* exposure (not particularly visible to the viewer) rating was allocated to each observation point.
VISUAL ABSORPTION CAPACITY (VAC)	The potential of the landscape to conceal the proposed activity was assessed. A rating of *high* (effective screening by topography and vegetation), *moderate* (partial screening) and *low* (little screening) was allocated to each observation point.
VISUAL INTRUSION	The potential of the activity to fit into the surrounding environment was determined. The visual intrusion relates to the context of the proposed activity while maintaining the integrity of the landscape. A rating of *high* (noticeable change), *moderate* (partially fits into the surroundings) or *low* (blends in well with the surroundings) was allocated.
DURATION	With regard to roads, the distance (in kilometres) and duration (in seconds) for which the property will be visible to the road user, were calculated for each observation point.

7.3 Summary of Assessment

Based on the viewshed analysis and the preceding sections, the envisaged visual impact of the proposed activity was assessed in accordance with the criteria for visual impact assessments (DEA&DP, 2005). The findings of the assessment from selected observation points are included under Annexure 2.

7.3.1 Assessment Criteria

It is stated in the DEA&DP's Visual Guidelines that to aid decision-making, the assessment and reporting of possible impacts requires consistency in the interpretation of impact assessment criteria. The criteria that specifically relate to VIAs were therefore described in Table 4 and Annexure 2.

The potential visual impact of the proposed activity was assessed against these criteria, with reference to the summary of criteria in Box 12 of the Visual Guidelines. Table 5 provides a description of the summary criteria used to determine the impact significance.

Table 5: Summary of criteria used to assess the potential impacts of the proposed activity.

CRITERIA	DESCRIPTION
NATURE OF THE IMPACT	The nature of the impact refers to the visual effect the proposed activity would have on the receiving environment. The nature of the development proposals are described in the preceding sections.
EXTENT	This category deals with the spatial or geographic area of influence and refers to the following levels: • *Site-related* (extending only as far as the activity), • *Local* (limited to the immediate surroundings), • *Regional* (affecting a larger metropolitan or regional area), • *National* (affecting large parts of the country), • *International* (affecting areas across international boundaries). A value between 1 and 5 is assigned as appropriate (with 1 being low and 5 being high).
DURATION	Duration refers to the expected life-span of the visual impact. A rating of short term (during the construction phase) (assigned score of 1 or 2), *medium term* (duration for screening vegetation to mature) (assigned score of 3), *long term* (the lifespan of the project) (assigned score of 4), or *permanent* (where time will not mitigate the visual impact) (assigned score of 5) were applied.
MAGNITUDE	Magnitude refers to the magnitude of the impact on views, scenic or cultural resources. The following ratings were allocated to determine the intensity of the impact: • *No effect* (assigned score of 0), • *Low* (visual and scenic resources not affected) (score of 2), • *Minor* (will not result in impact on processes) (score of 4), • *Medium* (affected to a limited scale) (assigned score of 6), • *High* (scenic and cultural resources are significantly affected) (assigned score of 8), • *Very high* (result in complete destruction of patterns) (score of 10).
PROBABILITY	This category refers to the degree of possibility of the visual impact occurring. A rating of *very improbable* (probably will not happen) (assigned score of 1), *improbable* (very low possibility of the impact occurring) (assigned score of 2), *probable* (distinct possibility that the impact will occur) (assigned score of 3), *highly probable* (most likely) (assigned score of 4), or *definite* (impact will occur regardless of any preventative measures) (assigned score of 5) were applied.
STATUS	Status will be described as *positive*, *negative* or *neutral*.

REVERSIBILITY	Degree to which the activity can be reversed. The following rating were allocated: • Reversible (assigned score of 1), • Recoverable (assigned score of 3), or • Irreversible (assigned score of 5).
SIGNIFICANCE	The significance is calculated by combining the criteria in the following formula: S = (E+D+M)P S = Significance E = Extent D = Duration M = Magnitude P = Probability The significance ratings for each potential impact are as follows: • *Low* (where it will not have an influence on the decision) (<30 points), • *Medium* (where it should have an influence on the decision unless it is mitigated) (30-60 points), or • *High* (where it would influence the decision regardless of any possible mitigation) (>60 points).

7.4 Assessment of Impacts

7.4.1 Assessment of Impact on Sensitive Receptors in Foreground and Middle Ground

The sensitive receptors in the *fore*-and *middle ground* of the generated viewshed represent mostly users of the road network and the town of Steynsrus itself. The R76 and R720 is the major link roads in the region and is the most sensitive receptors in terms of possible impacts as observers using these roads will come into direct view of the proposed activity.

The proposed activity will represent a change in land use and land form to what is currently the status quo. The introduction of foreign structures and forms in the agrarian landscape will have a limited impact on these sensitive receptors as described in the table below.

Table 6: Impact table summarising the visual impact on sensitive receptors in the *foreground* and *middle ground*.

NATURE:	Potential visual impact on the sensitive receptors in the *foreground* and *middle ground*.			
	Without Mitigation	**Score**	**With Mitigation**	**Score**
EXTENT	Regional	**3**	Local	**2**
DURATION	Long term	**4**	Long term	**4**
MAGNITUDE	Minor	**4**	Low	**2**
PROBABILITY	Probable	**3**	Improbable	**2**
SIGNIFICANCE	Medium	**33**	Low	**16**
STATUS	Neutral		Neutral	
REVERSIBILITY	Recoverable	**3**	Recoverable	**3**
IRRIPLACEABLE LOSS OF RESOURCE?	No		No	
CAN IMPACTS BE MITIGATED?	Yes			
MITIGATION:	• Keep disturbed areas to a minimum. • No clearing of land to take place outside the demarcated footprint. • Institute a rigorous planting regime along the western and southern boundaries, adjacent to the R76, to shield the proposed activity from users of the latter road. Only indigenous plant species to be introduced and planted in an organic manner and location which would not cast shadows on the PV 'strings'. • Buildings and similar structures must be in keeping with regional planning policy documents, especially the principles of critical regionalism, namely sense of place, sense of history, sense of nature, sense of craft and sense of limits. • Utilise existing roads and tracks to the extent possible. Where new roads are required, they should be two-track gravel roads, maintained to prevent dust plumes and erosion.			
CUMULATIVE IMPACTS:	As described above, the existing Steynsrus Rural 132kV substation and its associated industrial-type infrastructure such as electrical transmission lines and pylons already exists in the immediate surroundings. Therefore, the cumulative impact will be increased with the establishment of the PV plant.			
RESIDUAL IMPACTS:	The proposed infrastructure is of such a nature that the status quo could be regained for the majority of the site after decommissioning of the plant. Providing that the site is rehabilitated to its current state, the visual impact will also be removed.			

7.4.2 Assessment of Impact on Sense of Place

Sense of place and intrinsic values are closely related to one another. Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria and specifically visual character of an area (informed by a combination of aspects, such as topography, level of development, vegetation, noteworthy features, cultural/historical features, etc.) play a significant role (MetroGIS, 2012).

A visual impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light (MetroGIS, 2012).

Although very weak and not promoted in any way, the sense of place of Steynsrus is very much one of an agricultural town in an agrarian landscape, dotted by agricultural farmsteads. The sense of place attributes and intrinsic values of the project site has, to a large degree, further been lost with the introduction of the electrical substation and associated infrastructure.

Table 7: Impact table summarising the visual impact on the sense of place.

NATURE:	Potential visual impact on the intrinsic value and sense of place of the Steynsrus region.			
	Without Mitigation	**Score**	**With Mitigation**	**Score**
EXTENT	Local	**2**	Local	**2**
DURATION	Long term	**4**	Long term	**4**
MAGNITUDE	Medium	**6**	Minor	**4**
PROBABILITY	Probable	**3**	Improbable	**2**
SIGNIFICANCE	Medium	**36**	Low	**20**
STATUS	Negative		Neutral	
REVERSIBILITY	Recoverable	**3**	Recoverable	**3**
IRRIPLACEABLE LOSS OF RESOURCE?	No		No	
CAN IMPACTS BE MITIGATED?	Yes			
MITIGATION:	• Keep disturbed areas to a minimum. • No clearing of land to take place outside the demarcated footprint. • Institute a rigorous planting regime along the western and southern boundaries, adjacent to the R76, to shield the proposed activity from users of the latter road. Only indigenous plant species to be introduced and planted in an organic manner and location which would not cast shadows on the PV 'strings'. • Buildings and similar structures must be in keeping with regional planning policy documents, especially the principles of critical regionalism, namely sense of place, sense of history, sense of nature, sense of craft and sense of limits.			

	• Utilise existing roads and tracks to the extent possible. Where new roads are required, they should be two-track gravel roads, maintained to prevent dust plumes and erosion.
CUMULATIVE IMPACTS:	As described above, the existing Steynsrus Rural 132kV substation and its associated industrial-type infrastructure such as electrical transmission lines and pylons already exists in the immediate surroundings. Therefore, the cumulative impact will be increased with the establishment of the PV plant.
RESIDUAL IMPACTS:	The proposed infrastructure is of such a nature that the status quo could be regained for the majority of the site after decommissioning of the plant. Providing that the site is rehabilitated to its current state, the visual impact will also be removed.

7.4.3 Assessment of Impact of Lighting

The project site has a relatively low illumination factor. The occurrence of light sources in the vicinity of the project site is confined to the townscape approximately 2.5km away. As a result of the proximity of the town, a slight sky glow[5] effect is visible at night.

The proposed PV 'string' will not include lights of any kind, however, the associated ancillary buildings and infrastructure may include some degree of lighting.

It is not expected that the proposed activity will contribute to the effects of sky glow or artificial lighting of the area. In order to ensure this, the proposed mitigation measures will have to be complied with.

Table 8: Impact table summarising the visual impact of lighting.

