Annex I

Visual Specialist Report

FINAL

VISUAL IMPACT ASSESSMENT

PROPOSED OLYVEN KOLK SOLAR POWER PLANT

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TABLE OF CONTENTS

TABLE OF COLOUR PLATES

ACRONYMS

BPEO	Best Practicable Environmental Option
BLM	Bureau of Land Management (United States Department of Internal Affairs)
DTM	Digital terrain model
EIA	Environmental impact assessment
EMP	Environmental Management Plan
GIS	Geographic information system
I&AP	Interested and Affected Party
IEMA	Institute of Environmental Management and Assessment (UK)
KOP	Key Observation Point
PLM	Proposed Landscape Modification
PRU	Physiographic Rating Unit
VAC	Visual absorption capacity
VE	Visual Envelope
VIA	Visual impact assessment
VRM	Visual resource management
WRD	Waste Rock Dump
ZVI	Zone of Visual Influence

GLOSSARY

Alternatives
A possible course of action, in place of another, that would meet the same purpose and need defined by the development proposal. Alternatives considered in the EIA process can include location and/or routing alternatives, layout alternatives, process and/or design alternatives, scheduling alternatives or input alternatives.

Best practicable environmental option
This is the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.

Cumulative Impact
The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.' [1]

Environmental impact assessment
A public process that is used to identify, predict and assess the potential positive and negative social, economic and biophysical impacts of a proposed development. EIA includes an evaluation of alternatives, appropriate management actions and monitoring programmes.

Impact (visual)
A description of the effect of an aspect of the development on a specified component of the visual, aesthetic or scenic environment within a defined time and space

Issue (visual)
Issues are concerns related to the proposed development, generally phrased as questions, taking the form "what will the impact of some activity be on some element of the visual, aesthetic or scenic environment?"

Key Observation Points (KOP)
Receptors refer to the people located in the most critical locations or Key Observation Points (KOPs) surrounding the landscape modification who make consistent use of the views associated with the site where the landscape modifications are proposed. KOPs can either be a single point of view that an observer/evaluator uses to rate an area or panorama, or a linear view along a roadway, trail, or river corridor. [2]

Landscape integrity
The relative intactness of the existing landscape or townscape, whether natural, rural or urban, and with an absence of intrusions or discordant structures

Management actions
Actions that enhance benefits of a proposed development, or avoid, mitigate, restore or compensate for negative impacts.

Physiographic Rating Units (PRU)
PRU which are defined as areas within the proposed sites which have physical as well as graphic similarities.

Pre-application planning
The process of identifying environmental opportunities and constraints, potential fatal flaws and negative impacts, as well as alternatives and management actions in the early stage of the project design, prior to application for environmental authorization.

Receptors
Individuals, groups or communities who will be subject to the visual influence of a particular project.

Scenarios
A description of plausible future environmental states that could influence the nature, extent, duration, magnitude/intensity, probability and significance of the impact occurring

Sense of place
The unique quality or character of a place, whether natural, rural or urban.

Scenic corridor
A linear geographic area that contains scenic resources, usually, but not necessarily, defined by a route. See also *view corridor.*

Scoping
The process of determining the key issues, and the space and time boundaries to be addressed in an environmental assessment.

Viewshed
The outer boundary defining a view catchment area, usually along crests and ridgelines. Similar to a watershed.

Zone of Visual Influence
The ZVI is defined as the 'area within which a proposed development may have an influence or effect on visual amenity.'[3]

1 EXECUTIVE SUMMARY

The proposed solar power plant is located on the remaining portion of 14 (a portion of portion 4) of Olyven Kolk Farm, No. 187 which is situated in the Siyanda District of the Northern Cape. The project has two layout alternatives to be assessed:

- Site Layout Alternative 1: (Plate 3) This option consists of 160 panels in three sections over a footprint of 160ha with a total power of 200 MW
- Site Layout Alternative 2: (Plate 4) This alternative has a total power of 190MW and is derived out of the constraints and mitigations put forward by specialists in their assessment of Alternative 1.

Planning and Guidelines Key Findings:

- Tourism is an existing important economic driver for the region
- Solar farming is seen as an important future economic driver for the region
- The Siyanda District in the Northern Cape has been identified as the top solar resource in the country which ranks with some of the best solar statistics in the world. A solar power station in this area would therefore provide steady power generation with low CO^2 emissions and water consumptions.

Site Landscape Character Key Findings:

The site is mostly flat with some slight undulation in the drainage areas. The landuse is currently agricultural sheep farming and as such existing man made modifications are limited. Located on the site are two 400 kV Eskom transmission lines which feed into the Aries Sub-station located just to the north of the site. The following broad brush landscapes were defined within the 2km Zone of Visual Influence (ZVI) of the proposed solar power project:

- Biodiversity
  - Bushmanland Basin Shrubland
  - Natural drainage lines /dry river beds
- Modified
  - Railway Line and access road
  - Aries Sub station
  - Powerlines crossing site and adjacent to site
- Agricultural Grazing land

Viewshed Key Findings:

The viewshed is described as **localised** in extent. Based on the viewshed and the findings of the site visit, the following receptors and landscape features were identified as being included in the viewshed of the proposed component landscape modifications:

- Agricultural Farmstead 1
- Gravel District Road (Eastbound)
- Gravel District Road (Westbound)
- Aries Substation
- Agricultural Farmstead 2

Exposure Key Findings:

The following communities were identified as having **High and Moderate** Exposure to the proposed landscape modifications. It is recommended that the receptors are assessed in terms of sensitivity to proposed landscape modification:

- High exposure:
  - District Farm Road receptors east and westbound
  - Aries Substation
- Moderate exposure:
  - Agricultural Dwelling receptors as indicated by GPS points 017 & 020.

The overall visual exposure of the proposed landscape modification would be **Moderate.**

Receptor Sensitivity Key Findings:

PHYSIOGRAPHIC RATING UNITS	TYPE OF USERS	AMOUNT OF USE	PUBLIC INTEREST	ADJACENT USERS	SPECIAL AREAS	TOTAL
Dry river beds/ drainage lines	L	L	H	L	H	H
Arid Nama Karoo biome	L	L	L	L	L	L

Source: Bureau of Land Management, U.S. Department of Interior. 2004. Visual Resource Management Manual 8400
(L = Low, M = Moderate, H = High, N = No. Y = Yes)

The overall sensitivity of the receptors would be **Low** due to the limited use of the views of the project site and the strong visual associations of the Aries Substation and transmission lines.

KOP Key Findings:
The following communities were identified as significant in terms of their proximity to the proposed landscape modifications and would require assessment of the visual impacts as seen from these locations:

- Agricultural Farm buildings (GPS 020)
- District Farm Road (GPS 013 & GPS 015)
- Agricultural Farmstead (west of site) (GPS 017)

Scenic Quality Key Findings:

- The overall scenic quality was defined as **Moderate to Low** due to the uniformity of the landscape. Adjacent scenic value is Low due to the presence of the Aries substation and the powerlines which cut through the property. The scarcity value of the dry river beds / drainage lines is due to the High and Medium to High ecological ratings for these areas from the Ecology Impact assessment (Simon Todd Consulting)

VRM Sensitivity Mapping Key Findings:

- No Class I type landscapes were defined within the area.
- The Dry river beds/ drainage lines were defined as having a Class II status where the visual objective is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low and should not attract the attention of the casual observer.
- The Arid Nama Karoo biome was defined as having a Class III status where the visual objective is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate and may attract attention but should not dominate the view of the casual observer.

Cumulative Impacts
There are a number of known proposed solar energy facilities (approximately ten) planned in the Northern Cape. Three of these are located in close proximity to the proposed Olyven Kolk solar power plant, including one which will also be located on another portion of the Olyven Kolk Farm.[4] The proposed BioTherm Energy Kleinzwart Bast Photovoltaic Solar Power Plant is situated in the Kenhardt District, alongside the Aries substation. See Appendix for background details.

Should many more of these types of solar energy development take place in close proximity to each other, there is a possibility that the area will exceed the carrying capacity created by the agricultural sense of place and that the sense of place will be defined by the solar energy facilities. However, due to the limited visual resources in the area and the limited number of receptors, any potential cumulative impact would be contained to the area and would not negatively impact on the tourism.

Summary Impacts Rating

Impact	**Layout Alternative 1** Pre- mitigation	**Layout Alternative 2** Pre- mitigation	**Layout Alternative 2** Residual Impact (post mitigation)
Construction Phase			
Visual Impact	Major -ve	Minor -ve	Minor -ve
Operational Phase			
Visual Impact	Major -ve	Minor -ve	Minor -ve

Conclusion

The site is remote and located in a flat and arid environment typical of the Northern Cape. The area is not associated with any established heritage sites or scenic routes. The main landuse in the area is agricultural sheep farming. The area is not a pristine landscape and other landscape modifications define the context, specifically the Eskom Aeries Substation (which generates high levels of visual contrast), the powerlines, the telecommunication mast and the Sishen Iron Ore railway line.

The Site Layout Alternative 2 of 190 MW photovoltaic (PV) solar panels avoids areas highlighted as ecologically sensitive and as such is the preferred development alternative. The low 2.5m height of the proposed PV panels does limit the visibility to the surrounding mainly flat terrain. As such, the viewshed is located mainly in the 2km high exposure area but does also extend in some parts to the 5km Foreground / Middle ground. However, it must be noted that the viewshed does not extend outside of the existing Aries Substation located adjacent the site to the north. This existing feature dominates the landscape context, and as such it is very likely that the visual intrusion would not be perceived as significant by the receptors.

2 INTRODUCTION

Visual impact is defined as 'The effect of an aspect of the development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.' [5] As identified in this definition, 'landscapes are considerably more than just the visual perception of a combination of landform, vegetation cover and buildings as they embody the history, landuse, human culture, wildlife and seasonal changes to an area.' [6] These elements combine to produce distinctive local character that will affect the way in which the landscape is valued and perceived.

VRM Africa's objective is to provide I&AP's and decision makers with sufficient information to take "early opportunities for avoidance of negative visual effects." This is based on the U.K Institute of Environmental Management and Assessment's (IEMA) and Western Cape Department of Environmental Affairs and Development Planning Guidelines (South Africa):

- "The ideal strategy for each identifiable negative effect is one of avoidance. If this is not possible, alternative strategies of reduction, remediation and compensation may be explored. If the consideration of mitigatory measures is left to the later stages of scheme design, this can result in increased mitigation costs, because early opportunities for avoidance of negative visual effects are missed." [7]
- "In order to retain the visual quality and landscape character, management actions must become an essential part of the guidelines throughout construction, and operation.... Proper management actions ensure that the lowest possible impact is created by the project...
- On-going monitoring programmes with regard to the control of aesthetic aspects for all stages of the project are a vital component ensuring that the long term visual management objectives will be met."[8]

2.1 TERMS OF REFERENCE

VRM Africa was appointed by Environmental Resources Management (Southern Africa) Pty Ltd (ERM) to undertake a Landscape and Visual Impact Assessment (VIA) for the proposed Olyven Kolk Solar Power Plant. The proposed Olyven Kolk Solar Power Project lies on Portion 14 (a portion of portion 4) of Olyven Kolk Farm, No. 187 which is situated 126 km south west of Upington in the Kai !Garib Municipal Area under the Siyanda District Municipality, Northern Cape. The nearest town is Kenhardt, which lies 44 km north east along the R27. (See Regional Locality Map in Plate 1)

The intention of this report is to:

- identify the visual resources of the area which define the landscape character;
- identify the main potential receptors or Key Observation Points (KOP);
- identify potential visual impacts;
- identify potential mitigations.

Other solar energy projects that VRM Africa has been involved in are:

- Kathu CSP
- Sasol CSP
- Beaufort West PV (in progress)

2.2 VRM AFRICA DECLARATION OF INDEPENDENCE

ERM appointed *VRM AFRICA CC* as an independent professional visual impact practitioner to facilitate the Visual Impact Assessment (VIA). Stephen Stead is the director and owner of VRM Africa, a GIS and visual impact assessment consultancy. He studied Psychology and Geography at Pietermaritzburg University in KwaZulu – Natal and then undertook an Honours degree in Human Geography. He has 12 years experience in the field of GIS mapping and 3D modelling through his work as a GIS consultant and visual impact practitioner. His experience in visual impact assessment was obtained by working in association with ILASA and SACLAP registered landscape architect Liesel Stokes (B.L. Pr L.Arch (ML) (Pret)). Together they have assessed over 100 major landscape modifications throughout Southern Africa. The contract services of Liesel Stokes were utilised in this project for review and design related work. VRM Africa has been operating for eight years and has successfully established and retained a large client base throughout Southern Africa.

I, Stephen Stead, author of the Visual Impact specialist report, hereby declare that I am an independent consultant appointed by ERM to provide specialist input on the proposed Olyven Kolk Solar Power Plant. I hereby confirm that I have no business, financial, personal or other interest in the activity, application or appeal in respect of which I have been appointed other than fair remuneration for work performed in connection with the activity and application. All opinions expressed in this specialist report are my own.

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VRM Africa is indemnified from any damages that may result from publication. Any comments on the draft copy of the VIA need to be put in writing. This report or electronic copies thereof must not be altered or added to without the prior consent of the author. Any recommendations, statements or conclusions drawn from or based upon this report must make reference to it. Within the main report, this report must be included in its entirety as an appendix or separate section.

2.3 LIMITATIONS AND ASSUMPTIONS

- This report is limited to the assessment of the visual impact of the proposed Olyven Kolk Solar Power Plant.
- The information for the terrain on which the visibility analysis is based was generated from the Chief Directorate: Surveys and Mapping 1:50 000 aerial photograph map series using the 20m contours.
- The viewshed mapping is approximate and may not represent an exact visibility incidence.
- A limitation in terms of understanding the cumulative impacts of the project is that there are other proposed solar power projects located around the Olyven Kolk site which this study could not address. It is recommended that the suitability of solar power projects needs to be addressed at a strategic level which would allow for a better understanding of the visual impacts taking all the solar power projects proposed for the area into consideration. (See Annexure 2)
- A Visual Impact Assessment is subjective as it is well documented that 'determining a visual resource in absolute terms is not achievable' (Lange 1994). [9]
- A visualisation exercise was undertaken but with moderate accuracy due to the 2.5 kilometre distance from the site to the proposed landscape modifications and the limited base modelling of the site. As such the images are for illustrative purposes only. Images of the 3D model are provided in the document I order to allow the relevant authority more of an understanding into the nature of the landscape modification.

2.4 SUMMARY OF METHODOLOGY

The impact assessment methodology that VRM Africa uses is based on the Visual Resource Management system[10] which is a systematic process developed by the Bureau of Land Management (BLM) from the United States Department of Internal Affairs to evaluate potential visual impacts associated with landscape modifications. The method is based on the premise that the degree to which a management activity affects the visual quality of a landscape depends on the visual contrast created between a project and the existing landscape. [11] The objective of this methodology is to:

- Provide a way of identifying and evaluating scenic values to determine the appropriate levels of management.

- Provide a way to analyse potential visual impacts and apply visual design techniques to ensure that surface-disturbing activities are in harmony with their surroundings.
- Using multi criteria mapped based methods increases objectivity in decision making.[12]

A: FIELD STUDY

- Relevant Planning
- Site information
- Project description and mapping
- Visual envelope/viewsheds verification
- Exposure verification
- Landscape Character
- Receptor Identification

B: INVENTORY STAGE (Baseline): The inventory stage during which field study and site sampling is undertaken**,** involves the identification of the visual resources of the area where the proposed landscape modification will influence landscape character.