NATURE:	Potential visual impact of artificial lighting as a result of the activity.			
	Without Mitigation	**Score**	**With Mitigation**	**Score**
EXTENT	Local	**2**	Local	**2**
DURATION	Long term	**4**	Long term	**4**
MAGNITUDE	Minor	**4**	Low	**2**
PROBABILITY	Probable	**3**	Probable	**3**
SIGNIFICANCE	Medium	**30**	Low	**24**
STATUS	Negative		Negative	
REVERSIBILITY	Recoverable	**3**	Recoverable	**3**
IRRIPLACEABLE LOSS OF RESOURCE?	No		No	
CAN IMPACTS BE	Yes			

[5] Sky glow refers to the illumination of the night sky or parts thereof. The most common cause of sky glow is artificial light that emits light pollution, which accumulates into a fast glow that can be seen from miles away.

MITIGATED?	
MITIGATION:	• Outdoor lighting must be strictly controlled so as to prevent light pollution. • All lighting must be installed at downward angles. • Sources of light must as far as possible be shielded by physical barriers. • Consider the application of motion detectors to allow the application of lighting only where and when it is required. • Only minimum wattage light fixtures must be used.
CUMULATIVE IMPACTS:	As mentioned above, the area within which the proposed activity is to be undertaken is relatively low lit. The occurrence of ancillary structures of the solar plant will contribute to the cumulative lighting effect of the area but it is expected to be negligible in a local context.
RESIDUAL IMPACTS:	The proposed infrastructure is of such a nature that the status quo could be regained after decommissioning of the plant. Providing that the site is rehabilitated to its current state, the visual impact will also be removed.

7.4.4 Assessment of Impact of Reflection and Glare of Structures

Glare is an adverse consequence of using large smooth and polished surfaces as a building material. Glare is characterized by a light, often reflected, within the field of vision that is brighter than the surroundings resulting in visual discomfort or impairment. Glare also occurs when the light level of a region is brighter than the level to which the eyes are adapted.

The impact of the glare source depends on the nature of the receptor, the size of the source relative to the visual field, the position of the source within the visual field and intensity of the source. Glare can pose, at minimum, a nuisance and in other cases can create a safety risk. Areas of particular sensitivity include roads, airports and rail as individuals are guiding vehicles and are required to visually scan their environment without averting their gaze (www.rwdi.com).

Photovoltaic solar panels are designed to absorb sunlight in order to convert it into electricity. The more sunlight that is absorbed, the more energy can be produced.

The polycrystalline silicone cell absorbs two-thirds of the sunlight reaching the panel's surface. This effectively means that only one-third of the sunlight reaching the surface of a solar panel has a chance to be reflected.

In addition, the PV panels have a reflectivity of around 30%, while surface materials such as dry sand has a reflectivity of around 45% and grass-type vegetation at 25%. Moreover, PV panels are installed at a fixed angle of around 30°. The solar panels will therefore not noticeably alter the site's current amount of reflected, indirect sunlight.

Table 9: Impact table summarising the visual impact of reflection and glare.

NATURE:	Potential visual impact of reflection and glare of the structures.			
	Without Mitigation	**Score**	**With Mitigation**	**Score**
EXTENT	Regional	**3**	Local	**2**
DURATION	Long term	**4**	Long term	**4**
MAGNITUDE	Medium	**6**	Low	**2**
PROBABILITY	Improbable	**2**	Improbable	**2**
SIGNIFICANCE	Low	**26**	Low	**16**
STATUS	Neutral		Neutral	
REVERSIBILITY	Recoverable	**3**	Recoverable	**3**
IRRIPLACEABLE LOSS OF RESOURCE?	No		No	
CAN IMPACTS BE MITIGATED?	Yes			
MITIGATION:	• Consider installing anti-reflective coating or glass to reduce the sunlight that is reflected and increase the amount of sunlight that is absorbed. • Install all steel structures and columns at right angles to the sun. • Prevent the use of reflective steel columns and structures in the design of infrastructure. • Steel components should not be painted but be galvanised and allowed to oxidise naturally over time. The grey colour produced in this process will help to reduce the visual impact. • Install all new electrical cables underground en-route to the substation.			
CUMULATIVE IMPACTS:	The introduction of the PV plant, coupled with the existing substation and transmission lines will contribute to an increased cumulative visual impact and possible overall increased reflection in the area.			
RESIDUAL IMPACTS:	The proposed infrastructure is of such a nature that the status quo could be regained for the majority of the site after decommissioning of the plant. Providing that the site is rehabilitated to its current state, the visual impact will also be removed.			

8 IMPACTS THAT MAY RESULT FROM THE ACTIVITY AS WELL AS PROPOSED MANAGEMENT OF IDENTIFIED IMPACTS AND PROPOSED MITIGATION MEASURES

The tables below provide a summary and anticipated significance of the potential direct, indirect and cumulative impacts that are likely to occur as a result of the planning and design phase, construction phase, operational phase, decommissioning and closure phase, including impacts relating to the choice of site/activity/technology alternatives as well as the mitigation measures that may eliminate or reduce the potential impacts listed.

Table 10: Impacts, management and mitigation.

ACTIVITY	IMPACT SUMMARY	SIGNIFICANCE	PROPOSED MITIGATION
PLANNING AND DESIGN PHASE			
Continuation of agricultural activity	***Direct impacts:***		
	Loss of agricultural land	Medium	Consider raising the PV platforms so that cattle can roam underneath the PV 'string'.
	Indirect impacts:		
	N/A	N/A	N/A
	Cumulative impacts:		
	Reduced agricultural yield	High	Portions of the project site that will not be impacted by the proposed activity must be allowed to continue the agricultural activity unhindered.
Visibility of the activity from sensitive receptors	***Direct impacts:***		
	Indirect impacts:		
	Negative impact on the sense of place	Medium	Plan vegetated and landscaped berms around the perimeter of the project site to minimise visual impacts onto the site.
	Cumulative impacts:		
	Reduction in property values	Medium-low	Plan vegetated and landscaped berms around the perimeter of the project site to minimise visual impacts onto the site.
Ability of planned infrastructure to fit in with the landscape	***Direct impacts:***		
	Introduction of foreign architectural forms	Medium-low	Design buildings to reflect the local architecture and sense of place of the Free State.
	Indirect impacts:		
	N/A	N/A	N/A
	Cumulative impacts:		
	N/A	N/A	N/A
Potential loss of conservation-worthy species	***Direct impacts:***		
	Damage to environmental sensitive areas	High	Prepare an environmental constraints plan to establish the environmental sensitive areas and those areas upon which the development may occur.
	Indirect impacts:		
	N/A	N/A	N/A
	Cumulative impacts:		
	N/A	N/A	N/A

ACTIVITY	IMPACT SUMMARY	SIGNIFICANCE	PROPOSED MITIGATION

ACTIVITY	IMPACT SUMMARY	SIGNIFICANCE	PROPOSED MITIGATION
CONSTRUCTION PHASE			
Site clearing	***Direct impacts:***		
	Loss of natural vegetation, erosion and dust plumes	Medium-high	• Utilise existing roads and tracks to the extent possible. Where new roads are required, they should be two-track gravel roads, maintained to prevent dust plumes and erosion. • Reduce and control dust through the use of approved dust suspension techniques as and when required. • Keep disturbed areas to a minimum. • No clearing of land to take place outside the demarcated footprint. • Institute a rigorous planting regime along the borders of the project site. • Only indigenous plant species to be introduced and planted in an organic manner and location which would not cast shadows on the PV 'strings'. • Appoint an Environmental Control Officer (ECO) to oversee the construction process and ensure compliance with conditions of approval.
	Indirect impacts:		
	N/A	N/A	N/A
	Cumulative impacts:		
	Possible damage to lower-lying properties due to storm water run-off	Medium	Cumulative impacts of developments on lower-lying properties can be reduced if activities on site are undertaken in accordance with the approved Environmental Management Plan.
Use of large earth-moving equipment	***Direct impacts:***		
	Increased industrial activity in an otherwise rural landscape	Medium-low	• Contractors to adhere to strict hours of operation. Should any construction be approved outside the demarcated hours, due notice to surrounding

ACTIVITY	IMPACT SUMMARY	SIGNIFICANCE	PROPOSED MITIGATION
			properties must be provided. • Construction vehicles on site should be limited to at maximum speed of 40 km/hour. • Construction vehicles must be in a good running condition. Faulty vehicles often create smoke plumes.
	Indirect impacts:		
	Damage caused to existing road infrastructure and safety of road users	Medium-high	• The condition of the existing road infrastructure must be monitored to prevent the deterioration of the road surface. • Access to the project site must be determined and approved by the applicable roads authority to ensure safe sight distances for access onto and from the main road.
	Cumulative impacts:		
	N/A	N/A	N/A
Establishment of construction camp	***Direct impacts:***		
	Suitable areas on the project site must be identified within which the construction camp could be accommodated. The camp will include a site for fuel storage, temporary workshops, eating areas, ablution facilities and washing areas.	Low	• Construction camp to be established on the least visible portion of the project site. • Construction to occur only during daytime. Should the ECO authorize night work, low flux and frequency lighting shall be used. • Institute a solid waste management programme to minimise waste generated on the construction site, and recycle where possible.
	Indirect impacts:		
	Spillage of contaminants.	High	A spill log in which a record is responses to maintained of the volume, nature, petrochemical or location, date, time and clean up action hazardous spill may take is to be daily updated on site.
	Cumulative impacts:		
	N/A	N/A	N/A

ACTIVITY	IMPACT SUMMARY	SIGNIFICANCE	PROPOSED MITIGATION
OPERATION PHASE			
Maintenance and operation of proposed PV plant	***Direct impacts:***		
	Continuation of natural processes	Medium-high	• Strict adherence to the Environmental Management Plan (EMP) will ensure that all levels of disturbance are kept within acceptable levels. • Operator to monitor ecological processes on site and address where necessary.
	Impact of lighting on sensitive receptors in the area	Medium-high	• Outdoor lighting must be strictly controlled so as to prevent light pollution. • All lighting must be installed at downward angles. • Sources of light must as far as possible be shielded by physical barriers. • Consider the application of motion detectors to allow the application of lighting only where and when it is required. • Only minimum wattage light fixtures must be used.
	Indirect impacts:		
	Negative impact on the sense of place	Medium-low	Vegetated and landscaped berms around the perimeter of the project site should minimise visual impacts onto the site and negate any potential negative impact on the sense of place of the area.
	Cumulative impacts:		
	The proposed activities will contribute to an increased cumulative visual impact and possible overall increased reflection and glare in the area.	Medium	Install all steel structures and columns at right angles to the sun and prevent the use of reflective steel columns and structures.

ACTIVITY	IMPACT SUMMARY	SIGNIFICANCE	PROPOSED MITIGATION
DECOMMISSIONING AND CLOSURE PHASE			
Disassemble PV plant and rehabilitate disturbed areas	***Direct impacts:***		
	The major visual impact associated with the decommissioning of the facility is the residual	Medium-low	• Prepare a decommissioning plan to establish a timeframe and order of decommissioning of the plant.

ACTIVITY	IMPACT SUMMARY	SIGNIFICANCE	PROPOSED MITIGATION
	visual effects such as scarring of the landscape.		• Rehabilitate all new access roads created during the construction period. • Institute monitoring of all decommissioned and rehabilitated sections of the project site at regular intervals.
	Indirect impacts:		
	N/A	N/A	N/A
	Cumulative impacts:		
	N/A	N/A	N/A

9 POLICY CONTEXT

The development of sustainable energy sources holds huge benefits for the country as a whole, and would have significant multipliers in the local economy. Not only do renewable energy projects contribute to clean development mechanism, but it would also establish an empowering environment in the region within which the facility is established. Sustainable energy projects should therefore be undertaken to provide the necessary infrastructure and associated amenities to accommodate the industry in an efficient manner and which does not negatively impact on the comparative economic advantages of a region.

Several policy documents have been drafted which promote the expansion of the green economy and especially environmentally friendly practice with regard to electricity generation in the country. Of particular reference to the proposed solar facilityis the Provincial Growth and Development Strategy for the Free State Province (PGDS), which also deals with these issues.

The PGDS, under Chapter 2.2.9, describes the challenge of preserving the environment and states that *it should be noted that the landscape of the province allows massive opportunities for the harvesting of solar energy, which could be used for household consumption and use in facilities such as schools and clinics*.

This statement is followed-up in growth and development pillars and a set of drivers with long-term programmes. *Driver 12: Integrate Environmental Limitations and Change into Growth and Development Planning* identified the long-term programme of *Mitigation of Cause and Effect of Climate Change*. Under this programme the following strategies, as it relates to solar projects, have been identified.

a) Adopt and integrate alternative energy approaches (solar, wind, hydro and biofuels) to reduce the carbon footprint of the Province's energy requirements.

b) Adopt the Sustainable Development approach of a 'Green Economy' by increasing the use of Green Energy, waste recycling schemes, facilitation of ecotourism

opportunities and the advocacy of labour-intensive economic development Develop climate change mitigation strategies pertaining to the core functions of provincial departments.

10 IMPACT STATEMENT

The on-site verification from the selected Key Observation Points and the viewsheds generated from the latter points indicated that the project site is indistinguishable from most observation points in the *background*. The verification pointed out that the project site is also indistinguishable from many of the observation points in the *foreground*. Perhaps the only exception in this regard is the receptors using the R76. This road passes in the foreground of the project site and, for a brief moment, will be in direct line of sight of the proposed activity.

To this end, the results of the viewshed analysis from defined Key Observation Points, together with a photograph indicating the actual view has been included under Annexure 2. The assessment findings of the KOPs were categorised as follows:

10.1 Impact on the Foreground and Middle Ground

Most of the potential impacts relate to the *foreground* and *middle ground* zone of visual influence. The visual analysis and assessment from all of these observation points found that the proposed activity is potentially visible and recognisable from Key Observation Points along the R76 and R720 as well as from Steynsrus itself. The summarised assessment of the KOPs is as follows:

a)	**Visibility:**	Medium to low
b)	**Visual exposure:**	Medium to high
c)	**Visual absorption capacity:**	Medium
d)	**Visual sensitivity of receptors:**	Medium to low
e)	**Visual intrusion:**	Medium to low
f)	**Significance of impact:**	Medium to low

The results of the Visual Impact Assessment for the proposed Steynsrus PV Solar Energy Facility therefore found that the proposed activity will have a **medium to low** impact from KOPs identified in the *foreground* and *middle ground*(<3km).

10.2 Recommendations

Based on the above and the documentation attached under Annexure 2, it is herewith recommended that the proposed activity be approved subject to the mitigation measures described in section 7.4 above and the Environmental Management Programme described in section 11 below.

It is furthermore recommended that the proposed activity not be established closer than 200m from the R76 in order to establish a proper buffer between the observer and the observed view.

11 ENVIRONMENTAL MANAGEMENT PROGRAMME

The management plan tables summarise the key findings of the visual impact report and include possible management actions in order to mitigate the potential visual impacts.

Table 11: Environmental Management Programme – Planning Phase

OBJECTIVE: To establish a facility that would fit in with the landscape and not create a detrimental visual impact.		
Project component/s	Photovoltaic 'string' of panels including ancillary infrastructure such as a maintenance workshop, storage building and offices.	
Potential Impact	Potential visual intrusion in the area and damage to the natural environment.	
Activity/risk source	Potential impact on sensitive receptors within the *foreground* and *middle ground*.	
Mitigation: Target/Objective	Diligent planning of the proposed facility to minimise the expected visual impact.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Prepare an environmental constraints plan to establish the environmental sensitive areas and those areas upon which the development may occur.	SunCorp / planners	In the planning phase
Plan vegetated and landscaped berms around the perimeter of the project site to minimise visual impacts onto the site.	SunCorp / planners / landscape architect	In the planning phase
Design buildings to reflect the local architecture and sense of place of the Free State.	SunCorp / contractor	Pre-construction
Consider raising the PV platforms so that cattle can roam underneath the PV 'string'.	SunCorp / planners	In the planning phase
Continue farming practices elsewhere on the property to ensure that the property is not completely denude of agricultural activities.	SunCorp / planners	In the planning phase
Performance Indicator	Well maintained facility that has a small footprint on the environment. Natural processes continuing to occur unhindered. All actions to be measured against the Operational Phase Environmental Management Plan.	
Monitoring	N/A	

Table 12: Environmental Management Programme – Construction Phase

OBJECTIVE: Mitigate the possible visual impact associated with the construction phase.		
Project component/s	Construction site	
Potential Impact	Visual impact of general construction activities and associated impacts.	
Activity/risk source	Potential impact on sensitive receptors within the *foreground* and *middle ground*.	
Mitigation: Target/Objective	Minimal visual intrusion by construction activities and general acceptance and compliance with Environmental Specifications.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
An Environmental Control Officer (ECO) must be appointed to oversee the construction process and ensure compliance with conditions of approval.	SunCorp	Pre-construction
Contractor to sign and undertake to comply with Environmental Specifications.	Contractor	Pre-construction
Demarcate sensitive areas and no-go areas with danger tape to prevent disturbance during construction.	SunCorp / contractor	Pre-construction
Keep disturbed areas to a minimum.	SunCorp/ contractor	Throughout construction
Identify suitable areas within the construction site for fuel storage, temporary workshops, eating areas, ablution facilities and washing areas.	SunCorp/ contractor	Throughout construction
Institute a solid waste management programme to minimise waste generated on the construction site, and recycle where possible.	SunCorp/ contractor	Throughout construction
Reduce and control dust through the use of approved dust suspension techniques as and when required.	SunCorp/ contractor	Throughout construction
Construction to occur only during daytime. Should the ECO authorize night work, low flux and frequency lighting shall be used.	SunCorp/ contractor	Throughout construction
Rehabilitate all disturbed areas in accordance with the development plan.	SunCorp/ contractor	Construction
Institute a rigorous planting regime in collaboration with the appointed botanical specialist.	SunCorp/ contractor	Construction

Performance Indicator	Construction site is confined to the demarcated areas identified on a Development Plan. No transgression of the Environmental Specifications visible and natural processes occurring freely outside boundaries of the construction site.
Monitoring	Monitoring to be undertaken by an appointed Environmental Control Officer who will enforce compliance with the Environmental Specifications.

Table 13: Environmental Management Programme – Operational Phase

OBJECTIVE: Mitigate the possible visual impact associated with the operational phase.		
Project component/s	Photovoltaic 'string' of panels including ancillary infrastructure such as a maintenance workshop, storage building and offices.	
Potential Impact	Potential visual intrusion in the area and damage to the natural environment.	
Activity/risk source	Potential impact on sensitive receptors within the *foreground* and *middle ground*.	
Mitigation: Target/Objective	A facility that fits in with the landscape, that is well maintained and managed.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Maintain the general appearance of the facility as a whole (i.e. the PV panels, buildings and associated infrastructure, roads and natural environment).	SunCorp/ operator	Throughout operational phase
Monitor land surface below PV 'strings' to prevent loss of vegetation and first signs of desertification.	SunCorp/ operator	Throughout operational phase
Maintain access roads to prevent scouring and erosion, especially after rains.	SunCorp/ operator	Throughout operational phase
Performance Indicator	Well maintained facility that has a small footprint on the environment. Natural processes continuing to occur unhindered. All actions to be measured against the Operational Phase Environmental Management Plan.	
Monitoring	ECO to undertake monitoring functions for a year after construction has been completed to ensure compliance with mitigation measures. Management thereafter to be undertaken by operator.	