- Identify Areas visual resources:
  - Landscape units
  - Scenic qualities
  - Receptor Sensitivities
  - Distance zone analysis
  - Class I, II, III and IV categorisation and objectives
  - Identify Key Observation Points
  - VRM Sensitivity mapping
  - Preliminary recommendations and mitigations (if any)

C: CONTRAST RATING STAGE (Impacts): The contrast rating or impacts assessment phase is undertaken after the inventory process has been completed. The suitability of the landscape modification is assessed by measuring the degree of contrast of the proposed landscape modification to the existing contrast created by the existing landscape. As a component in this contrast rating process, visual representation such as photo montages are vital in large scale modifications, as this serves to inform I&APs and decision making authorities of the nature and extent of the impact associated with the proposed project/development.

- Visualisation (Photo montages from KOPs if any)
- Suitability assessed by contrast rating from KOPs
- Mitigations if objectives not met.
- Impacts
- Final recommendations
- Final mitigations

For further details please refer to Annexure 1: Methodology

3

4 PROPOSED PROJECT COMPONENTS

Photovoltaic power generation employs solar panels composed of a number of cells containing a photovoltaic material. The panels are separate entities optimally angled toward the sun. The proposed project will be completed in a number of phases and will be made up of 200 Photovoltaic (PV) solar panels.

The proposed Solar Power Project is situated in the Northern Cape Province as seen in the Regional Locality Map in Plate 1. The site is located approximately 44km south-west from the town of Kenhardt which is approximately 127 km south of Upington. Stellenbosch University's Centre for Renewable and Sustainable Energy Studies data studies found that the Northern Cape has been identified as an area with exceptionally high solar irradiance.' [13] The South African government has developed a policy framework on Renewable Energy and set a target of sourcing 10,000 GWh from renewable energy projects by 2013, approximately 4 percent of South Africa's total estimated energy demand by 2013.[14]

The proposed solar power plant is located on the remaining portion of 14 (a portion of portion 4) of Olyven Kolk Farm, No. 187 which is situated in the Siyanda District of the Northern Cape. The site is accessible from the R27 along the Sishen -Saldanha railway line service road. The proposed site is approximately 400 m from the Eskom 400 kV Aries Substation.

The area of the proposed site is approximately 1,010.47 ha (10.10 km^2). The proposed photovoltaic (PV) panels will be 1.2 m in length and 0.6 m in width. These will be connected in strings and arrays to form units with a total power of 1MW each (around12,500 panels/MW). The panels will be mounted on fixed structures, approximately 2.5 m in height from the ground. The distance or spacing between rows will be around 3 m. The panels will face north in order to capture maximum sunlight.[15]

The project has two layout alternatives to be assessed:

Site Layout Alternative 1: (Plate 3)

- This option consisted of 160 panels in three sections over a footprint of 160ha with a total power of 200 MW as seen in the layout plan on Plate 3.
- Site Layout Alternative 1 consists of two stages. However the first stage of 10MW is not included in the assessed in this document.
- Input on environmental sensitivity of Alternative 1 was received from specialists following a mitigation workshop undertaken in July 2011 which informed the layout of Alternative 2.

Site Layout Alternative 2: (Plate 4)

This alternative has a total power of 190MW and is derived out of the constraints and mitigations put forward by specialists in their assessment of Alternative 1. The areas of each section can be seen in the diagram and table on the following page. A layout plan overlaid onto a Google Earth Locality Map can be seen in Plate 4. Solar arrays will cover 35.4% of the site.

Sections	Area in ha
0	11.83
1	25.38
2	23.65
3	113.01
4	32.17
5	28.76
6	36.27
7	86.67
	357.73

The break down of stages would be:

- Site Preparation and Construction
  - Site Preparation - Vegetation clearance, levelling, fence, construction camp, access roads and tracks
  - Construction - PV panels, inverter and transformer foundations, cables, electrical and control room, office, storage etc
- Operation (25 years): Cleaning, replacement of faulty components
- Decommissioning: Refurbished or replaced

List of visually relevant project components

- PV panels
- Power lines
- one or more permanent meteorological stations
- a small site office and storage facility, including security and ablution facilities
- temporary construction camp (60-80 people); permanent accommodation (for 4-5 people)
- temporary storage of materials during the construction activities and site fencing car park

5 RELEVANT PLANNING POLICY

In order to comply with the VRM requirements it is necessary to clarify which planning policies govern the property area to ensure that the scale, density and nature of activities or developments are harmonious and in keeping with the sense of place and character of the area. The proposed landscape modifications must be viewed in the context of the planning policies from the following:

- National Environmental Management Act (No. 107 of 1998) as amended by Act 56 of 2002 and Act 8 of 2004
- Northern Cape Department of Environment and Nature Conservation. Strategic Plan 2010/11-2014/15
- Siyanda District Municipality Integrated Development Plan (IDP) 2007/8 – 2011/12
- Kai !Gariep Municipality IDP 2009
- Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town. (Oberholzer, B. 2005) [16]

5.1 NORTHERN CAPE DEPT OF ENVIRONMENT & NATURE STRATEGIC PLAN 2010-15

Strategic Objective: Biodiversity Enforcement and Compliance Monitoring. Ensure sustainable use of resources for the protection of the environment and biodiversity through compliance monitoring and enforcement activities. … Stopping environmental harm before it occurs is less expensive, in terms of damage to human health and total economic costs to the community than cleaning up after the act. (Pg 33/34)[17]

5.2 SIYANDA DISTRICT MUNICIPALITY

Developmental goals and objectives:

- Siyanda District Municipality must deliver a positive contribution to the sustainable growth and development within its boundaries and the rest of the Northern Cape.
- The creation of a environmentally friendly environment within and outside of the Councils district boundaries
- The promotion of a safe and tourism friendly environment should be furthered in order to promote tourism and investor interest in the region. *(Page 35)*

5.3 KAI !GARIEP MUNICIPALITY IDP 2009

Potential internal economic drivers include:

- The development of niche tourism markets that capture full value out of the special attributes of the area.
- The exploitation of the climate of the area for energy generation (sunshine), i.e. solar farming in the adjacent Mier and //Khara Hais Municipalities *(Page 12)*

5.4 DEA&DP GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS

The Western Cape DEA&DP Guideline for involving visual and aesthetic specialists in EIA processes is used in the absence of a specific Northern Cape Visual Guideline. The BPEO (Best Practicable Environmental Option) should address the following:

- Ensure that the scale, density and nature of activities or developments are harmonious and in keeping with the sense of place and character of the area. The BPEO must also ensure that development must be located to prevent structures from being a visual intrusion (i.e. to retain open views and vistas).
- 'Long term protection of important scenic resources and heritage sites;
- Minimisation of visual intrusion in scenic areas;
- Retention of wilderness or special areas intact as far as possible;
- Responsiveness to the area's uniqueness, or sense of place.'[18]

Planning and Guidelines Key Findings:

- Tourism is an existing important economic driver for the region
- Solar farming is seen as an important future economic driver for the region
- The Siyanda District in the Northern Cape has been identified as the top solar resource in the country which ranks with some of the best solar statistics in the world. A solar power station in this area would therefore provide steady power generation with low CO^2 emissions and water consumptions.

6 LANDSCAPE CHARACTER

Landscape character is defined by the U.K Institute of Environmental Management and Assessment (IEMA) as the 'distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, landuse and human settlement.' It creates the specific sense of place or essential character and 'spirit of the place'. [19] The aim of this section is to identify the key elements that define the greater landscape character within the proposed area.

The vegetation is characteristic of a typical Nama Karoo biome where the dominant vegetation is a grassy, dwarf shrubland. Grasses tend to be more common in depressions and on sandy soils, and less abundant on clayey soils.[20] The general landuse of the area is for agricultural purposes and Kenhardt is considered the heart of the Dorper sheep-farming area.[21]. Hills to the south of Kenhardt contain the Quiver Tree Forest National Monument which is made up of 4000 – 5000 Quiver Trees.

The topography is characteristically flat to slightly undulating plains. Sporadic hills to the south of Kenhardt create some topographical relief. There is a large flat salt pan (Verneukpan) to the south and granite metamorphic outcrops in the area. 'The Bushmanland Basin, which the site falls into, forms an environment for a number of ephemeral pans and extensive systems of intermittent river channels. Approximately 4 kilometres to the south of the Olyven Kolk site there are a number of large ephemeral waterbodies (pans) which may hold water at certain times of the year, during and immediately after the rains.'[22] A photograph of the different landscapes in the area can be seen in Plate 7 to Plate 11.

The following broad brush landscapes were defined within the greater Kenhardt district:

- Non perennial rivers and drainage lines
- Disturbed context. E.g. Eskom Aries Substation
- Railway line and access road
- Arid agricultural grazing landscape

6.1 SITE

The site is currently used for agricultural grazing and is crossed by intermittent tracks and fences. It covers an area of 1033 hectares and is currently zoned as Agricultural. To the north of the property is a gravel district farm road connecting the R27 with the R358 to Pofadder. There are some isolated farmsteads on this road as well as the Eskom Aries Substation. The different components of modified landscape found in the vicinity of the site are: a gravel airstrip, a railway line and service road, an Eskom substation including its associated power lines and a lattice communication tower. The site sense of place can be seen in the photographs on the following page.

As can be seen in the Slopes Analysis Map on Plate 12 the landscape of the site and surrounds is relatively flat with shallow drainage lines running in a south to north direction. The area to the east of the Sishen- Saldanha railway is more undulating. The slope across the site is shallow with topographical elevations across the site ranging from approximately 960 to 930m amsl.

An ecological survey was undertaken by Simon Todd Consulting (August 2010) and an Ecological Sensitivity Map was generated (See Plate 13) The map shows the high ecologically sensitive areas along the drainage lines as they are often considered as important habitats for a range of species, with moderate sensitivity areas buffering the drainage areas.

The site visit (31 May 2011) showed sporadic existing landscape modifications in the area which reflects previous and existing agricultural activities, including farm labourers cottages, disused dwellings, farm tracks, as well as railway lines, existing overhead power lines, sub-station and lattice mast.

The photographs below depict the compass point views taken on the site.

Panoramic view south to south east showing existing vertical nature of the power line modifications to the landscape *(GPS 024, Plate 25:GPS Point Map)*

Panoramic view west depicting the flat landscape with existing high voltage power lines in the background *(GPS 024, Plate 25)*

Panoramic view north to north east depicting the different grasses and woody vegetation found more in the drainage lines. *(GPS 024, Plate 25)*

Panoramic view south east to south west of the railway line and power lines in the background. *(GPS 027, Plate 25)*

Site Landscape Character Key Findings:

The site is mostly flat with some slight undulation in the drainage areas. The landuse is currently agricultural and as such the man made modifications are limited. Located on the site are two Eskom transmission lines which feed into the Aries Sub-station located just to the north of the site. The following broad brush landscapes were defined within the 2km Zone of Visual Influence (ZVI) of the proposed solar power project:

- Biodiversity
  - Bushmanland Basin Shrubland
  - Natural drainage lines /dry river beds
- Modified
  - Railway Line and access road
  - Aries Sub station
  - Powerlines crossing site and adjacent to site
- Agricultural Grazing land

7 VIEWSHEDS

A viewshed is 'the outer boundary defining a view catchment area, usually along crests and ridgelines'.[23] This reflects the area or extent where the landscape modification would probably be seen. However, visibility tends to diminish exponentially with distance which is well recognised in visual analysis literature. [24] Therefore the views of a landscape modification would not necessarily influence the landscape character within all areas of the viewshed. However, it is important to assess the extent to which the proposed landscape modifications are visible in the surrounding landscape as a point of departure for defining the shared landscape context and to identify the receptors making use of the common views.

A viewshed analysis was undertaken for both of the Alternatives taking 3 metres as the proposed height of the PV structure. As depicted on Plate 14 and Plate 15, the viewshed for both alternatives is mostly the same. The viewshed is fairly widely dispersed within the two km high visibility buffer area excepting for the southern extent where views will be contained by slightly elevated terrain. Within the 5 km foreground / Middle Ground zone the viewshed is broadly linear in spatial distribution aligning to a NE to SW direction. In both instances the Viewshed could be rated Medium in extent.

Viewshed Key Findings:

The viewshed is described as localised in extent. Based on the viewshed and the findings of the site visit, the following receptors and landscape features were identified as being included in the viewshed of the proposed component landscape modifications:

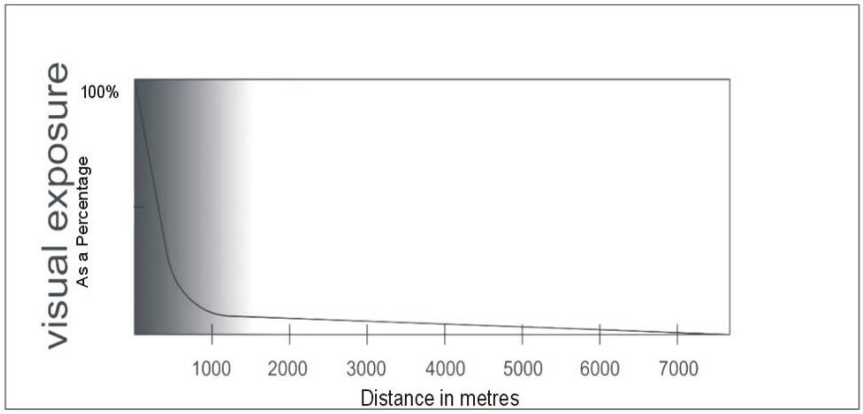
- Agricultural Farmstead 1
- Gravel District Road (Eastbound)
- Gravel District Road (Westbound)
- Aries Substation
- Agricultural Farmstead 2

8 VISUAL EXPOSURE

As defined by the DEA&DP Visual and Aesthetic Guidelines exposure is based on distance from the project to selected viewpoints. Exposure or visual impact tends to diminish exponentially with distance.[25]

The area where a landscape modification starts to influence the landscape character is termed the Zone of Visual Influence (ZVI) and is defined by the U.K Institute of Environmental Management and Assessment (IEMA), *'Guidelines for Landscape and Visual Impact Assessment'* as the 'area within which a proposed development may have an influence or effect on visual amenity (of the surrounding areas).'

The inverse relationship of distance and visual impact is well recognised in visual analysis literature.[26] According to Hull and Bishop, exposure or visual impact tends to diminish exponentially with distance. The areas where most landscape modifications would be visible are located within 2km from the site of the landscape modification. Thus the potential visual impact of an object diminishes at an exponential rate as the distance between the observer and the object increases, due to atmospheric conditions prevalent at the location which causes the air to appear greyer, diminishing detail. For example, at 1000 metres from the property would be 25% of the impact as viewed from 500 metres from the property. At 2000 metres it would be 10% of the impact at 500 metres. The relationship is indicated in the following graph generated by Hull and Bishop.



The VRM methodology also takes distance from the landscape modification into consideration in terms of understanding visual resource. Three distance categories are defined by the Bureau of Land Management (United States Department of Interior):[27] The distance zones are:

- Foreground / Middle ground, up to approximately 6km, which is where there is potential for the sense of place to change.
- Background areas, from 6km to 24km, where there is some potential for change in the sense of place but would only take place with very large landscape modifications.
- Seldom seen areas which fall within the Foreground / Middle ground area but as a result of no receptors they are not viewed or seldom viewed.

In order to determine the level of exposure to receptors, the following criteria were utilised and the receptor located within each distance zone were identified:

RECEPTOR COMMUNITIES	SOLAR PANELS		POWER LINES	
	APPROX DIST (km)	RATING	APPROX DIST (km)	RATING
Agricultural Farm buildings	3.5 km	M	5.5 km	M
Gravel District Road (Eastbound)	1.8 km	H	1 km	H
Gravel District Road (Westbound)	1.7 km	H	1 km	H
Agricultural Farmstead to the west of the site	4.3 km	M	4.3 km	M
Aries Substation	0.1 km	H	0.1 km	H

Visual Exposure Rating Criteria[28]

- High: Dominant or clearly noticeable (<2km)
- Moderate: Recognisable to the viewer (2 – 6km)
- Low: Minimally visible areas in the landscape (>6km)

Exposure Key Findings:

The following communities were identified as having **High and Moderate** Exposure to the proposed landscape modifications. It is recommended that the receptors are assessed in terms of their sensitivity to the proposed landscape modification:

- High exposure:
  - District Farm Road receptors east and westbound
  - Aries Substation

- Moderate exposure:
  - Agricultural Dwelling receptors as indicated by GPS points 017 & 020 (Plate 25*)*

The overall visual exposure of the proposed landscape modification would be **Moderate.**

9 PHYSIOGRAPHIC RATING UNITS

During the study, the following criteria were used to undertake a broad brush landscape characterisation exercise to identify the dominant landscapes as well as to define the physiographic units within the area. These are land parcels within the property which have physical as well as graphic similarities.' [29] The assessment criteria are:

- Similar visual patterns, texture, colour, variety (vegetation)
- Like geographic character
- Similar impacts from man-made modifications (landuse)
- Areas of high prominence.
- Topography

In order to understand the landscape character, the major landscapes physiographic rating units (PRU) affecting the visual context within the zone of visual influence (ZVI) were identified.

PHYSIOGRAPHIC RATING UNIT	LANDSCAPE CHARACTER	SUMMARY DESCRIPTION
Dry river beds/ drainage lines	HIGH	The landscape of the site and surrounds is relatively flat with shallow drainage lines running in a south to north direction. Drainage lines feature taller, woody vegetation.[30]
Arid Nama Karoo biome	MEDIUM	The Nama-Karoo Biome (Mucina & Rutherford, 2006) is not particularly rich in plant diversity with only one natural vegetation type, Bushman Basin Shrubland. This habitat features slightly irregular plains with dwarf shrubland dominated by a mixture of low sturdy and spiny (and sometime succulent) shrubs [31]

Each PRU was evaluated and rated in terms of the VRM scenic quality rating criteria, the sensitivity of the property and the distance between the property and receptor areas in the VRM class rating table on page 25. It must be noted that these classes should rather be used as a guide to ensure that every attempt is made to minimise potential visual impacts.

10 RECEPTOR SENSITIVITY

Sensitivity levels are a measure of public concern for scenic quality. Public lands are assigned high, medium, or low sensitivity levels by analysing the various indicators of public concern. The following criteria were used to assess each the sensitivity of each of the communities:

- **Public Interest.** The visual quality of an area may be of concern to local, State, or National groups. Indicators of this concern are usually expressed in public meetings, letters, newspaper or magazine articles, newsletters, land-use plans, etc. Public controversy created in response to proposed activities that would change the landscape character should also be considered
- **Special Areas.** Management objectives for special areas such as Natural Areas, Wilderness Areas or Wilderness Study Areas, Wild and Scenic Rivers, Scenic Areas, Scenic Roads or Trails, and Areas of Critical Environmental Concern (ACEC), frequently require special consideration for the protection of the visual values. This does not necessarily mean that these areas are scenic, but rather that one of the management objectives may be to preserve the natural landscape setting. The management objectives for these areas may be used as a basis for assigning sensitivity levels.
- **Adjacent Land Uses.** The interrelationship with land uses in adjacent lands can effect the visual sensitivity of an area. For example, an area within the viewshed of a residential area may be very sensitive, whereas an area surrounded by commercially developed lands may not be visually sensitive
- **Type of User.** Visual sensitivity will vary with the type of users. Recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change
- **Amount of Use.** Areas seen and used by large numbers of people are potentially more sensitive. Protection of visual values usually becomes more important as the number of viewers increase.[32]

Based on the viewshed and the findings of the site visit, the following receptor communities were identified as being included in the viewshed of the proposed component landscape modifications.

- Agricultural Farmstead (east of site)
- District Farm Road
- Agricultural Farmstead (west of site)

Receptor Community 1: Agricultural Farm buildings (GPS 020)

As seen in Plate 17 (GPS 020) the view from the receptor is taken from the entrance to the receptor dwelling in a SSE direction. Aries Substation is visible in the distance on the right and the full extent of the site is shown. The site is 3.5 km away.

Receptor Community 2: District Farm Road (Westbound) (GPS 013)

As seen in Plate 18 the photograph shows the view south to south east towards the site from the gravel road travelling west (Aries Substation to the right). The site is 1.8 km away.

Receptor Community 3: District Farm Road (Eastbound) (GPS 015)

Plate 19 shows the panoramic view south-east towards site as seen from the gravel road receptors travelling east. Aries substation indicated on the left. The site is 1.7 km away.

Receptor Community 4: Agricultural Farmstead (west of site) (GPS 017)

Plate 20 shows the panoramic view north east to east towards site from the Farmstead west of the site. Aries substation indicated on the left. The site is 4.3 km away.

Receptor Sensitivity Key Findings:

PHYSIOGRAPHIC RATING UNITS	TYPE OF USERS	AMOUNT OF USE	PUBLIC INTEREST	ADJACENT USERS	SPECIAL AREAS	TOTAL
Dry river beds/ drainage lines	L	L	H	L	H	H
Arid Nama Karoo biome	L	L	L	L	L	L

Source: Bureau of Land Management, U.S. Department of Interior. 2004. Visual Resource Management Manual 8400

(L = Low, M = Moderate, H = High, N = No. Y = Yes)

The overall sensitivity of the receptors would be **Low** due to the limited use of the views of the project site and the strong existing visual associations of the Aries Substation and transmission lines.

10.1 KEY OBSERVATION POINTS

Key Observation Points are defined by the BLM Visual Resource Management as the people located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape modifications are proposed. These locations are important in terms of the VRM methodology as it requires that the degree of contrast that the proposed landscape modifications will make to the existing landscape is measured from these most critical locations within the zone of visual influence. [33] (See Plate 25)

KOP Key Findings:

The following communities were identified as significant in terms of their proximity to the proposed landscape modifications and would require assessment of the visual impacts as seen from these locations:

- Agricultural Farm buildings (GPS 020)
- District Farm Road (GPS 013 & GPS 015)
- Agricultural Farmstead (west of site) (GPS 017)

11 SCENIC QUALITY

In the VRM methodology, the scenic quality is a measure of the visual appeal of a tract of land. In the visual resource inventory process, public lands are given a rating based on the apparent scenic quality which is determined using seven key factors. During the rating process, each of these factors are ranked on a comparative basis with similar features in the region. [34] These 7 elements are:

- **Landform:** Topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured.
- **Vegetation:** Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular. Consider also smaller scale vegetation features which add striking and intriguing detail elements to the lands.
- **Water:** That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration.
- **Colour:** Consider the overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) as they appear during seasons or periods of high use. Key factors to use when rating "colour" are variety, contrast, and harmony.
- **Scarcity:** This factor provides an opportunity to give added importance to one or all of the scenic features that appear to be relatively unique or rare within one physiographic region.
- **Adjacent Landuse:** Degree to which scenery outside the scenery unit being rated enhances the overall impression of the scenery within the rating unit. The distance which adjacent scenery will influence scenery within the rating unit will normally range, depending upon the characteristics of the topography, the vegetative cover, and other such factors.
- **Cultural Modifications:** Cultural modifications in the landform/water, vegetation, and addition of structures should be considered and may detract from the scenery in the form of a negative intrusion or complement or improve the scenic quality of a unit. Rate accordingly

These landscapes are then rated from 1 – 5 with the higher values being the most valued. Three categories of scenic quality are provided based on the apparent scenic quality.

VRM SCENIC QUALITY RATING CRITERA	
A - High	19 or more
B - Medium	12 - 18
C - Low	11 or less

LANDSCAPE AREAS (PRU)	LANDFORM	VEGETATION	WATER	COLOUR	ADJACENT SCENERY	SCARCITY	CULTURAL MODIFICATION	TOTAL	SCENIC QUALITY RATING
Dry river beds/ drainage lines	1	4	3	3	2	4	0	17	B
Arid Nama Karoo biome	1	1	0	2	3	1	0	9	C

Table 1: Table of Landscape types

(A= score of ≥19; B = score of 12 – 18, C= score of ≤11)

Scenic Quality Key Findings:

The overall scenic quality was defined as **Moderate to Low** due to the uniformity of the landscape. Adjacent scenic value is Low due to the presence of the Aries substation and the powerlines which cut through the property. The scarcity value of the dry river beds / drainage lines is due to the High and Medium to High ecological ratings for these areas from the Ecology Impact assessment (Simon Todd Consulting)

12 VRM ASSESSMENT

The degree of contrast the proposed landscape modifications will make to the existing landscape is measured from locations surrounding the property. The selection criterion for these receptors is their location within the defined viewshed where they have a clear view of the property (Key Observations Points (KOP)). View corridors within the viewshed are also taken into account. View corridors are linear geographic areas that contain scenic resources, usually, but not necessarily, defined by a route. Five steps are involved in the visual resource management (VRM) classification process. These are:

1. Outlining and numerical evaluation of scenic quality;
2. Outlining of visual sensitivity levels;
3. Delineating distance zones;
4. Overlaying the scenic quality, sensitivity levels and distance zones using a matrix to develop visual resource inventory classes;
5. Adjusting the inventory to meet the landscape goals and designating VRM management classes with objectives for each class through the planning process.[35]

Class I is assigned to those areas where a ***management or specialist decision*** has been made to maintain a natural landscape. The **Class I** objective is to preserve the existing character of the landscape where the level of change to the characteristic landscape should be very low and must not attract attention. It must be noted that these classes are ***informative in nature*** and would have to be modified to take into consideration a management decision. For this study area, no Class I type landscapes were defined a within the area.

Classes II, III & IV are assigned to the physiographic regions by cross referencing scenic quality, distance zones and sensitivity combined values, making use of the table below developed by the Bureau of Land Affairs, USA.

- The **Class II** objective is to retain the existing character of the landscape and the level of change to the characteristic landscape should be low but should not attract the attention of the casual observer.
- The **Class III** objective is to partially retain the existing character of the landscape where the level of change to the characteristic landscape should be moderate and may attract attention but should not dominate the view of the casual observer.
- The **Class IV** objective is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the landscape can be high.

Bureau of Land Affairs, USA developed the VRM Matrix table below in order to cross reference scenic quality, distance zones and sensitivity values that are defined using criteria and scenic quality and sensitivity questionnaires.

			VISUAL SENSITIVITY LEVELS								
			HIGH			MEDIUM			LOW		
19 or more	SCENIC QUALITY	A	II	II	II	II	II	II	II	II	II
12 - 18		B	II	III	III/ IV *	III	IV	IV	IV	IV	IV
11 or less		C	III	IV	IV	IV	IV	IV	IV	IV	IV
	DISTANCE ZONES		fore/middle ground	background	seldom seen	fore/middle ground	background	seldom seen	fore/middle ground	background	seldom seen

* If adjacent areas are **Class III** or lower assign **Class III**, if higher assign **Class IV**

PHYSIOGRAPHIC RATING UNIT	SCENIC	RECEPTOR SENSITIVITY	DISTANCE	VRM CLASS
Dry river beds/ drainage lines	B	H	FG	II
Arid Nama Karoo biome	C	L	FG	III

(A= score of ≥19; B = score of 12 – 18, C= score of ≤11,
L = Low, M = Moderate, H=High, FG = Foreground)

VRM Sensitivity Mapping Key Findings:

- No Class I type landscapes were defined within the area. See Plate 21.
- The Dry river beds/ drainage lines were defined as having a Class II status where the visual objective is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low and should not attract the attention of the casual observer.
- The Arid Nama Karoo biome was defined as having a Class III status where the visual objective is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate and may attract attention but should not dominate the view of the casual observer.

12.1 VISUAL REPRESENTATION

As a component in this contrast rating process, visual representation using 3D Google Earth modelling for context was used. Some kind of visual representation is vital in large scale modifications as this serves to inform I&APs and decision making authorities of the nature and extent of the impact associated with the proposed project/development. There is an ethical obligation in this process as visualisation can be misleading if not undertaken ethically. In terms of adhering to standards for ethical representation of landscape modifications, VRM Africa subscribes to the Proposed Interim Code of Ethics for Landscape Visualisation developed by the Collaborative for Advanced Landscape Planning (CALP) (July 2003).[36] (See Annexure for further details)

This code states that professional presenters of realistic landscape visualisations are responsible for promoting full understanding of proposed landscape changes; providing an honest and neutral visual representation of the expected landscape, by seeking to avoid bias in responses and demonstrating the legitimacy of the visualisation process. Presenters of landscape visualisations should adhere to the principles of:

- Access to Information
- Accuracy
- Legitimacy
- Representativeness
- Visual Clarity
- Interest

The Photo Montages using 3D modelling can be seen in the attached Colour Plates in Plate 23 and Plate 24 .**These are an approximation and for illustrative purposes only.**

13 VRM CONTRAST RATING

The contrast rating or impacts assessment phase is undertaken after the inventory process has been completed. The suitability of landscape modification is assessed by measuring the degree of contrast of the proposed landscape modification with the existing landscape. This is done by evaluating the level of change to the existing landscape in terms of the line, colour, texture and form in relation the visual objectives defined for the area. The following criteria are utilised in defining the degree of contrast:

The following steps will be carried out in the Contrast Rating Process.

1. Obtain a detailed project description.
2. Define the site landscape character
3. Identify the Viewshed for the proposed landscape modification and significant receptors that fall within this area.
4. Define the VRM Classes for the site and identify VRM Class Objectives. This would involve the measuring of the Degree of Contrast that the proposed landscape modifications would create to the existing landscape and would include a motivation. (See Methodology in Annexure 1 for further details)
5. Identify whether or not the VRM Objectives were met.
6. Describe the Impacts and the Nature of the impacts.
7. Make recommendations and mitigations.

VRM Contrast Rating Criteria for assessment of visual intrusion:

- **None -** The element contrast is not visible or perceived.
- **Weak -** The element contrast can be seen but does not attract attention.
- **Moderate -** The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- **Strong -** The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

13.1 SUMMARY TABLE OF VRM CONTRAST RATING FOR ALT 1

IMPACT SUMMARY SHEET		VRM				VRM OBJECTIVES MET		
KOP	PRU AREA	SCENIC QUALITY	SENSITIVITY	VRM CLASS OBJECTIVE	DEGREE OF CONTRAST	YES	NO	WITH MITIGATION
1	Dry river beds/ drainage lines	**B**	H	II	M		✓	
	Arid Nama Karoo biome	**C**	L	III	W	✓		
2	Dry river beds/ drainage lines	**B**	H	II	M		✓	
	Arid Nama Karoo biome	**C**	L	III	W	✓		
3	Dry river beds/ drainage lines	**B**	H	II	M		✓	
	Arid Nama Karoo biome	**C**	L	III	W	✓		

There are limited views of the site, however from an aesthetic perspective there is merit in design which takes the landscape into consideration. The landscape character of the site is defined by the

topography with the washes and dry river beds being important ecological areas. As such it is recommended that development within these would **not meet the Class II visual objectives** to retain the existing character of the landscape. The level of change to the characteristic landscape would not be low.