Table 14: Environmental Management Programme – Decommissioning Phase

OBJECTIVE: To restore the property to is former natural state.	
Project component/s	Photovoltaic 'string' of panels including ancillary infrastructure such as a maintenance workshop, storage building and offices.
Potential Impact	Potential residual visual impacts left by buildings and infrastructure after

	decommissioning.		
Activity/risk source	Potential impact on sensitive receptors within the *foreground* and *middle ground*.		
Mitigation: Target/Objective	To leave a property that is rehabilitated to the extent that natural processes will be able to continue unhindered.		
Mitigation: Action/control		**Responsibility**	**Timeframe**
Prepare a decommissioning plan to establish a timeframe and order of decommissioning of the plant.		SunCorp	Pre-decommissioning phase
Removal of all infrastructure introduced into the landscape (i.e. PV panels, ancillary infrastructure such as a maintenance workshop, storage building and offices)		SunCorp / operator	During decommissioning phase
Rehabilitate all new access roads created during the construction period.		SunCorp / operator	During decommissioning phase
Institute monitoring of all decommissioned and rehabilitated sections of the project site at regular intervals.		SunCorp / operator	During decommissioning phase
Performance Indicator	Intact vegetation cover with no signs of former foreign infrastructure in the landscape. No signs of erosion.		
Monitoring	Operator, in consultation with botanical specialist, to undertake monitoring functions at regular intervals to ensure rehabilitation in accordance with the decommissioning plan.		

12 CONCLUSION

The development of sustainable energy sources holds huge benefits for the country as a whole, and would have significant multipliers in the local economy. Not only do renewable energy projects contribute to clean development mechanism, but it would also establish an empowering environment in the region within which the facility is established. Sustainable energy projects should therefore be undertaken to provide the necessary infrastructure and associated amenities to accommodate the industry in an efficient manner and which does not negatively impact on the comparative economic advantages of a region.

It is believed that the proposed Steynsrus PV Solar Energy Facility could go a long way to creating such an empowering environment.

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Steynsrus.27°57''10.36'S and 27°33''44.91E. Google Earth. 10 December 2012

http://www.saexplorer.co.za/south-africa/climate/steynsrus_climate.asp

http://en.wikipedia.org/wiki/Steynsrus

ZONE LAND SOLUTIONS
8 AUGUST 2013

PROPOSED STEYNSRUS PHOTOVOLTAIC SOLAR ENERGY FACILITY

Remainder of the Farm Kleindeel No. 1342, Remainder of the Farm Arbeid No. 2154, and Remainder of the Farm Weltevrede No. 2151, Free State Province

ANNEXURE 1

DECLARATION OF INDEPENDENCE

8 AUGUST 2013

PROJECT NO: VIA_301112.SA

Produced for:

SunCorp

On behalf of:

Savannah Environmental (Pty) Ltd.

Produced by:

PROPOSED STEYNSRUS PHOTOVOLTAIC SOLAR ENERGY FACILITY

Remainder of the Farm Kleindeel No. 1342, Remainder of the Farm Arbeid No. 2154, and Remainder of the Farm Weltevrede No. 2151, Free State Province

ANNEXURE 2

SELECTED OBSERVATION POINT VIEWSHEDS AND ASSESSMENTS

8 AUGUST 2013

PROJECT NO: VIA_301112.SA

Produced for:

SunCorp

On behalf of:

Savannah Environmental (Pty) Ltd.

Produced by:

ZONE LAND SOLUTIONS

www.zonesolutions.co.za

PROPOSED STEYNSRUS PHOTOVOLTAIC SOLAR ENERGY FACILITY

Remainder of the Farm Kleindeel No. 1342, Remainder of the Farm Arbeid No. 2154, and Remainder of the Farm Weltevrede No. 2151, Free State Province

ANNEXURE 3

LIST OF PLANS

8 AUGUST 2013

PROJECT NO: VIA_301112.SA

Produced for:

SunCorp

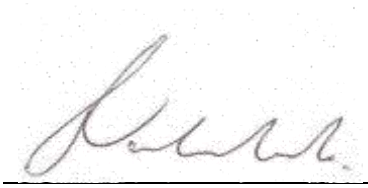
On behalf of:

Savannah Environmental (Pty) Ltd.

Produced by:

Declaration of Independence

I, Jacques Louis Volschenk, representing Zone Land Solutions (Pty) Ltd., hereby declares that I am an independent consultant appointed to provide specialist input for a VIA assessment. I confirm that I have no personal financial interest in the project other than remuneration for the VIA study itself, and neither I nor Zone Land Solutions (Pty) Ltd. will benefit in any other way from the outcomes of this VIA study. I further declare that opinions expressed in this report have been formulated in an objective manner without interference from any third party.