13.2 SUMMARY TABLE OF VRM CONTRAST RATING FOR ALT 2

IMPACT SUMMARY SHEET		VRM				VRM OBJECTIVES MET		
KOP	PRU AREA	SCENIC QUALITY	SENSITIVITY	VRM CLASS OBJECTIVE	DEGREE OF CONTRAST	YES	NO	WITH MITIGATION
1	Dry river beds/ drainage lines	**B**	H	II	M			✓
	Arid Nama Karoo biome	**C**	L	III	W			✓
2	Dry river beds/ drainage lines	**B**	H	II	M			✓
	Arid Nama Karoo biome	**C**	L	III	W			✓
3	Dry river beds/ drainage lines	**B**	H	II	M			✓
	Arid Nama Karoo biome	**C**	L	III	W			✓

This mitigated layout does take the dry river bed areas into consideration and the development is located within the **Class III** areas. As such the Class III objectives are met with mitigation (dust control) as the proposed landscape modifications would partially retain the existing character of the landscape where the level of change to the characteristic landscape would be moderate. Given that the surrounding landscape context is strongly associated with the Aries substation and associated transmission lines, it is likely that the development may attract attention but would not dominate the view of the casual observer.

14 RISK ASSESSMENT

The following criteria for the Risk Assessment were provided by ERM to assess the project impacts: *(See Annexure for details of ERM Impact Assessment Methodology)*

1. Nature of the Impact
2. Magnitude of the Impact
    a. Extent
    b. Duration
    c. Intensity
3. Likelihood of Impact
4. Impact Significance
5. Degree of Confidence

Two layout alternatives were assessed for the impact assessment:

- Layout Alternative 1: Initial layout plan (200MW) (See Plate 21)
- Layout Alternative 2: This alternative is based on specialist input on environmental sensitivity (190MW) (See Plate 22)

14.1 SITE LAYOUT ALTERNATIVE 1

Table of impacts	
Nature:	**Direct negative** impact with a potential for cumulative impacts from other similar projects which would be located around the Aries substation.
Impact Magnitude:	**High**
• Extent:	The extent is **Local** as the zone of visual influence would extend approximately two kilometres around the site. There is potential for further cumulative impacts associated with development in dry river bed areas.
• Duration:	The visual impacts would be **Long term** and continue for the life of the project but would cease should the project be decommissioned and the area rehabilitated back to agricultural land use.
• Intensity:	The intensity of the direct impacts on the Biophysical Environment would be High as development would take place in the dry river beds which are identified as having a high ecological sensitivity. The intensity of the indirect visual impacts on the surrounding receptors is Low as the surrounding communities would be able to adapt with relative ease and maintain pre-impact livelihoods. Due to the low levels of scenic quality of the area as a result of the Aries substation and associated power lines, in conjunction with the limited visual resource drivers, there are no tourism related activities in the area. The overall intensity would be **Medium to High**.
Likelihood:	As the impact would be to the aesthetics of the area associated with the direct impact on the biodiversity of the dry river areas, the impact will be **Definite**.
Impact Significance (Pre-mitigation):	**Major**
Degree of Confidence:	**High**

Recommendations

- Redesign the proposed site footprint to ensure that the footprint does not intrude into Class 2 areas which have been highlighted as sensitive.

14.2 SITE LAYOUT ALTERNATIVE 2

Table of Construction and Operation impacts	
Nature:	Neutral
Impact Magnitude:	**Low**
• Extent	The extent is **Local** as the zone of visual influence would extend approximately two kilometres around the site. There is potential for further cumulative impacts associated with development in dry river bed areas.
• Duration	The visual impacts would be **Long term** and continue for the life of the project but would cease should the project be decommissioned and the area rehabilitated back to agricultural land use.
• Intensity	The intensity of the direct impacts on the Biophysical Environment would be Moderate as development would not take place in the dry river beds which are identified as having a high ecological sensitivity. The intensity of the indirect visual impacts on the surrounding receptors is Low as the surrounding communities would be able to adapt with relative ease and maintain pre-impact livelihoods. Due to the low levels of scenic quality of the area as a result of the Aries substation and associated power lines, in conjunction with the limited visual resource drivers, there are no tourism related activities in the area. The overall intensity would be **Medium to Low**.
Likelihood	The impact would be **Likely** to occur under most conditions.
Impact Significance (Pre-mitigation):	**Minor**
Degree of Confidence:	**High**

Construction Residual Impact: Mitigations

- The clearing of vegetation should as much as possible be limited so as to reduce dust.
- On the areas that are cleared, dust prevention measures need to be implemented during construction to reduce visual impacts associated with dust.
- Fencing needs to be limited to only surrounding the specific sites where the PV panels are to be located and not constructed around the whole property.
- Agricultural land use should be retained on the remaining property so as to retain the agricultural sense of place.
- The construction camp should be located on an area that will eventually be constructed.
- A litter fence needs to be erected around the construction fence to reduce windblown litter.
- Littering needs to be a punishable offence.
- The structures need to be simple in design and form in order to blend with the surrounding agricultural setting.

Operation Residual Impact: Mitigations

- As much as possible, natural vegetation needs to be retained between the PV panel rows to reduce the effects of windblown dust.
- Littering needs to be a punishable offence.

14.2.1 *RESIDUAL IMPACT PRE AND POST- MITIGATION SIGNIFICANCE OF ALTERNATIVE 2*

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction	Minor	Minor

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Operation	Minor	Minor

14.3 SUMMARY IMPACT RATINGS

Impact	Layout Alternative 1 Pre- mitigation	Layout Alternative 2 Pre- mitigation	Layout Alternative 2 Residual Impact (post mitigation)
Construction Phase			
Visual Impact	Major -ve	Minor -ve	Minor -ve
Operational Phase			
Visual Impact	Major -ve	Minor -ve	Minor -ve

14.4 CUMULATIVE IMPACTS

There are a number of known proposed solar energy facilities (approximately ten) planned in the Northern Cape. Three of these are located in close proximity to the proposed AES Olyven Kolk solar power plant, including one which will also be located on another portion of the Olyven Kolk Farm.[37] The proposed BioTherm Energy Kleinzwart Bast Photovoltaic Solar Power Plant is situated in the Kenhardt District, alongside the Aries substation. See Appendix for background details.

Should many more of these types of development take place in close proximity to each other, there is a possibility that the area will exceed the carrying capacity created by the agricultural sense of place and that the sense of place will be defined by the solar energy facilities. However, due to the limited visual resources in the area and the limited number of receptors, any potential cumulative impact be contained.

15 CONCLUSION

The site is remote and located in a flat and arid environment typical of the Northern Cape. The area is not associated with any established heritage sites or scenic routes. The main landuse in the area is agricultural sheep farming. The area is not a pristine landscape and other landscape modifications define the context, specifically the Eskom Aeries Substation (which generates high levels of visual contrast), the powerlines, the telecommunication mast and the Sishen Iron Ore railway line.

The Site Layout Alternative 2 of 190 MW photovoltaic (PV) solar panels avoids areas highlighted as ecologically sensitive and as such is the preferred development alternative. The low 2.5m height of the proposed PV panels does limit the visibility to the surrounding mainly flat terrain. As such, the viewshed is located mainly in the 2km high exposure area but does also extend in some parts to the 5km Foreground / Middle ground. However, it must be noted that the viewshed does not extend outside of the existing Aries Substation located adjacent the site to the north. This existing feature dominates the landscape context, and as such it is very likely that the visual intrusion would not be perceived as significant by the receptors.

16 ANNEXURE 1: METHODOLOGY

Determining how an area should be managed first requires an assessment of the area's scenic values as different levels of scenic value require different levels of management. The impact assessment methodology that VRM Africa uses is based on the Visual Resource Management system[38] which is a systematic process developed by the Bureau of Land Management (BLM) from the United States Department of Internal Affairs to evaluate potential visual impacts associated with landscape modifications. The method is based on the premise that the degree to which a management activity affects the visual quality of a landscape depends on the visual contrast created between a project and the existing landscape. [39] The objective of this methodology is to:

- Provide a way of identifying and evaluating scenic values to determine the appropriate levels of management.
- Provide a way to analyse potential visual impacts and apply visual design techniques to ensure that surface-disturbing activities are in harmony with their surroundings.
- Using multi criteria mapped based methods increases objectivity in decision making.[40]

The VRM system consists of two stages:

- **Inventory** stage which is part of the baseline study: The inventory stage during which field study and site sampling is undertaken**,** involves the identification of the visual resources of the area where the proposed landscape modification will influence landscape character.
- **Contrast Rating** stage which forms part of the impact assessment study: The contrast rating or impacts assessment phase is undertaking after the inventory process has been completed. The suitability of landscape modification is assessed by measuring the degree of contrast of the proposed landscape modification to the existing contrast created by the existing landscape. As a component in this contrast rating process, visual representation such as photo montages are vital in large scale modifications as this serves to inform I&APs and decision making authorities of the nature and extent of the impact associated with the proposed project/development.

16.1 INVENTORY STAGE

The inventory stage during which field study and site sampling is undertaken**,** involves the identification of the visual resources of the area where the proposed landscape modification will influence landscape character. The following factors are defined during the inventory stage:

- Delineation of broad brush landscape units which have physical as well as graphic similarities.
- Identify and evaluate scenic qualities of each of the landscapes.
- Identification and evaluation of receptor sensitivities within the defined landscape areas;
- Distance Zone Analysis to determine the exposure of the surrounding landscapes and receptors to the proposed / existing landscape modifications.

Through the inventory process, landscapes are categorised into 4 different classes which reflect the inherent value of each of the landscapes. Each of the 4 classes has a management objective which is used to assess the suitability of the proposed landscape modification. It must be noted that this VRM technique is used as guideline. These Classes are not intended to be the only means of resolving these impacts but should rather be used as a guide.

Class I is assigned to those areas where a *specialist decision* has been made to maintain a natural landscape. Class I is not rated in terms of scenic quality, distance zones and sensitivity values. The Class I objective is to preserve the existing character of the landscape where the level of change to the characteristic landscape should be very low and must not attract attention.

Classes II, III & IV are assigned to the landscape areas by cross referencing scenic quality, distance zones and sensitivity values, making use of the VRM Matrix table below which was developed by the Bureau of Land Affairs, USA.

			VISUAL SENSITIVITY LEVELS								
			HIGH			MEDIUM			LOW		
19 or more		A	II	II	II	II	II	II	II	II	II
12 - 18	SCENIC QUALITY	B	II	III	III/ IV *	III	IV	IV	IV	IV	IV
11 or less		C	III	IV	IV	IV	IV	IV	IV	IV	IV
	DISTANCE ZONES		fore/middle ground	background	seldom seen	fore/middle ground	background	seldom seen	fore/middle ground	background	seldom seen

- If adjacent areas are **Class III** or lower assign **Class III**, if higher assign **Class IV**

The Class II objective is to retain the existing character of the landscape and the level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer and should repeat the basic elements of form, line, colour and texture found in the predominant natural features of the characteristic landscape.

The Class III objective is to partially retain the existing character of the landscape where the level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer and changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The Class IV objective is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the landscape can be high and these management activities may dominate the view and be the major focus of the viewer attention.

16.2 CONTRAST RATING STAGE

The contrast rating or impacts assessment phase is undertaking after the inventory process has been completed. The suitability of landscape modification is assessed by measuring the degree of contrast of the proposed landscape modification to the existing contrast created by the existing landscape. This is done by evaluating the level of change to the existing landscape in terms of the line, colour, texture and form in relation the visual objectives defined for the area. The following criteria are utilised in defining the degree of contrast:

- **None -** The element contrast is not visible or perceived.
- **Weak -** The element contrast can be seen but does not attract attention.
- **Moderate -** The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- **Strong -** The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

As an example, in a Class I area, the visual objective is to preserve the existing character of the landscape and the resultant contrast to the existing landscape should not be notable to the casual observer and cannot attract attention. In the Class IV area example, the objective is to provide for management activities which require major modifications of the existing character of the landscape. Based on whether the VRM Objectives are met, mitigations, if required, are defined to avoid, reduce or mitigate the proposed landscape modifications so that the visual impact does not detract from the surrounding landscape sense of place.

16.3 VISUALISATION

As a component in this contrast rating process, visual representation such as photo montages are vital in large scale modifications as this serves to inform I&APs and decision making authorities of the nature and extent of the impact associated with the proposed project/development. There is an ethical obligation in this process as visualisation can be misleading if not undertaken ethically. In terms of adhering to standards for ethical representation of landscape modifications, VRM Africa subscribes to the Proposed Interim Code of Ethics for Landscape Visualisation developed by the Collaborative for Advanced Landscape Planning (CALP) (July 2003).[41] This code states that professional presenters of realistic landscape visualisations are responsible for promoting full understanding of proposed landscape changes; providing an honest and neutral visual representation of the expected landscape, by seeking to avoid bias in responses and demonstrating the legitimacy of the visualisation process. Presenters of landscape visualisations should adhere to the principles of:

- Access to Information
- Accuracy
- Legitimacy
- Representativeness
- Visual Clarity
- Interest

The Code of Ethical Conduct states that the presenter should:

- Demonstrate an appropriate level of qualifications and experience.
- Use visualisation tools and media that are appropriate to the purpose.
- Choose the appropriate level of realism.
- Identify, collect and document supporting visual data available for or used in the visualisation process; conduct an on-site visual analysis to determine important issues and views.
- Seek community input on viewpoints and landscape issues to address in the visualisations.
- Provide the viewer with a reasonable choice of viewpoints, view directions, view angles, viewing conditions and time frames appropriate to the area being visualised.
- Estimate and disclose the expected degree of and uncertainty, indicating areas and possible visual consequences of the uncertainties.
- Use more than one appropriate presentation mode and means of access for the affected public.
- Present important non-visual information at the same time as the visual presentation, using a neutral delivery.
- Avoid the use or the appearance of ‘sales’ techniques or special effects.
- Avoid seeking a particular response from the audience.
- Provide information describing how the visualisation process was conducted and key decisions taken.[42]

As part of the process of providing I&APs and decision makers with information about the proposed landscape modifications, VRM Africa places a strong emphasis on the colour plates and on 3D modelling.

16.4 VRM CRITERIA

16.4.1 *SCENIC QUALITY RATING QUESTIONNAIRE*[1]

KEY FACTORS	RATING CRITERIA AND SCORE		
SCORE	**5**	**3**	**1**
Landform	High vertical relief as expressed in prominent cliffs, spires or massive rock outcrops, or severe surface variation or highly eroded formations including or dune systems: or detail features dominating and exceptionally striking and intriguing.	Steep sided river valleys, or interesting erosion patterns or variety in size and shape of landforms; or detail features that are interesting though not dominant or exceptional.	Low rolling hills, foothills or flat valley bottoms; few or no interesting landscape features.
Vegetation	A variety of vegetative types as expressed in interesting forms, textures and patterns.	Some variety of vegetation, but only one or two major types.	Little or no variety or contrast in vegetation.
Water	Clear and clean appearing, still or cascading white water, any of which are a dominant factor in the landscape.	Flowing, or still, but not dominant in the landscape.	Absent, or present, but not noticeable.
Colour	Rich colour combinations, variety or vivid colour: or pleasing contrasts in the soil, rock, vegetation, water.	Some intensity or variety in colours and contrast of the soil, rock and vegetation, but not a dominant scenic element.	Subtle colour variations contrast or interest: generally mute tones.
Adjacent Scenery	Adjacent scenery greatly enhances visual quality.	Adjacent scenery moderately enhances overall visual quality.	Adjacent scenery has little or no influence on overall visual quality.
Scarcity	One of a kind: unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing etc…	Distinctive, though somewhat similar to others within the region.	Interesting within its setting, but fairly common within the region.
SCORE	**2**	**0**	**-4**
Cultural Modification	Modifications add favourably to visual variety while promoting visual harmony.	Modifications add little or no visual variety to the area, and introduce no discordant elements.	Modifications add variety but are very discordant and promote strong disharmony.

[1] Bureau of Land Management, U.S. Department of Interior. 2004. Visual Resource Management Manual 8400

16.4.2 *SENSITIVITY LEVEL RATING QUESTIONNAIRE*

The following VRM questionnaire was completed.

FACTORS	QUESTIONS	
Type of Users	**Maintenance of visual quality is:**	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low
Amount of use	**Maintenance of visual quality becomes more important as the level of use increases:**	
	A high level of use	High
	Moderately level of use	Moderate
	Low level of use	Low
Public interest	**Maintenance of visual quality:**	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low
Adjacent land Users	**Maintenance of visual quality to sustain adjacent land use objectives is:**	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low
Special Areas	**Maintenance of visual quality to sustain Special Area management objectives:**	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low

16.4.3 *DISTANCE ZONES*

Landscapes are subdivided into 4 distance zones based on relative visibility from travel routes or observation points. The 4 zones are:

DISTANCE ZONES	DISTANCE ZONES DEFINITION
Foreground	The foreground (fig) zone includes areas seen from highways, rivers, or other viewing locations that are less than 1 kilometres away.
Middle ground	The middle ground (mg) zone includes areas seen from highways, rivers, or other viewing locations that are greater than 1 kilometre but less than 2 kilometres away.
Background	Seen areas beyond the foreground-middle ground zone greater than 2 kilometres away are in the background (big) zone.
Seldom seen	Areas not seen as foreground-middle ground or background (i.e. hidden from view) are in the seldom-seen (sis) zone

16.5 VISUALISATION

As a component in this contrast rating process, visual representation such as photo montages are vital in large scale modifications as this serves to inform I&APs and decision making authorities of the nature and extent of the impact associated with the proposed project/development. There is an ethical obligation in this process as visualisation can be misleading if not undertaken ethically. In terms of adhering to standards for ethical representation of landscape modifications, VRM Africa subscribes to the Proposed Interim Code of Ethics for Landscape Visualisation developed by the Collaborative for Advanced Landscape Planning (CALP) (July 2003).[43] This code states that professional presenters of realistic landscape visualisations are responsible for promoting full understanding of proposed landscape changes; providing an honest and neutral visual representation of the expected landscape, by seeking to avoid bias in responses and demonstrating the legitimacy of the visualisation process. Presenters of landscape visualisations should adhere to the principles of:

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- Provide information describing how the visualisation process was conducted and key decisions taken.[44]

As part of the process of providing I&APs and decision makers with information about the proposed landscape modifications, VRM Africa places a strong emphasis on the Colour plates and 3D modelling.

16.6 ERM IMPACT METHODOLOGY

1.1 IMPACT ASSESSMENTMETHODOLOGY

The adequate assessment and evaluation of the potential impacts and benefits that will be associated with the proposed project necessitates the development of a scientific methodology that will reduce the subjectivity involved in making such evaluations. A clearly defined methodology is used in order to accurately determine the significance of the predicted impact on, or benefit to, the surrounding natural and/or social environment. For this the proposed project must be considered in the context of the area and the people that will be affected.

Nonetheless, an impact assessment will always contain a degree of subjectivity, as it is based on the value judgment of various specialists and EIA practitioners. The evaluation of significance is thus contingent upon values, professional judgement, and dependent upon the environmental and community context. Ultimately, impact significance involves a process of determining the acceptability of a predicted impact to society.

The purpose of impact assessment is to identify and evaluate the likely significance of the potential impacts on identified receptors and resources according to defined assessment criteria, to develop and describe measures that will be taken to avoid, minimize, reduce or compensate for any potential adverse environmental effects, and to report the significance of the residual impacts that remain following mitigation.

There are a number of ways that impacts may be described and quantified. An impact is essentially any change to a resource or receptor brought about by the presence of the proposed project component or by the execution of a proposed project related activity.

The nature of the project may determine whether one needs to assess both routine and non-routine impacts. Non-routine impacts generally relate to accidents and could include oil/chemical/fuel spills, emergency venting of noxious gases, etc. In most cases, it would be sensible to have separate chapters for the assessment of routine and non-routine impacts.

The types of impacts and terminology to be used in the assessment are outlined in *Table1.1*.

Table 1.1 Defining the Nature of the Impact

Term	Definition
Impact nature	
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.

Term	Definition
Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (eg. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
Indirect impact	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (eg. in-migration for employment placing a demand on resources).
Cumulative impact (1)	Impacts that act together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the Project.

1.1.1 Assessing Significance

There is no single accepted definition of *significance* and its determination is , therefore, somewhat subjective. However, it is generally accepted that significance is a function of the **magnitude** of the impact and the **likelihood** of the impact occurring. It is widely accepted that Impact Magnitude (or Severity) is a function of the extent, duration and intensity of the impact.

The criteria used to determine significance are summarised in *Table1.2*. These criteria (specifically Extent and Duration) should be customised to suit individual projects.

Table 1.2 Significance Criteria

Impact magnitude – the degree of change brought about in the environment	
Extent	**On-site** impacts that are limited to the site boundaries. **Local** impacts that affect an area in a radius of XX km around the site. **Regional** impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem. **National** impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences. **Transboundary/International** impacts that affect internationally important resources such as areas protected by international conventions.
Duration	**Temporary** impacts are predicted to be of short duration and intermittent/occasional. **Short-term** impacts that are predicted to last only for the duration of the construction period. **Long-term** impacts that will continue for the life of the Project, but ceases when the Project stops operating. **Permanent** impacts that cause a permanent change in the affected receptor or resource (eg. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.

Intensity (1)	BIOPHYSICAL ENVIRONMENT: *Intensity can be considered in terms of the sensitivity of the biodiversity receptor (ie. habitats, species communities).* **Negligible** the impact on the environment is not detectable. **Low** the impact affects the environment in such a way that natural functions and processes are not affected. **Medium** where the affected environment is altered but natural functions and processes continue, albeit in a modified way. **High** where natural functions or processes are altered to the extent that it will temporarily or permanently cease. ***Where appropriate, national and/or international standards are to be used as a measure of the impact.*** *Specialist studies should attempt to quantify the magnitude of impacts and outline the rationale used.*
	SOCIO-ECONOMIC ENVIRONMENT: *Intensity can be considered in terms of the ability of project affected people/communities to adapt changes brought about by the Project* **Negligible** there is no perceptible change to peoples livelihood **Low** - People/communities are able to adapt with relative ease and maintain pre-impact livelihoods. **Medium** - Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support. **High** - Those affected will not be able to adapt to changes and continue to maintain-pre impact livelihoods.

Impact likelihood – the likelihood that an impact will occur	
Unlikely	The impact is unlikely to occur.
Likely	The impact is likely to occur under most conditions.
Definite	The impact will occur.

Once a rating is determined for magnitude and likelihood, the matrix in *Table 1.3* can be used to determine the impact significance.

Table 1.3 Example of Significance Rating Matrix for Positive and Negative Impacts

		SIGNIFICANCE RATING		
	LIKELIHOOD	**Unlikely**	**Likely**	**Definite**
MAGNITUDE	Negligible	Negligible	Negligible	Minor
	Low	Negligible	Minor	Minor
	Medium	Minor	Moderate	Moderate
	High	Moderate	Major	Major

A colour scale for negative and positive ratings is given in *Table1.4*

Table 1.4 Colour Scale for Ratings

Negative ratings	Positive ratings
Negligible	Negligible
Minor	Minor
Moderate	Moderate
Major	Major

Table1.5 outlines the various definitions for significance of an impact and is based on the significance rating matrix.

Table 1.5 Significance Definitions

Significance definitions	
Negligible significance	*An impact of negligible significance is where the magnitude is negligible, low or medium and the likelihood of the impact occurring is unlikely or likely.* An impact of negligible significance is where a resource or receptor will not be affected in any way by a particular activity, or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background levels.
Minor significance	*An impact of minor significance is where the magnitude of the impact is low but the likelihood is high or where the magnitude is high but the likelihood of occurrence is unlikely or likely.* An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.
Moderate significance	*An impact of moderate significance is where the magnitude is medium to high and the likelihood of the impact occurring is likely or definite* An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that moderate impacts have to be reduced to minor impacts, but that moderate impacts are being managed effectively and efficiently.
Major significance	*An impact of major significance is where the magnitude of the impact is medium to high and the likelihood of the impact occurring is also likely or definite* An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the Project.

Once the significance of the impact has been determined, it is important to qualify the **degree of confidence** in the assessment. Confidence in the prediction is associated with any uncertainties, for example, where

information is insufficient to assess the impact. Degree of confidence can be expressed as low, medium or high.

1.2 MITIGATION POTENTIAL AND RESIDUAL IMPACTS

It is expected that for the identified significant impacts, the project team will work with the client in identifying suitable and practical mitigation measures that are implementable. Mitigation that can be incorporated into the Project design in order to avoid or reduce the negative impacts or enhance the positive impacts will be developed. A description of these mitigation measures should also be included within the Framework ESMP.

Residual impacts are those impacts which remain once the mitigation measures have been designed and applied. Once the mitigation is applied, each impact is re-evaluated (assuming that the mitigation measure is effectively applied) and any remaining impact is rated once again using the process outlined above. The result is a significance rating for the residual impact.

The approach taken to defining mitigation measures is based on a typical hierarchy of decisions and measures, as described in *Box 1.1*.

Box 1.1 Mitigation Hierarchy

THE MITIGATION HIERARCHY FOR PLANNED PROJECT ACTIVITIES
Avoid at Source; Reduce at Source **Avoiding or reducing at source is essentially 'designing' the project so that a feature causi an impact is designed out (eg a waste stream is eliminated) or altered (eg reduced waste volume). Often called minimisation.**
Abate on Site **This involves adding something to the basic design to abate the impact ollution controls fall within this categor y. Often called 'end-of-pipe'.**
Abate at Receptor **If an impact cannot be abated on site then measures can be implemented off site - an example of this would be to use the stand-by vessel to help control the level of interference with fishing activity.**
Repair or Remedy **Some impacts involve unavoidable damag to a resource, eg land disturbance. Repair essentially involves restoration and reinstatement type measures, such base camp closure**
Compensate in Kind **Where other mitigation approaches are not pos sible or fully effective, then compensation, in some measure, for loss, damage and general intrusion might be appropriate.**

17 ANNEXURE 2: PROPOSED KLEINZWART BAST PHOTOVOLTAIC PLANT BAR

Extract from BioTherm Energy Basic Assessment Report for Photovoltaic Solar Power Plants, Northern Cape: *(DEA Reference: 12/12/20/2098/1, 2 & 3. February 2011)*

- Site 1: Konkoonsies (Pofadder District)
- Site 2: Kleinzwart Bast (Kenhardt District)

1. ACTIVITY DESCRIPTION

Describe the activity, which is being applied for in detail (A1):

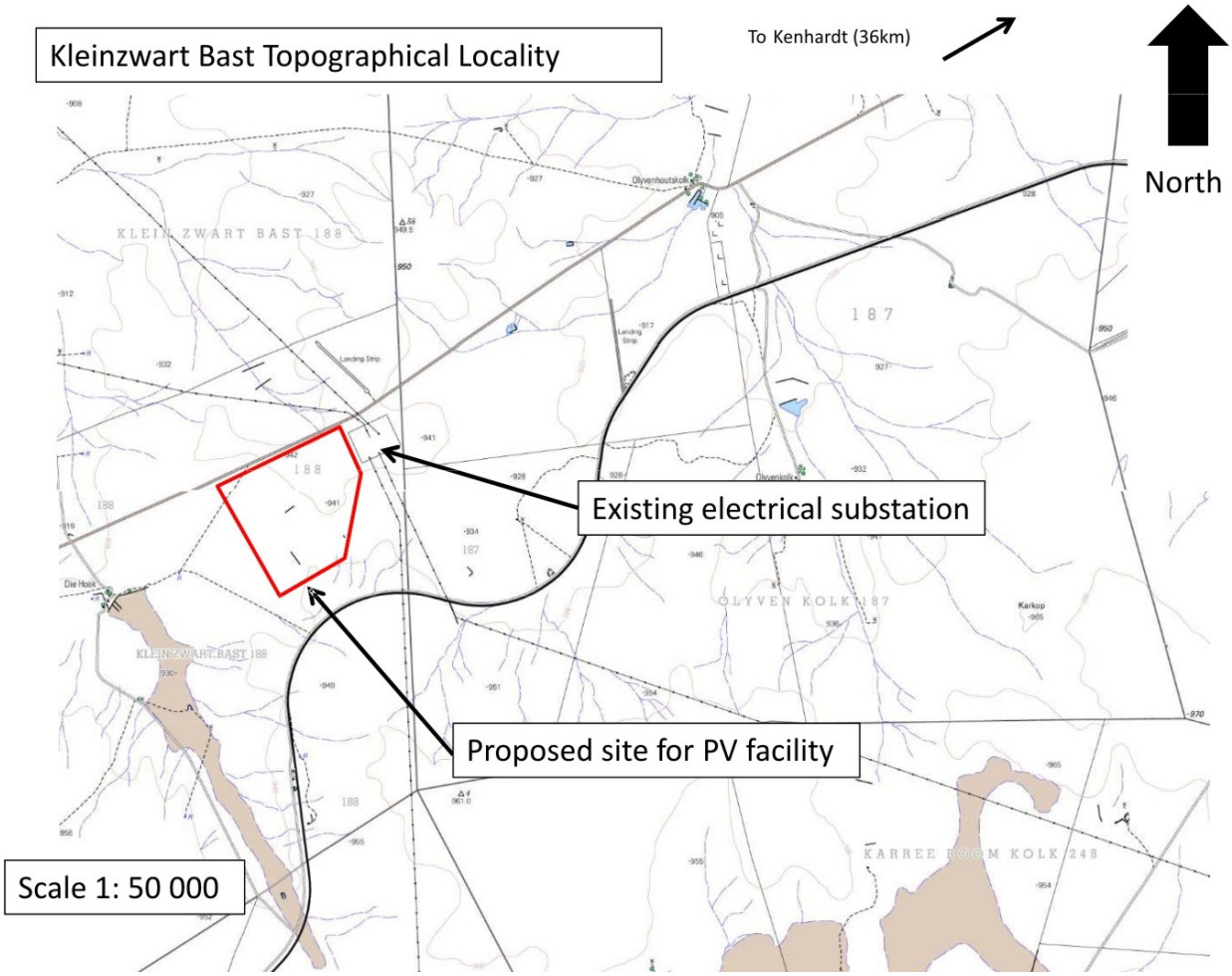
S1a and S1b will be described throughput the Basic Assessment Report. As described in the application form, the two applications that were originally made were requested to be consolidated, and this was accepted by the National Department of Environmental Affairs. As such, this Basic Assessment will deal with the assessment of two feasible areas (sites), NOT as potential alternatives, but as feasible and realistic developments. The two feasible areas for development that will be assessed include:

1. Konkoonsies (referred to as S1a, AKA: Paulputs Solar), and
2. Kleinzwart Bast (referred to as S1b, AKA: Aries Solar)

Photovoltaic's (PVs) are arrays of cells containing a solar photovoltaic material that converts solar radiation into direct current electricity.