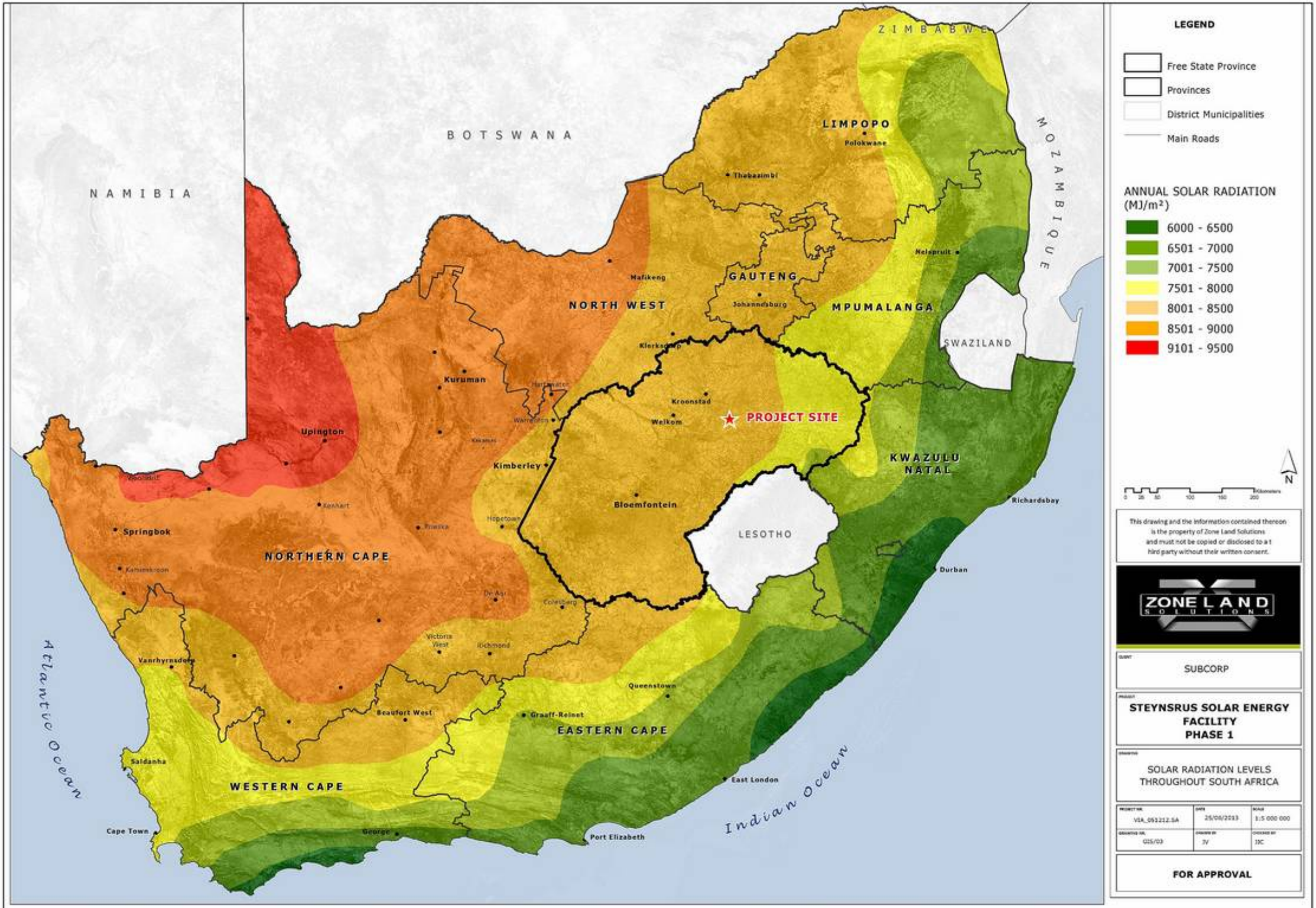


Jacques Volschenk

Print Name **Signature**

20 December 2012

Date



ZONE LAND SOLUTIONS

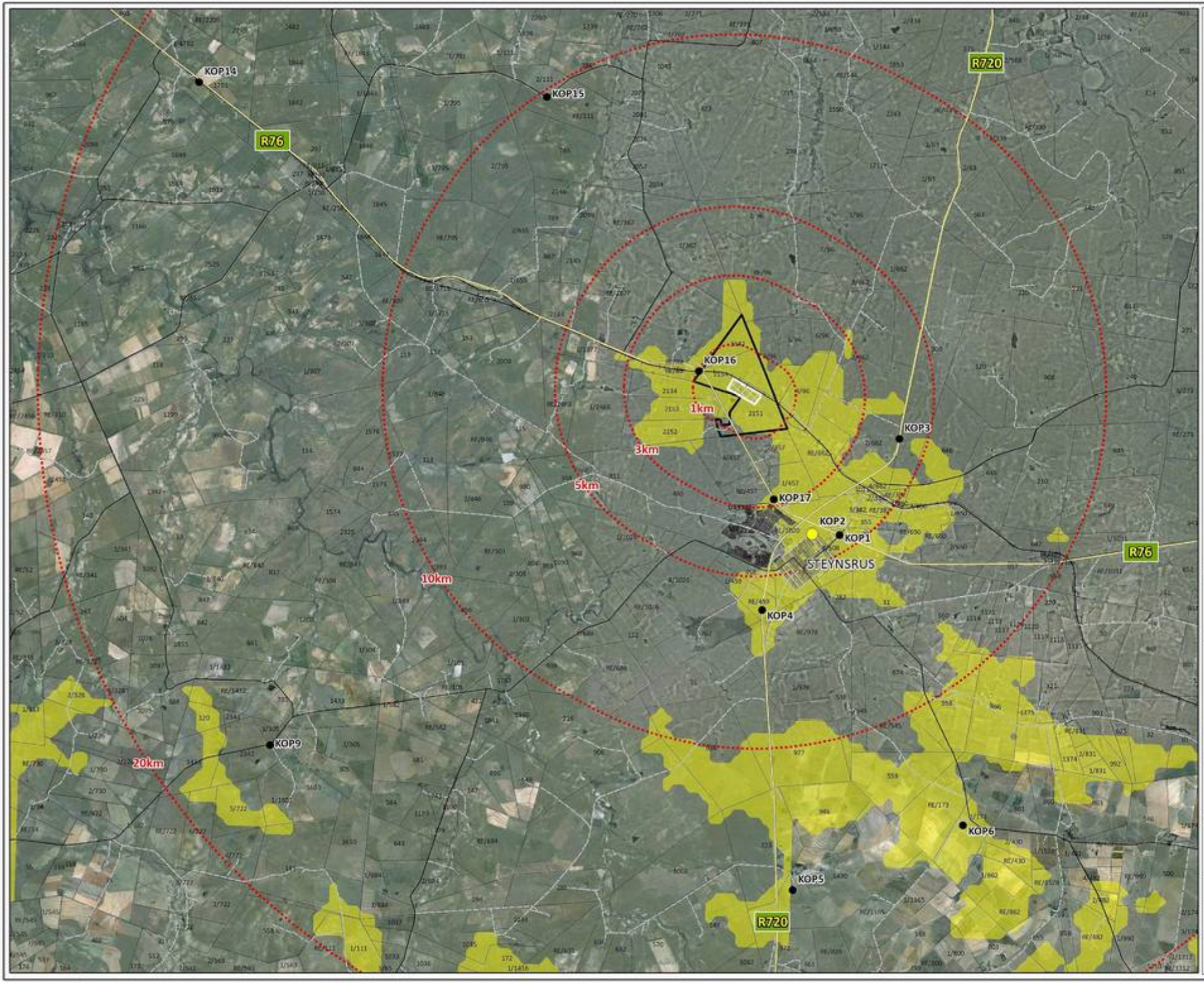
CLIENT: SUBCORP

PROJECT: **STEYNSRUS SOLAR ENERGY FACILITY PHASE 1**

DESCRIPTION: SOLAR RADIATION LEVELS THROUGHOUT SOUTH AFRICA

PROJECT NR.	DATE	SCALE
VSR_051212-SA	25/06/2013	1:5 000 000
DRAWING NR.	DRAWN BY	CHECKED BY
035/03	JV	JDC

FOR APPROVAL



LEGEND

- Subject property
- Project site
- Cadastral boundaries
- Distance radii
- Key Observation Points
- Origin of Viewshed

0 0.5 1 2 3 4 Kilometers

N

ZONE LAND SOLUTIONS

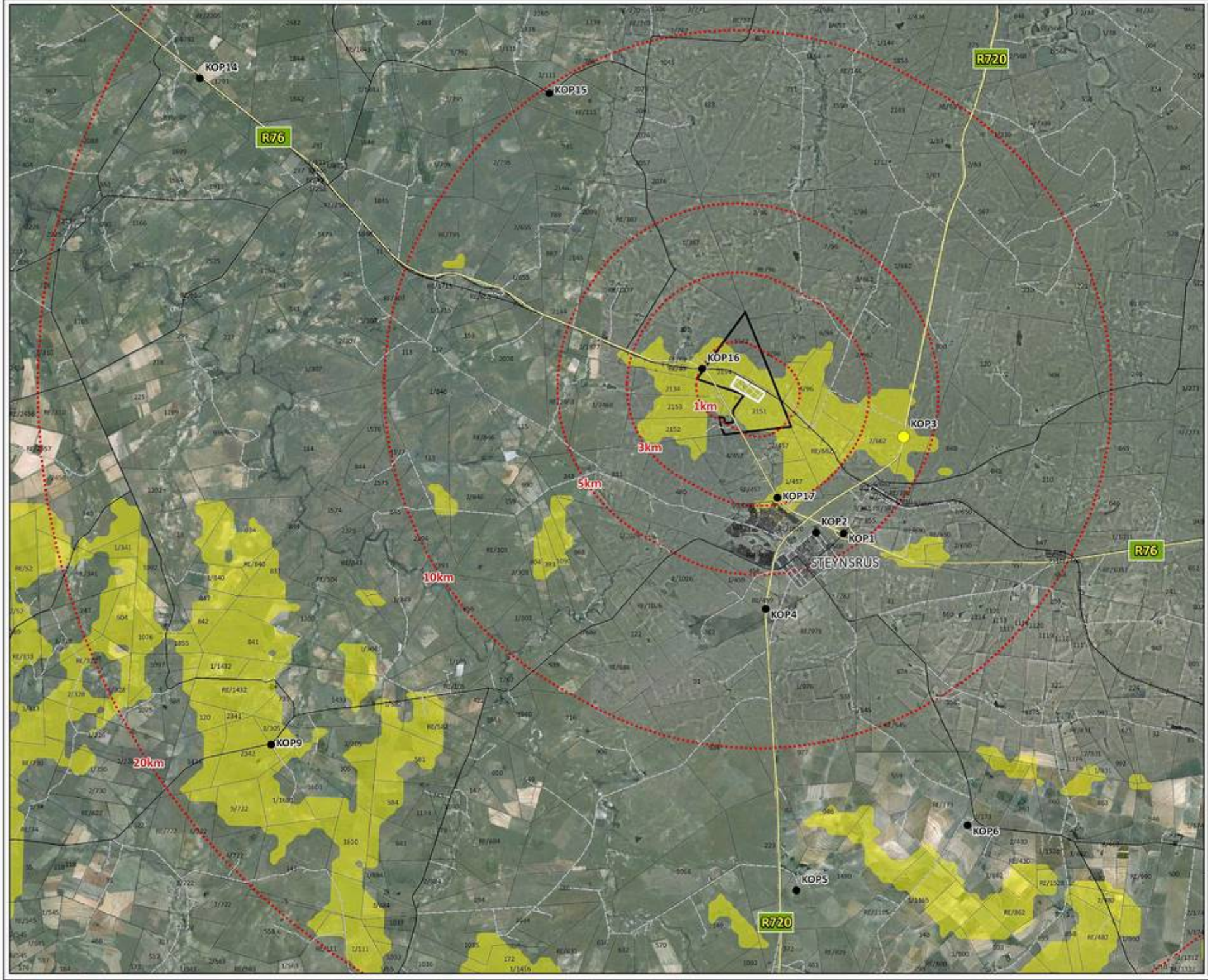
SUNCORP

STEYNSRUS SOLAR ENERGY FACILITY PHASE 1

KOP2 VIEWSHED

PROJECT NR.	DATE	SCALE
VIA_051212.SA	21/06/2013	1:100 000
DRAWING NR.	DRAWN BY	CHECKED BY
005/03a	JV	JJC

FOR APPROVAL



LEGEND

- Subject property
- Project site
- Cadastral boundaries
- Distance radii
- Key Observation Points
- Origin of Viewshed

0 0.5 1 2 3 4 Kilometers

N

ZONE LAND SOLUTIONS

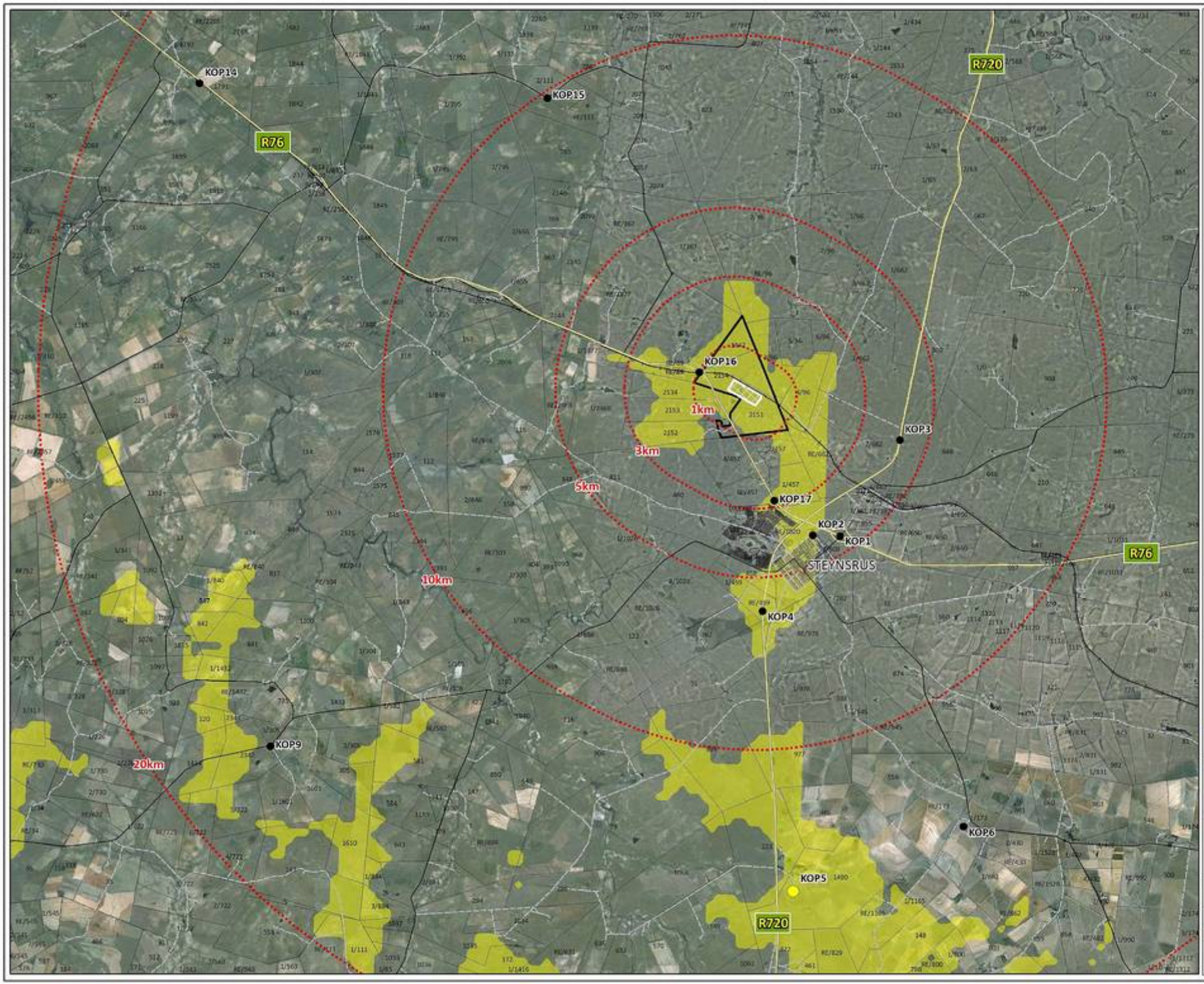
CLIENT: SUNCORP

PROJECT: **STEYNSRUS SOLAR ENERGY FACILITY PHASE 1**

DRAWING: KOP3 VIEWSHED

PROJECT NO.	DATE	SCALE
VIA_051212.SA	21/06/2013	1:100 000
DRAWING NO.	DRAWN BY	CHECKED BY
GIS/036	JV	DC

FOR APPROVAL



LEGEND

- Subject property
- Project site
- Cadastral boundaries
- Distance radii
- Key Observation Points
- Origin of Viewshed

0 0.5 1 2 3 4 Kilometers

N

ZONE LAND SOLUTIONS

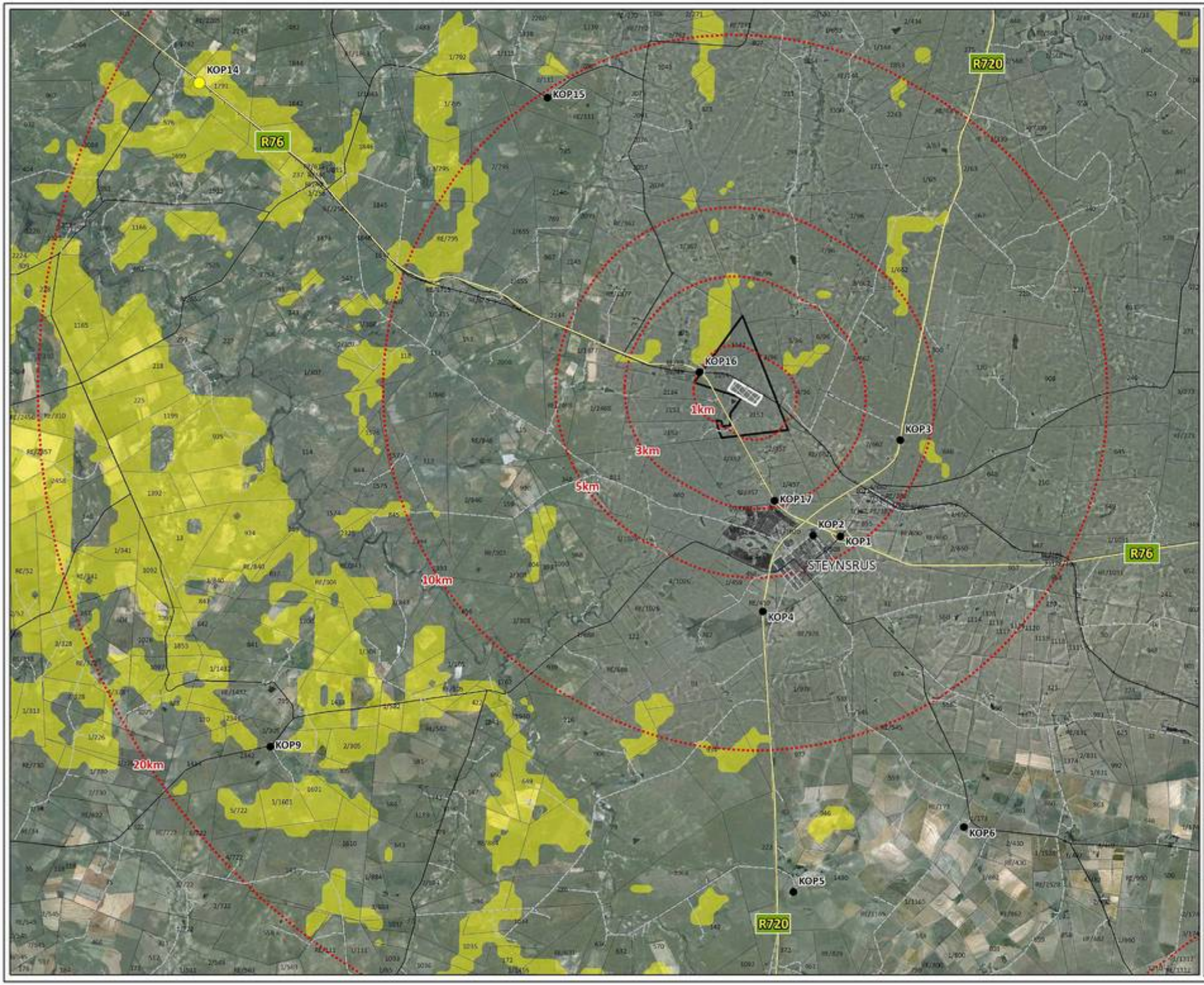
SUNCORP

STEYNSRUS SOLAR ENERGY FACILITY PHASE 1

KOP5 VIEWSHED

PROJECT NR.	DATE	SCALE
VIA_051212.SA	21/06/2013	1:100 000
DRAWING NR.	DRAWN BY	CHECKED BY
005/03c	JV	DC

FOR APPROVAL



LEGEND

- Subject property
- Project site
- Cadastral boundaries
- Distance radii
- Key Observation Points
- Origin of Viewshed

0 0.5 1 2 3 4 Kilometers

N

ZONE LAND SOLUTIONS

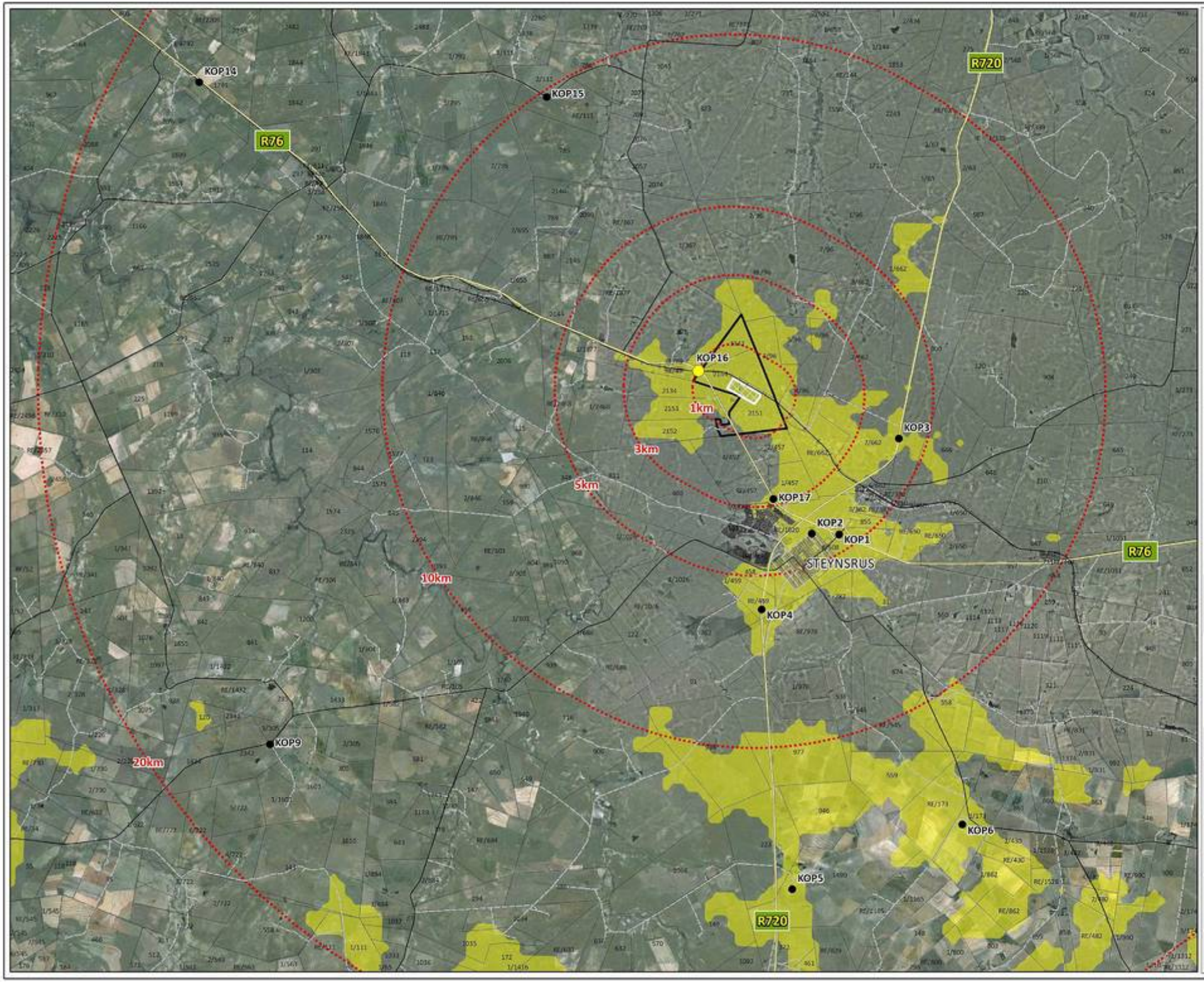
CLIENT: SUNCORP

PROJECT: **STEYNSRUS SOLAR ENERGY FACILITY PHASE 1**

DRAWING: KOP14 VIEWSHED

PROJECT NR.	DATE	SCALE
VIA_091212.SA	21/06/2013	1:100 000
DRAWING NR.	DRAWN BY	CHECKED BY
GIS/036	JV	JJC

FOR APPROVAL



LEGEND

- Subject property
- Project site
- Cadastral boundaries
- Distance radii
- Key Observation Points
- Origin of Viewshed