The PV plant is expected to have a power generating capacity of 10MVA (electrical, peak). The plant and all associated infrastructure will be less than 20 Ha in extent. The plant and associated infrastructure is made of up the following broad components:

· PV panel array
· Wiring to central inverters
· Connection to grid
· Balance of plant (incl. control rooms, regulators, etc…)



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DRAFT VISUAL IMPACT ASSESSMENT

PROPOSED OLYVEN KOLK SOLAR POWER PLANT

COLOUR PLATES

Revised 13 October 2011

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TABLE OF COLOUR PLATES

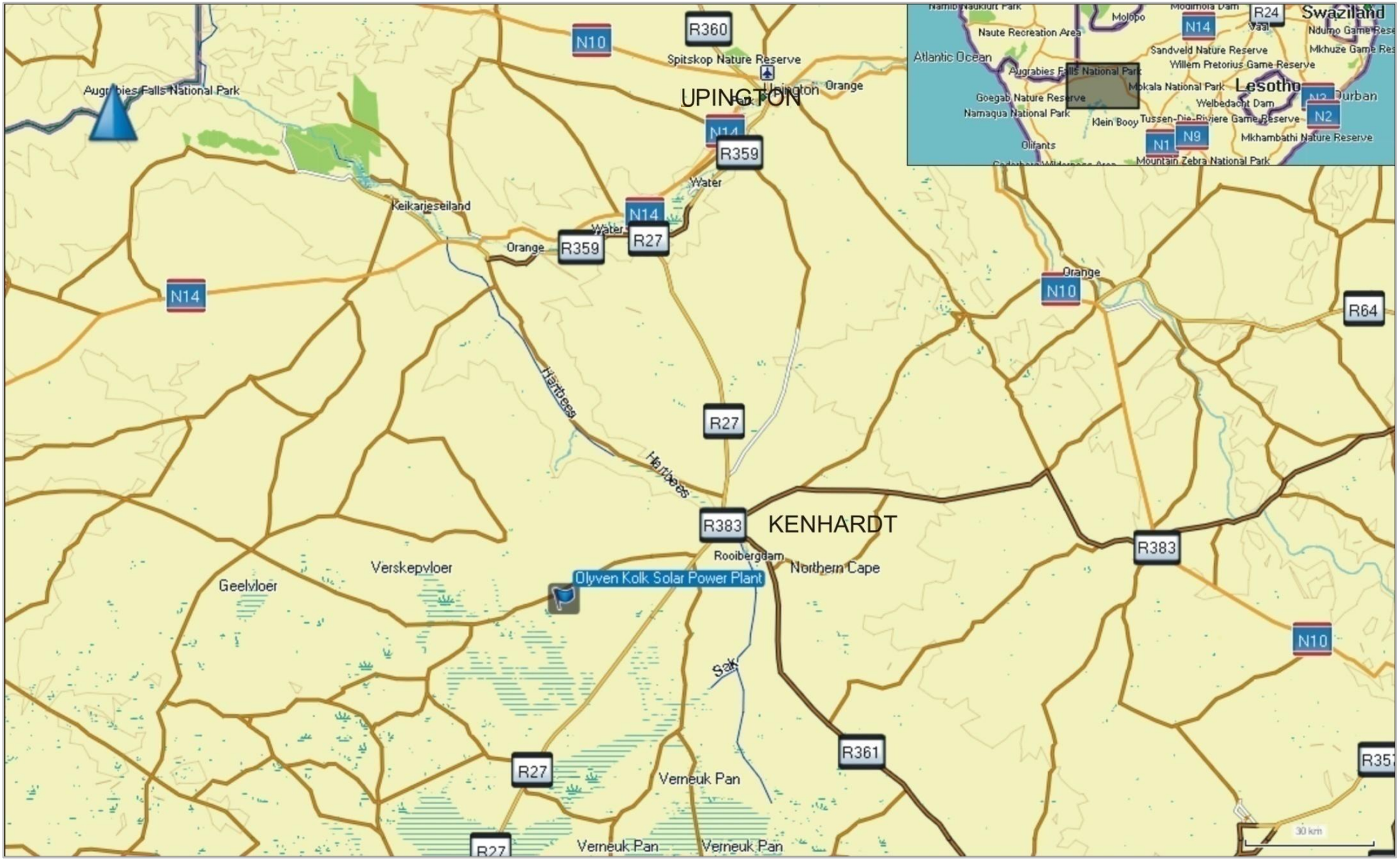


PLATE 1: REGIONAL LOCALITY MAP

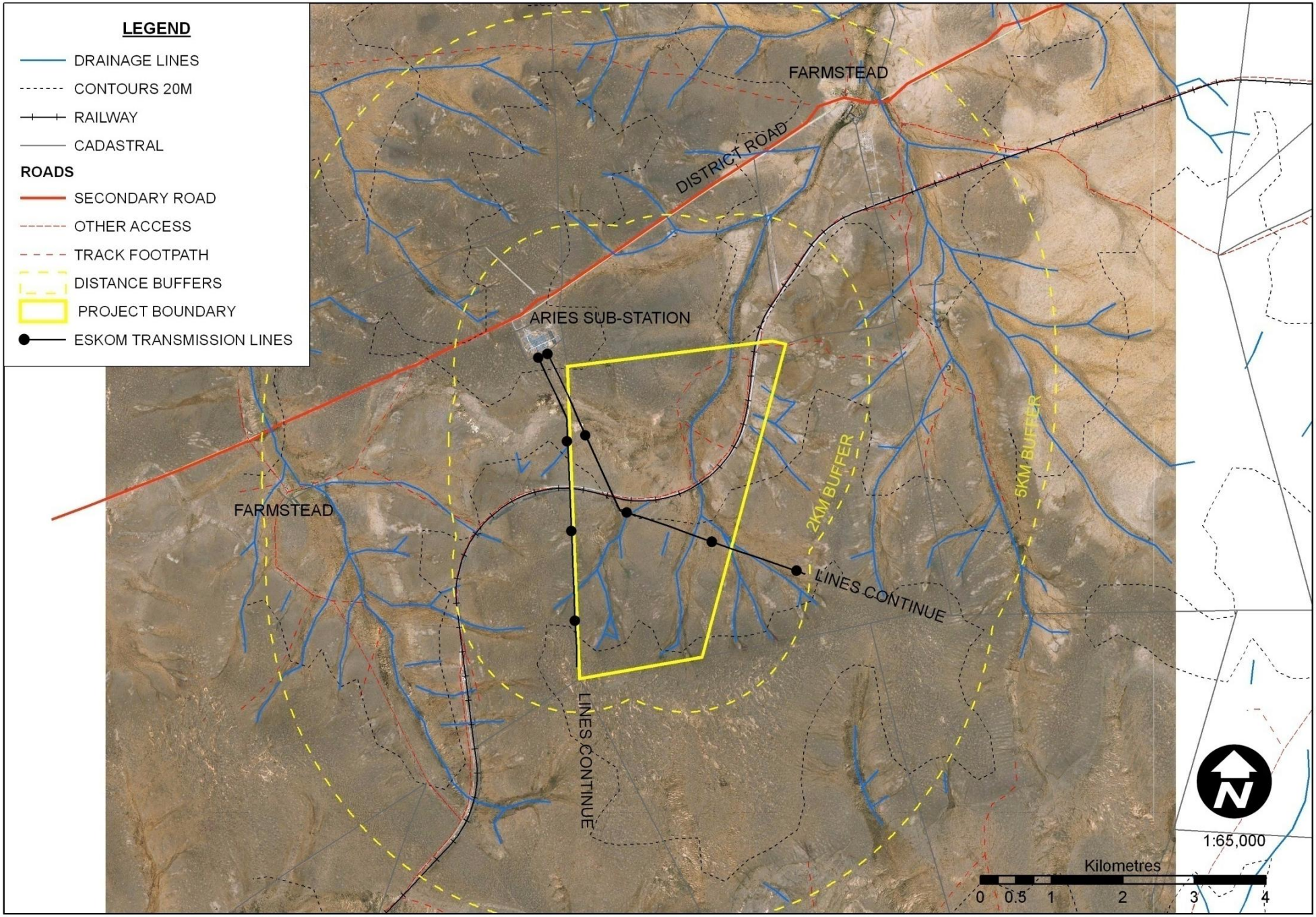


PLATE 2: SITE LOCALITY MAP

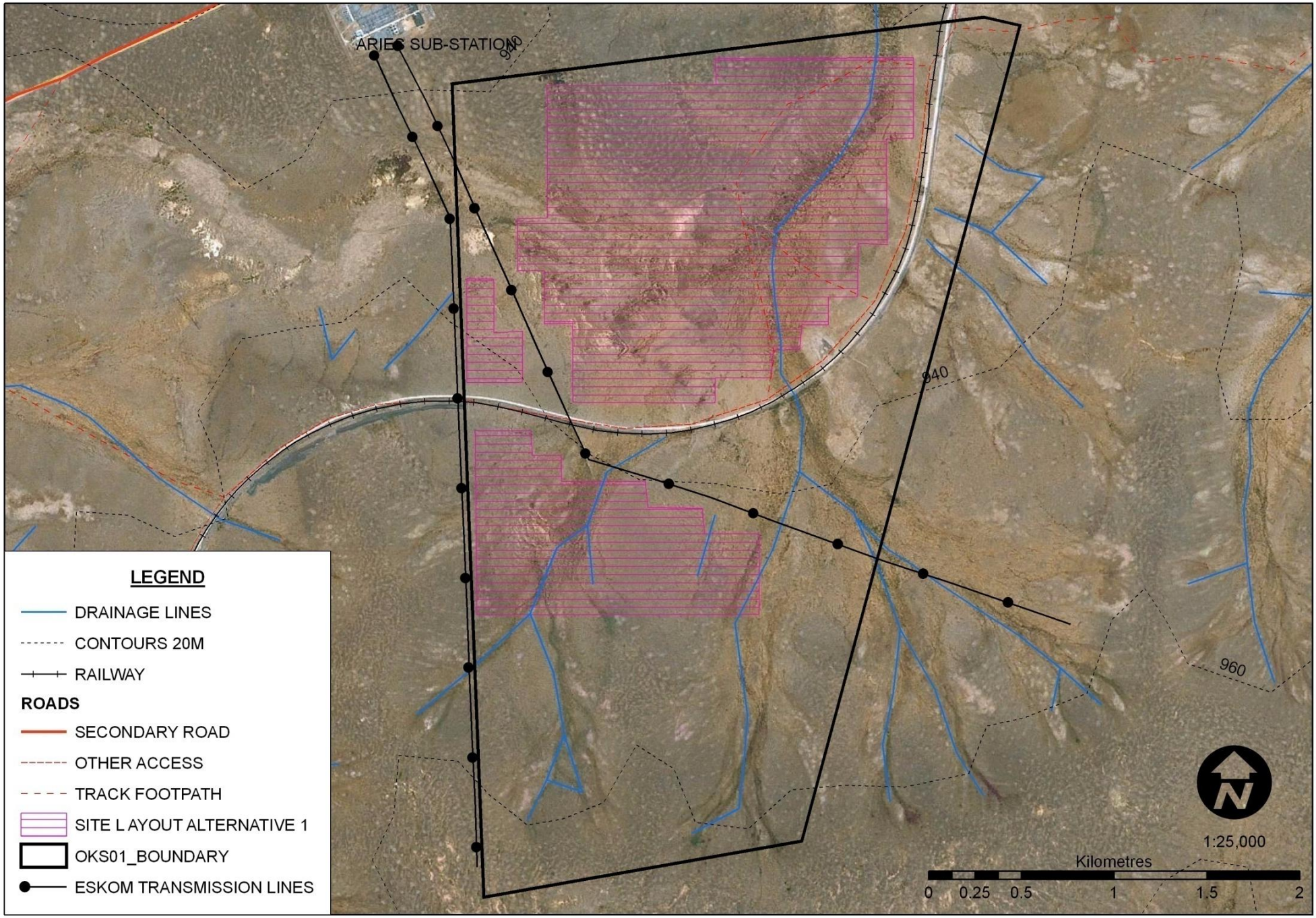


PLATE 3: PROJECT DESCRIPTION: PROPOSED SITE L AYOUT ALTERNATIVE 1

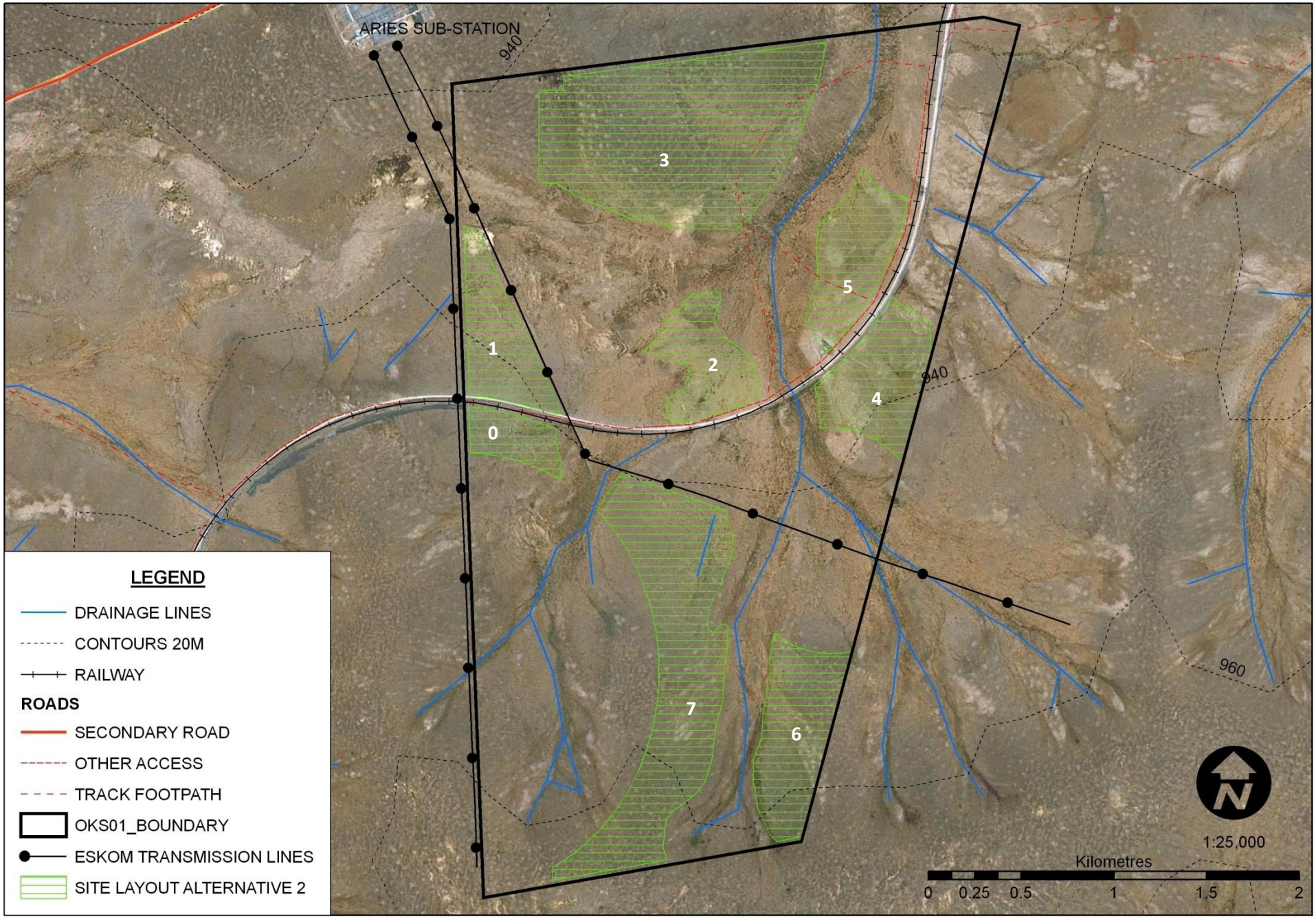


PLATE 4: PROJECT DESCRIPTION: PROPOSED SITE LAYOUT ALTERNATIVE 2

Figure 1: Photograph example of construction site of solar power panels *(Source: ERM)*