0 0.5 1 2 3 4 Kilometers

N

ZONE LAND SOLUTIONS

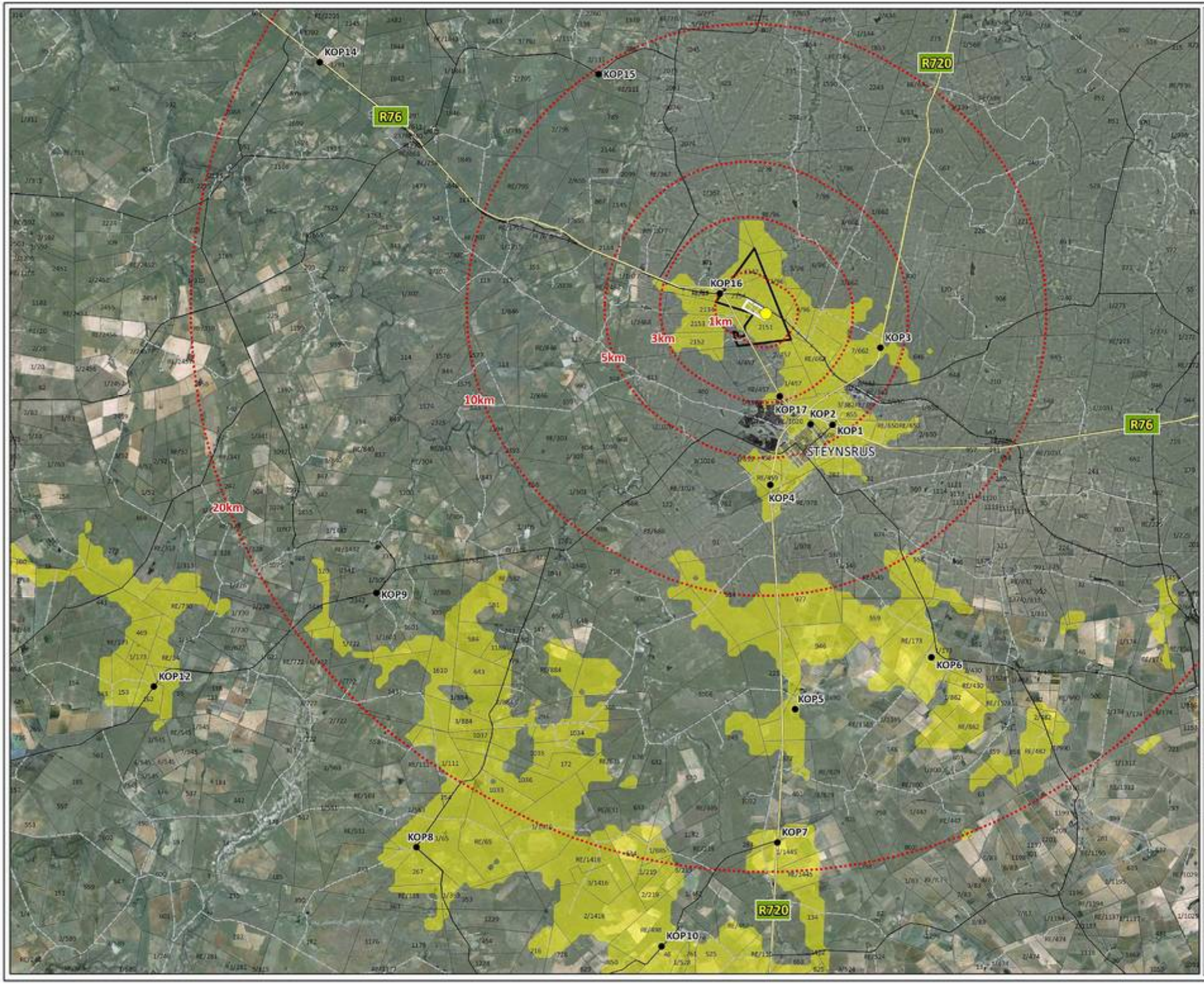
CLIENT: SUNCORP

PROJECT: **STEYNSRUS SOLAR ENERGY FACILITY PHASE 1**

DRAWING: KOP16 VIEWSHED

PROJECT NO.	DATE	SCALE
VIA_051212.SA	21/06/2013	1:100 000
DRAWING NO.	DRAWN BY	CHECKED BY
GIS/03e	JV	JBC

FOR APPROVAL



LEGEND

- Subject property
- Project sites/options
- Cadastral boundaries
- Distance radii
- Key Observation Points
- Origin of Viewshed
- Viewshed extent

0 0.5 1 2 3 4 Kilometers

N

ZONE LAND SOLUTIONS

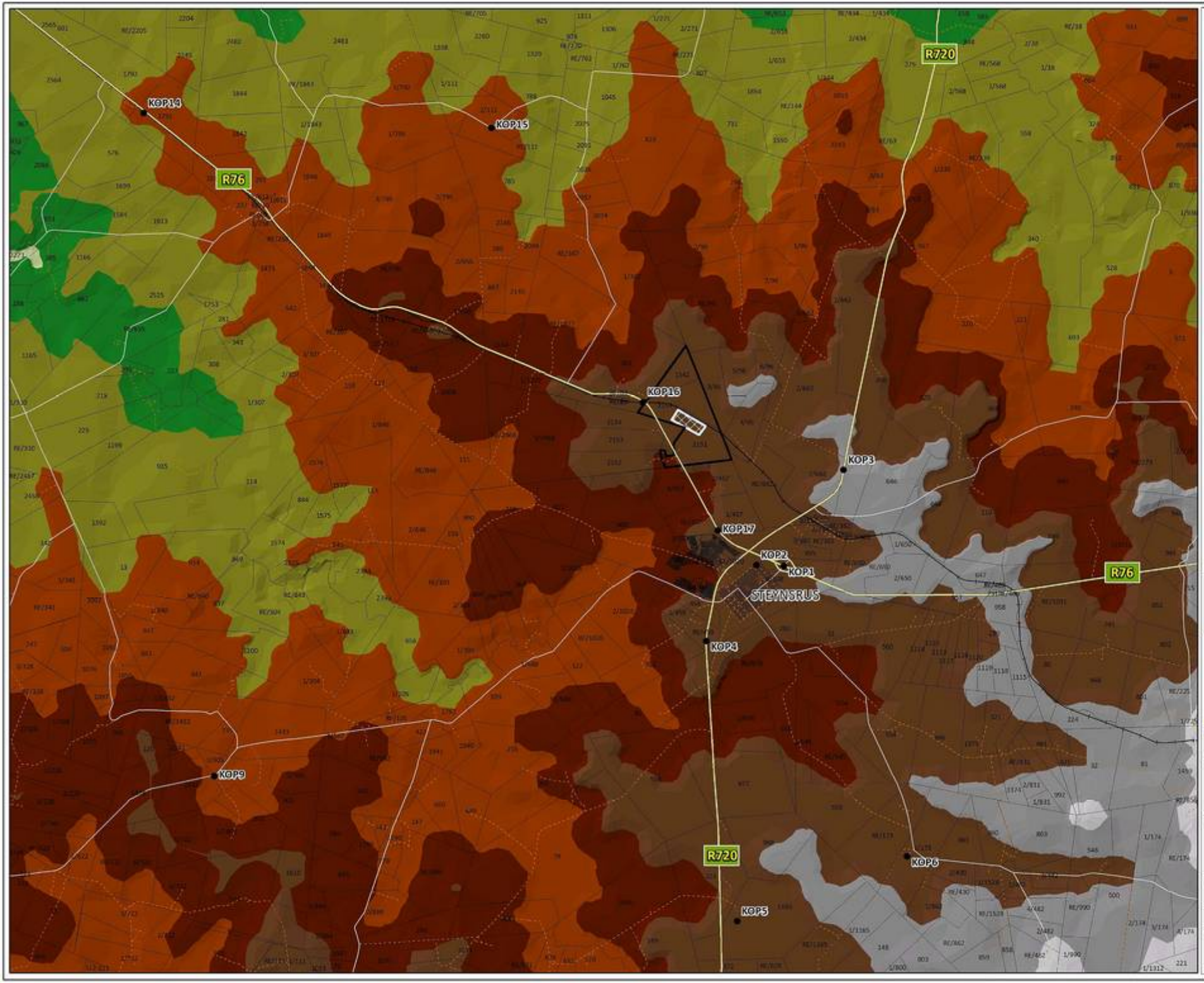
CLIENT: SUNCORP

PROJECT: **STEYNSRUS SOLAR ENERGY FACILITY PHASE 1**

DRAWING: VIEWSHED ANALYSIS

PROJECT NO.	DATE	SCALE
VIA_061212.SA	21/06/2013	1:125 000
DRAWING NO.	DRAWN BY	CHECKED BY
GIS/03	JV	DC

FOR APPROVAL



LEGEND

- Subject property
- Project site
- Cadastral boundaries
- Key Observation Points
- Main Roads
- Railway Lines

DIGITAL ELEVATION MODEL

Elevation

- 1586.667 - 1620
- 1553.333 - 1586.667
- 1520 - 1553.333
- 1486.667 - 1520
- 1453.333 - 1486.667
- 1420 - 1453.333
- 1386.667 - 1420
- 1353.333 - 1386.667
- 1320 - 1353.333