Figure 2: Photograph example of solar power panels *(Source: ERM)*

Figure 1: Photograph example of existing power lines in the area *(Source: ERM)*

Figure 2: Example of site clearing *(Source: ERM)*

Figure 3: Example trench construction *(Source: ERM)*

Figure 1*:* View towards Kenhardt and Quiver Forest *(GPS 009)*

Figure 2*:* View of regional sense of place *(GPS 018)*

Figure 1*:* View of existing vegetation *(GPS 015)*

Figure 2*:* View of existing arid gravel soil, sparse grass clumps and sporadic tree clumps *(GPS 012)*

Figure 1: View of existing railway line *(GPS 009)*

Figure 2: Existing airstrip *(GPS 029)*

Figure 1: Existing site entrance gate looking towards Aeries sub-station *(GPS 023)*

Figure 2: Existing industial infrastructure (GPS 14)

Figure 3: Aries sub-station (GPS 013)

Figure 1: View SSE of old quarry *(GPS 025)*

Figure 2: View towards Aeries showing existing structure on site in amongst trees *(GPS 026)*

Figure 3: Zoom of existing structure on site *(GPS 026)*

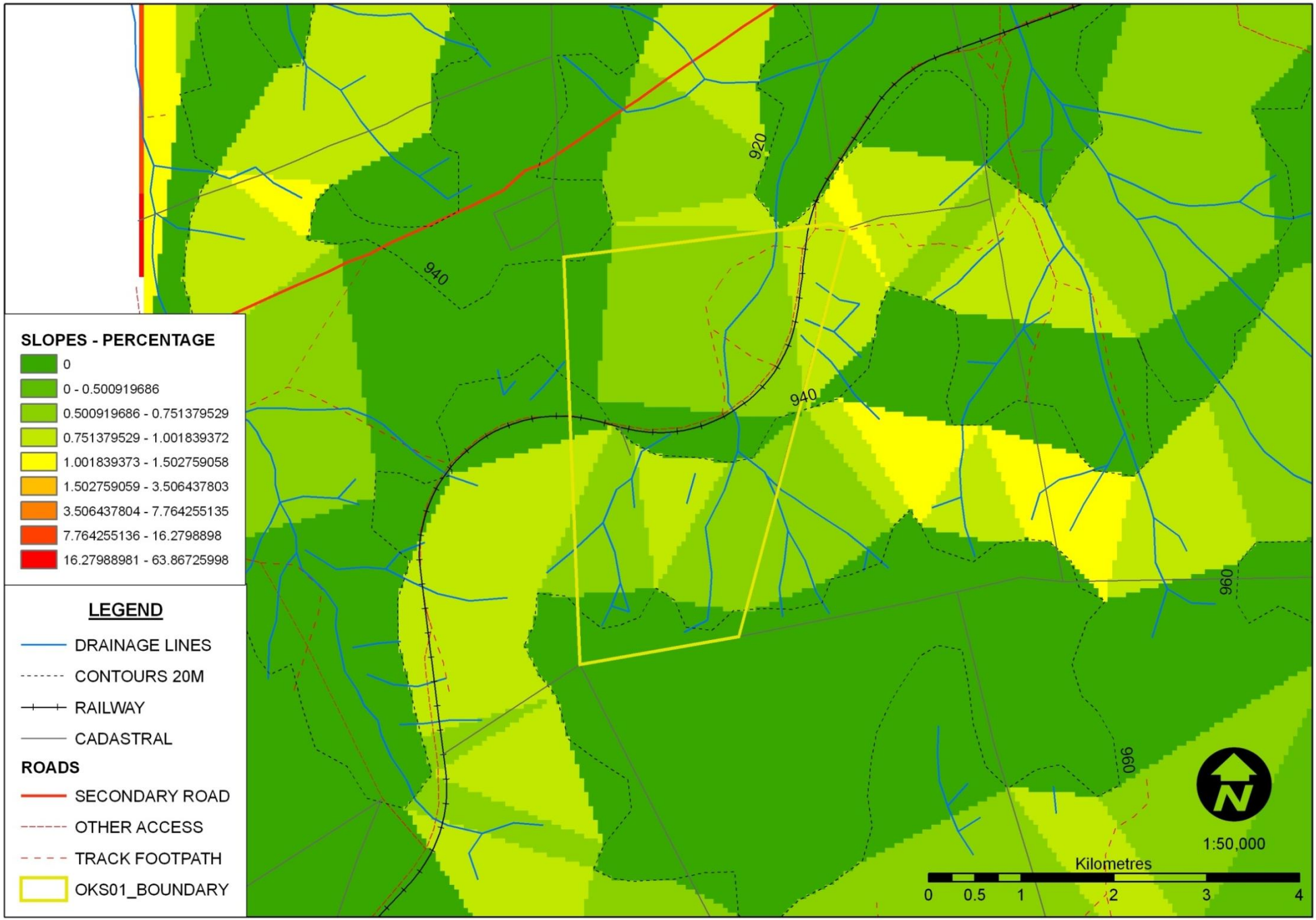


PLATE 12: SITE SLOPES MAP

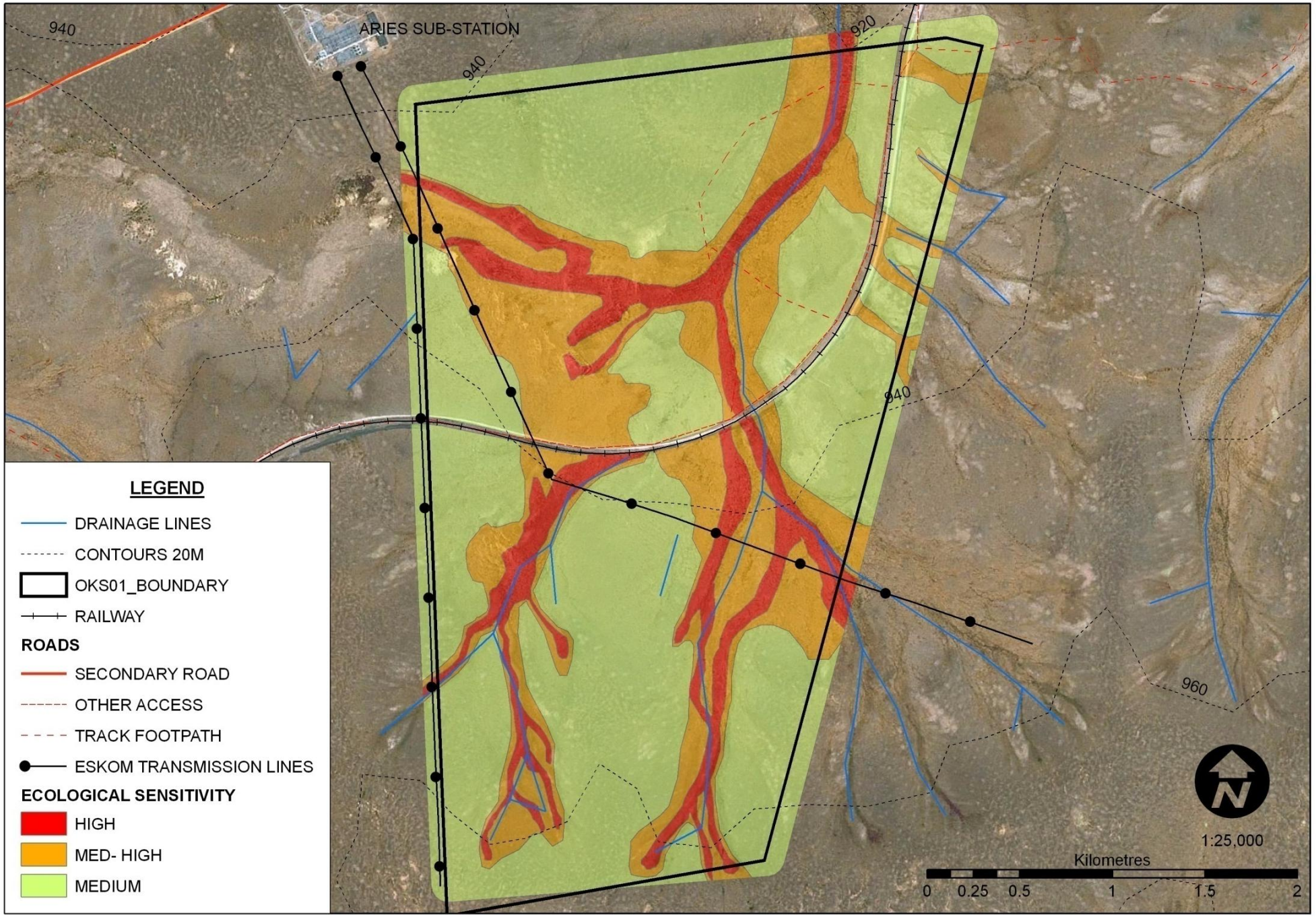


PLATE 13: SITE ECOLOGICAL SENSITIVITY MAP

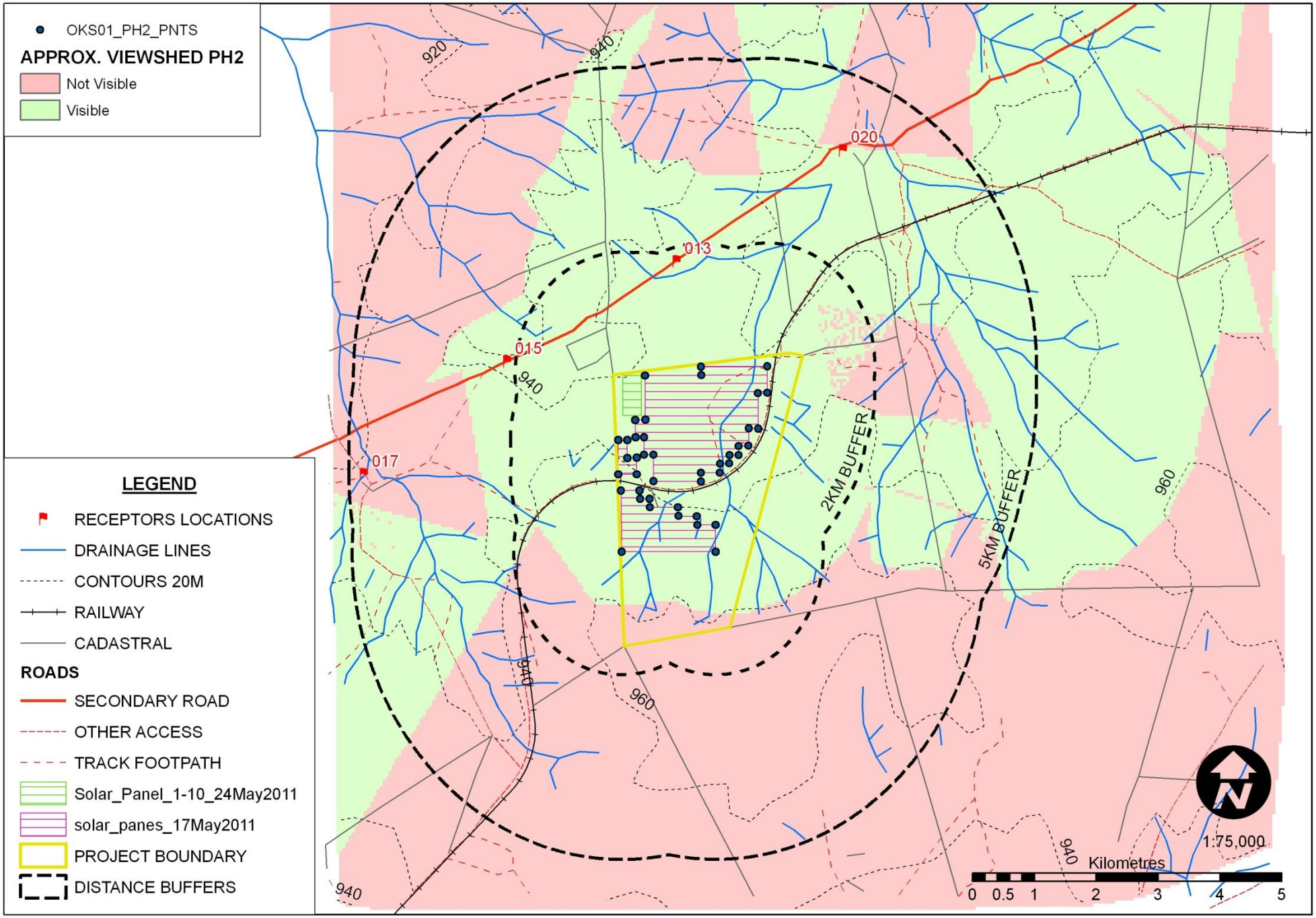


PLATE 14: VIEWSHED MAP: ALTERNATIVE 1