N

0 0.5 1 2 3 4 Kilometers

ZONE LAND SOLUTIONS

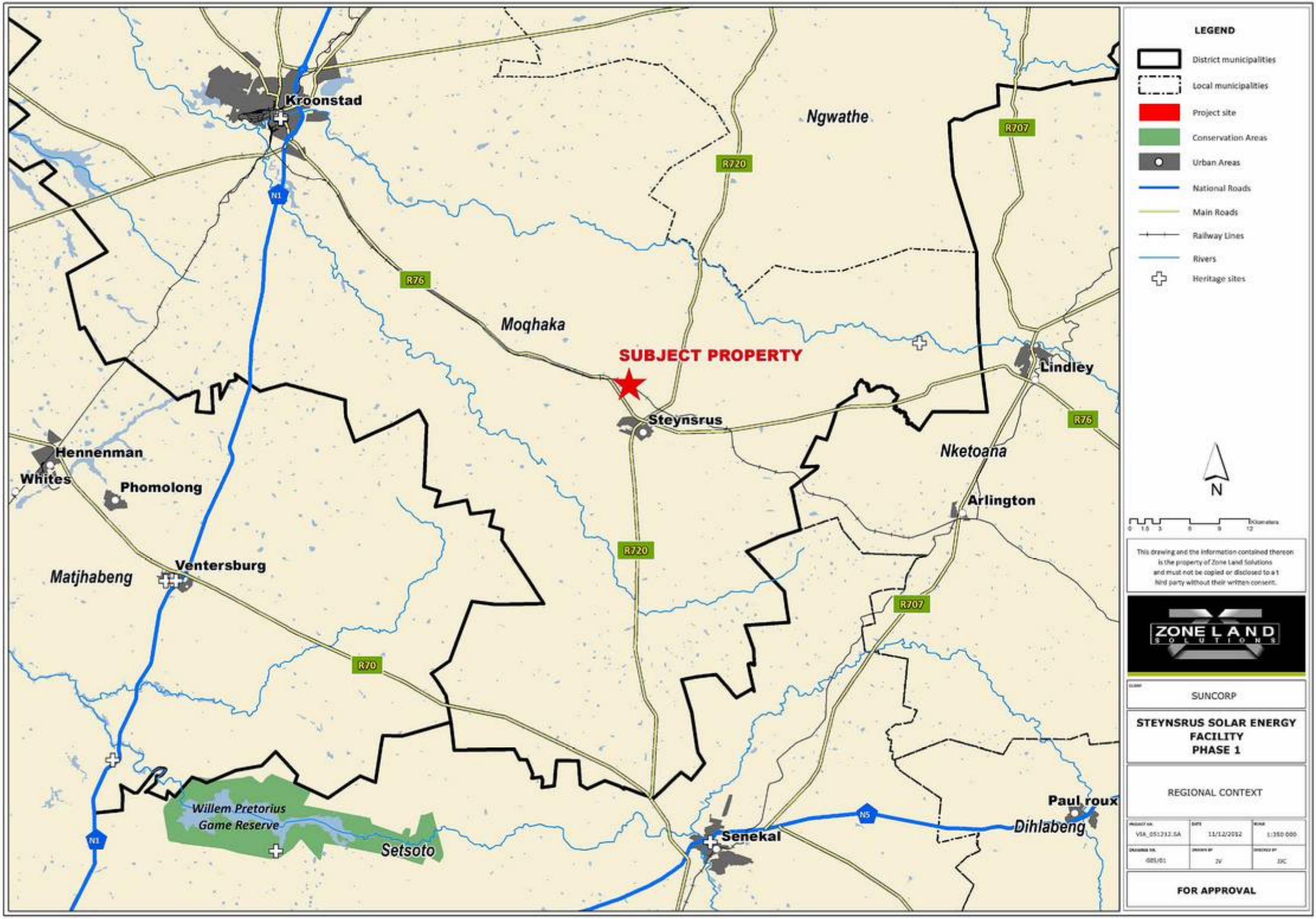
CLIENT: SUNCORP

PROJECT: **STEYNSRUS SOLAR ENERGY FACILITY PHASE 1**

DRAWING: DIGITAL ELEVATION MODEL

PROJECT NO.	DATE	SCALE
VIA_051212.SA	23/06/2023	1:150 000
DRAWING NO.	DRAWN BY	CHECKED BY
GDS/04	JV	JJC

FOR APPROVAL


Kroonstad
Ngwathe
R707
R720
N1
R76
Moqhaka
SUBJECT PROPERTY
Lindley
Steynsrus
R76
Hennenman
Whites
Phomolong
Nketoana
Arlington
R720
Matjhabeng
Ventersburg
R707
R70
Willem Pretorius
Game Reserve
Setsoto
Senekal
N5
Paul roux
Dihlabeng
N1
LEGEND
District municipalities
Local municipalities
Project site
Conservation Areas
Urban Areas
National Roads
Main Roads
Railway Lines
Rivers
Heritage sites
N
0 1.5 3 6 9 12 Kilometers
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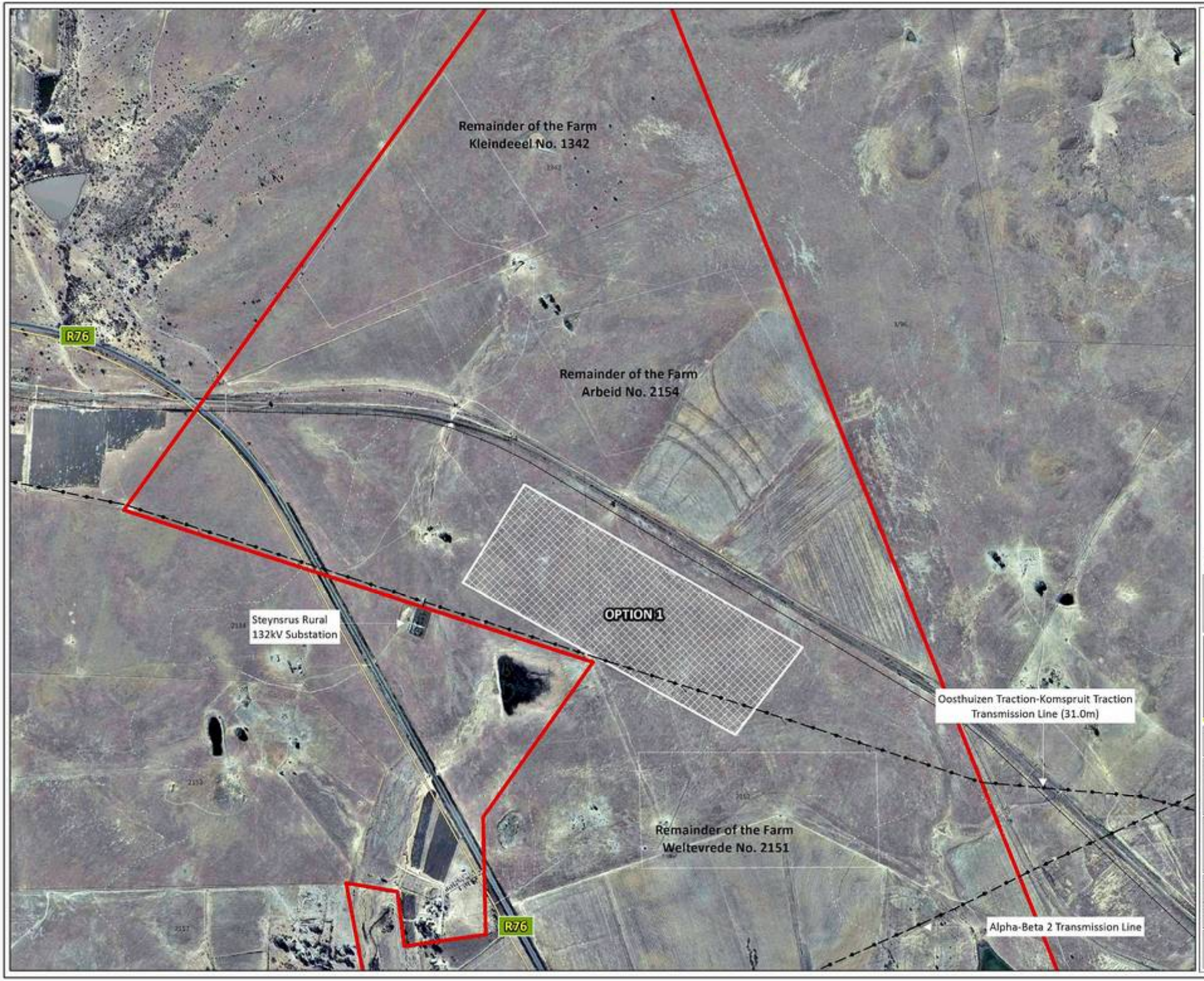
ZONE LAND SOLUTIONS
CLIENT
SUNCORP
STEYNSRUS SOLAR ENERGY FACILITY PHASE 1
REGIONAL CONTEXT
PROJECT NO. VIA_051212.SA
DATE 11/12/2012
SCALE 1:350 000
DRAWING NO. 085/01
DRAWN BY ZV
CHECKED BY DC
FOR APPROVAL



LEGEND

- Subject property
- Project site
- Cadastral boundaries
- Electrical Powerline Servitudes
- Contours

N

0 0.05 0.1 0.2 0.3 0.4 Kilometers

ZONE LAND SOLUTIONS

CLIENT: SUNCORP

PROJECT: **STEYNSRUS SOLAR ENERGY FACILITY PHASE 1**

DRAWING: PROJECT SITE CONTEXT

PROJECT NR.	DATE	SCALE
VEA_091212.SA	21/06/2013	1:10 000
DRAWING NR.	DRAWN BY	CHECKED BY
GDS/02	JV	JVC

FOR APPROVAL