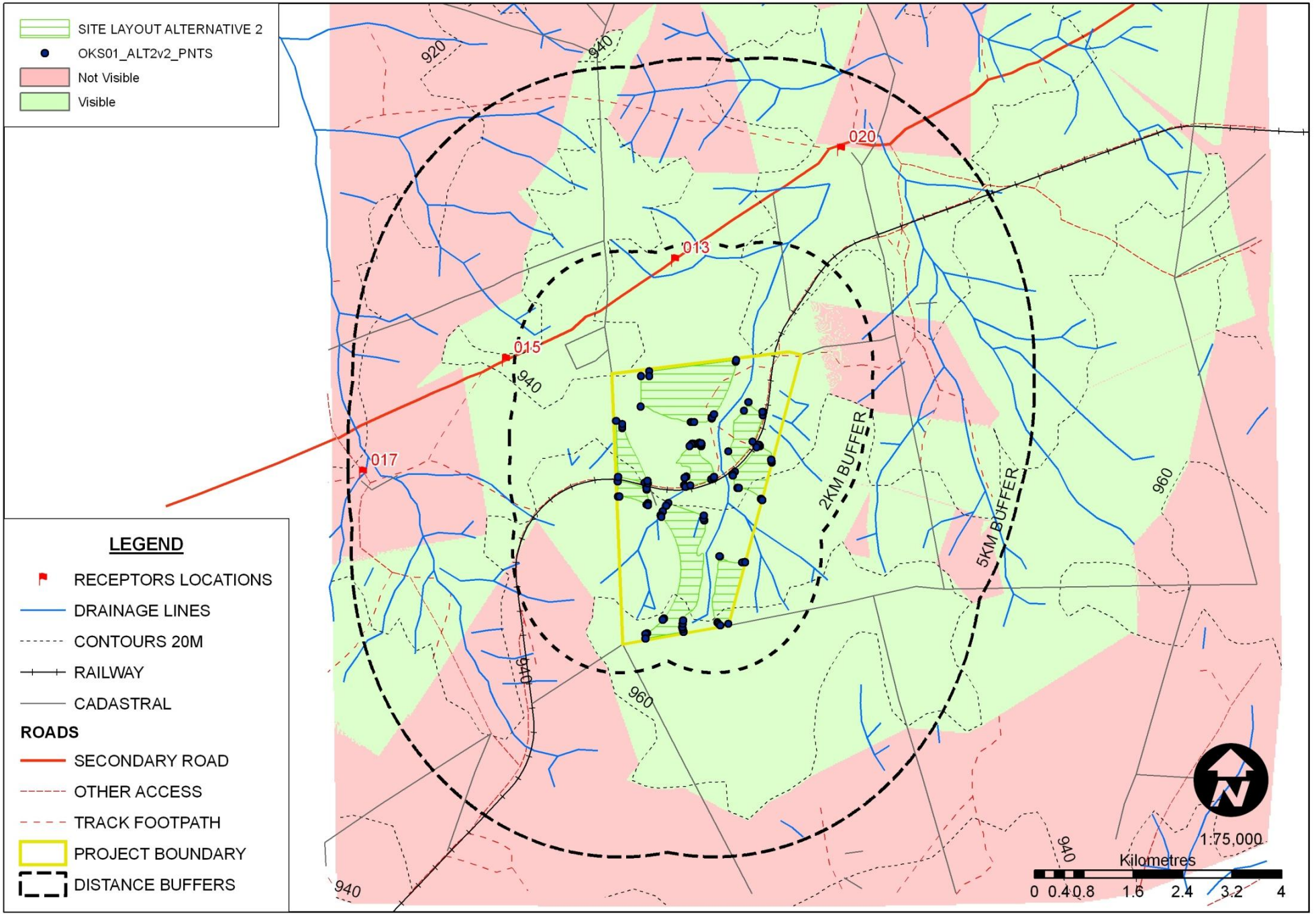


PLATE 15: VIEWSHED MAP: ALTERNATIVE 2

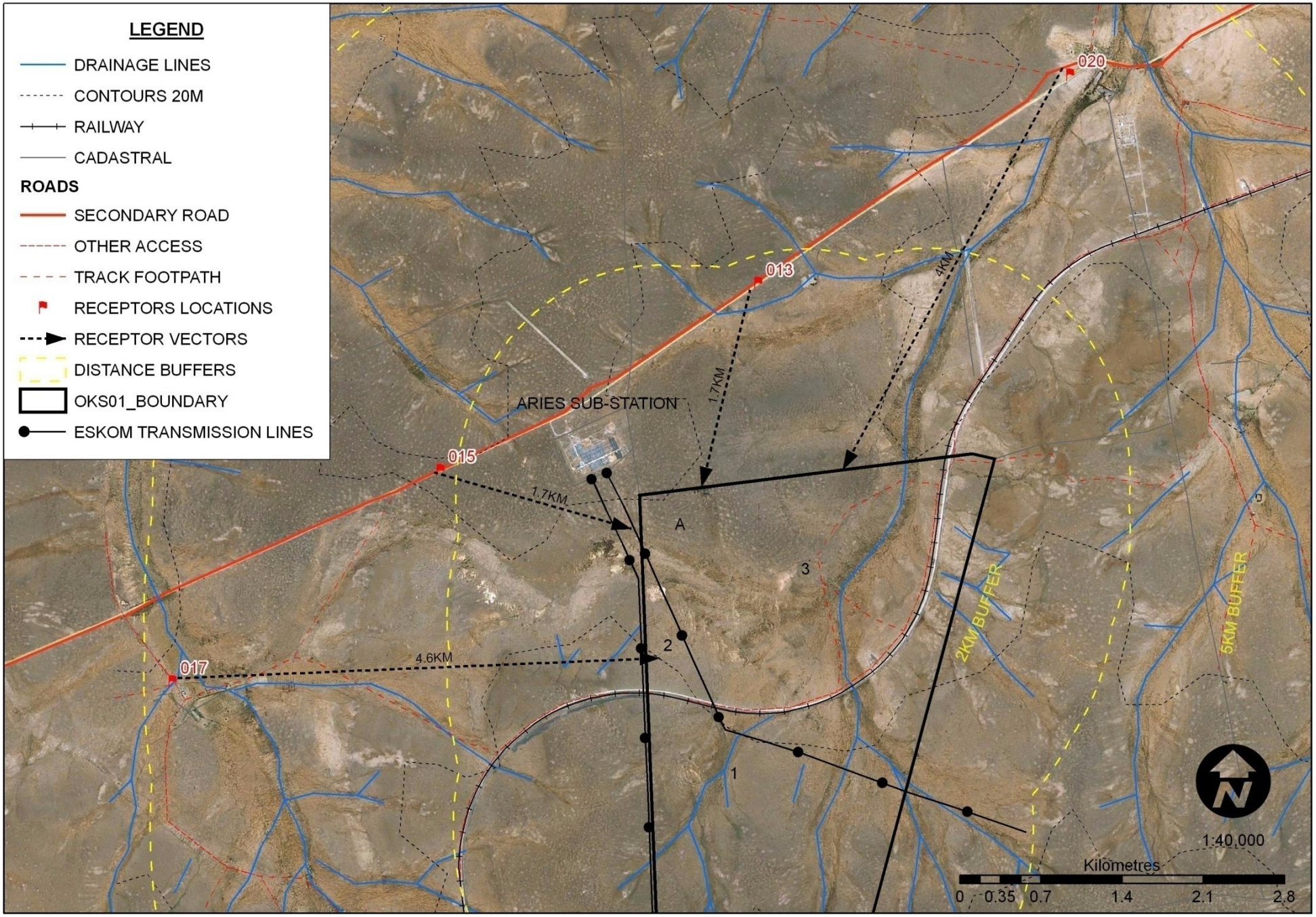


PLATE 16: RECEPTORS: LOCALITY MAP

Figure 1: Sense of place of clustered small farm buildings with medium to large shade trees.

Figure 2: View SSE in the direction of the proposed site from the entrance to the receptor dwelling (Aries Substation visible in the distance on the right)

Figure 1: Gravel road sense of place at location with the Aries Substation dominating the landscape context.

Figure 2: View south to south east towards the site from the gravel road travelling west (Aries Substation to the right)

Figure 1: View of gravel road sense of place

Figure 2: Panoramic view south-east towards site as seen from the gravel road receptors travelling east. Aries substation indicated on the left.

Figure 1: View of farmstead sense of place*(GPS 016)*

Figure 2: Panoramic view north east to east towards site. Aries substation indicated on the left.

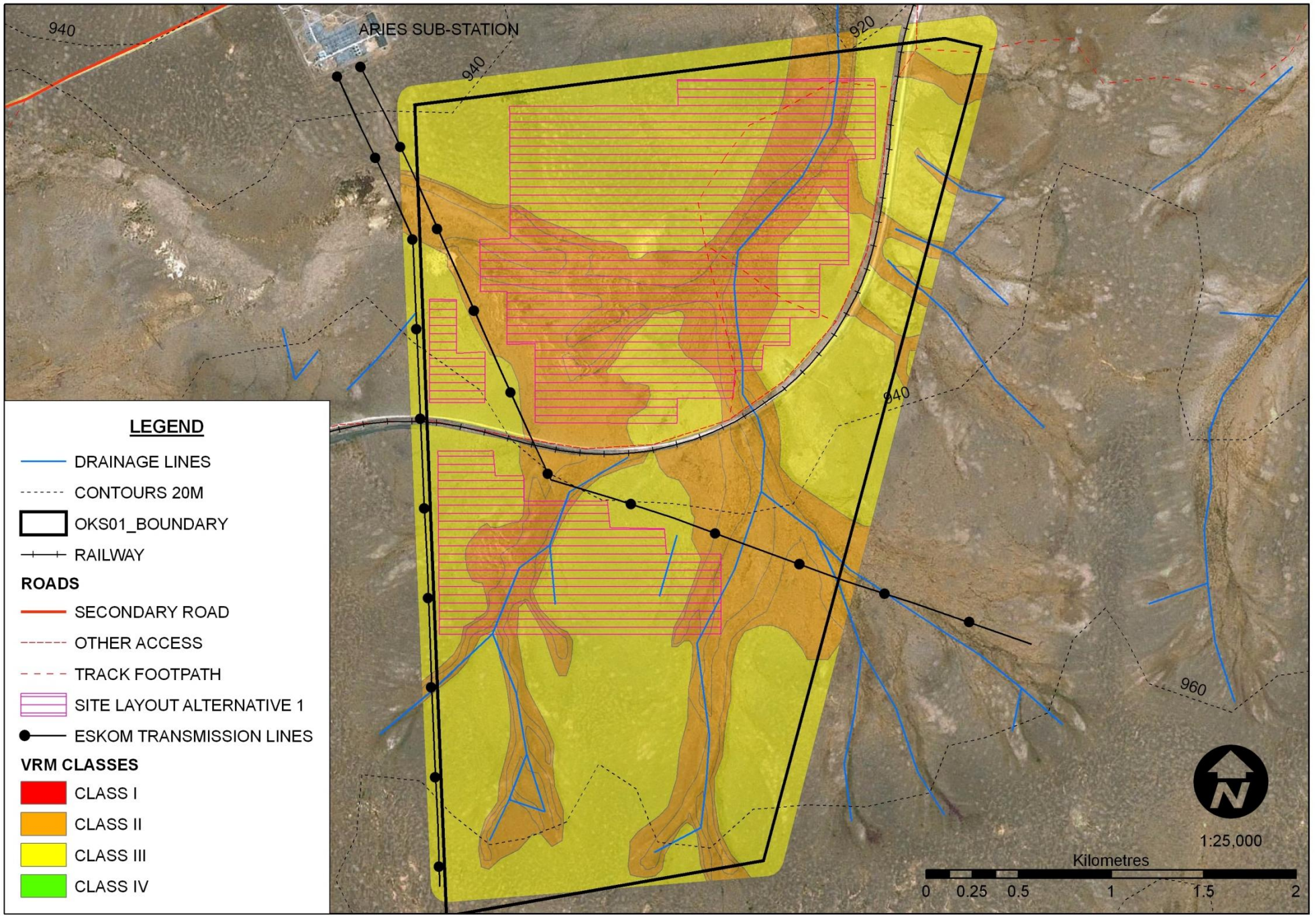


PLATE 21: VRM MAP: SITE LAYOUT ALTERNATIVE 1

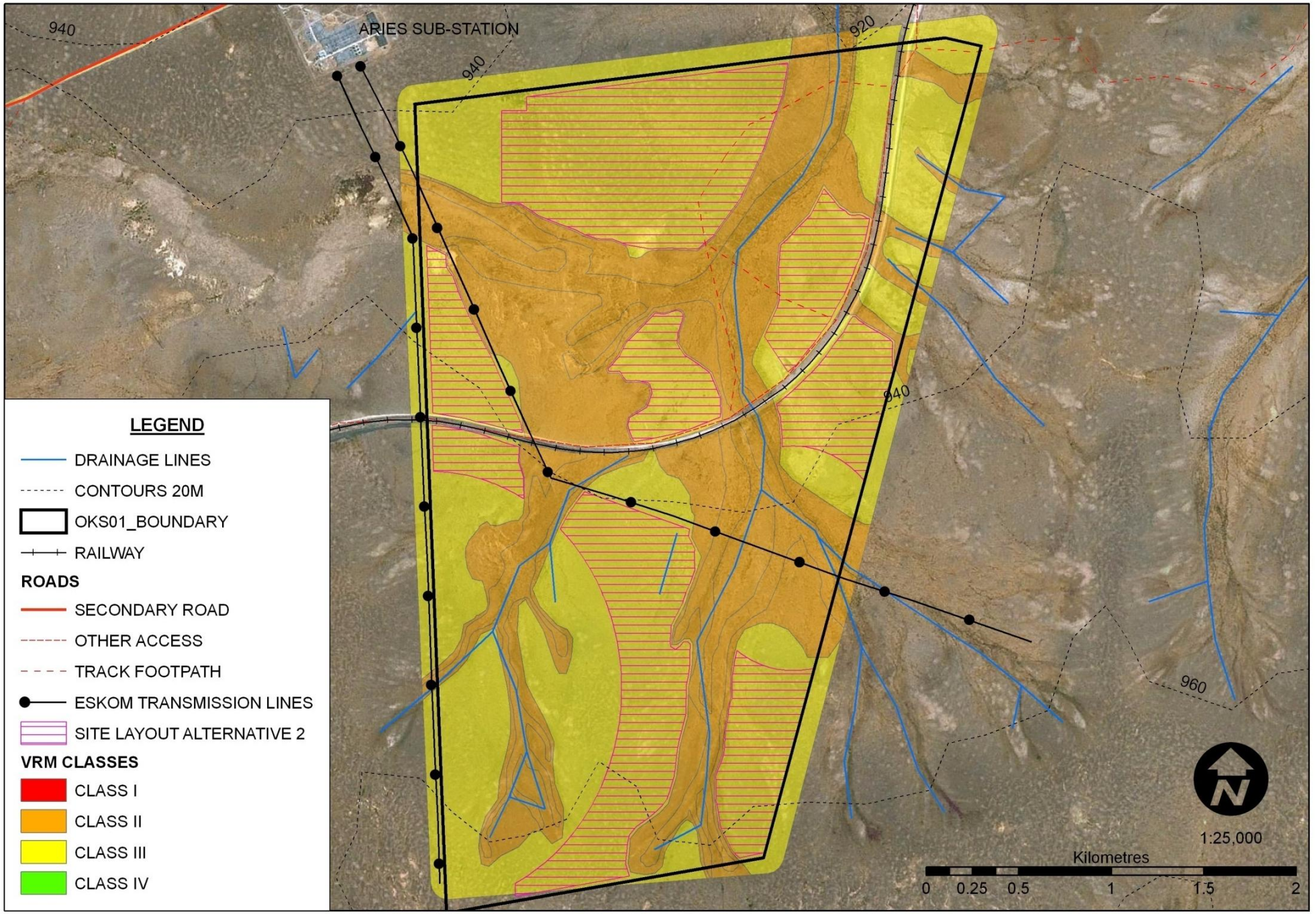
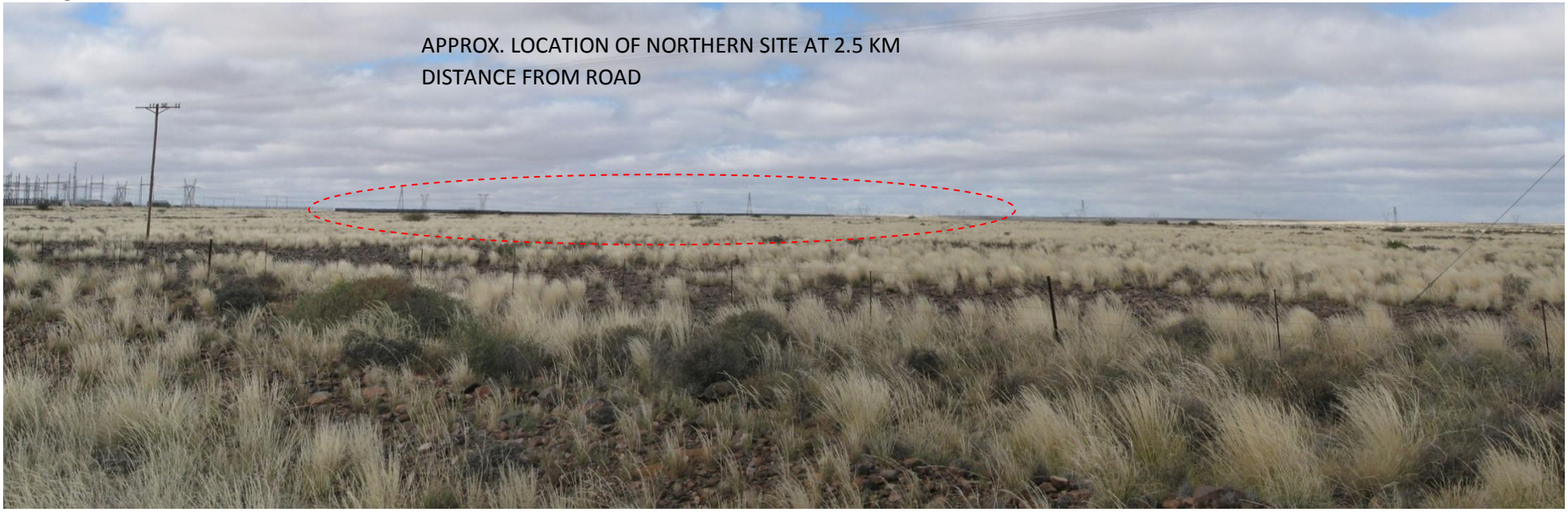


PLATE 22: VRM OVERLAY MAP: SITE LAYOUT ALTERNATIVE 2

Existing view from district road (GPS 15)

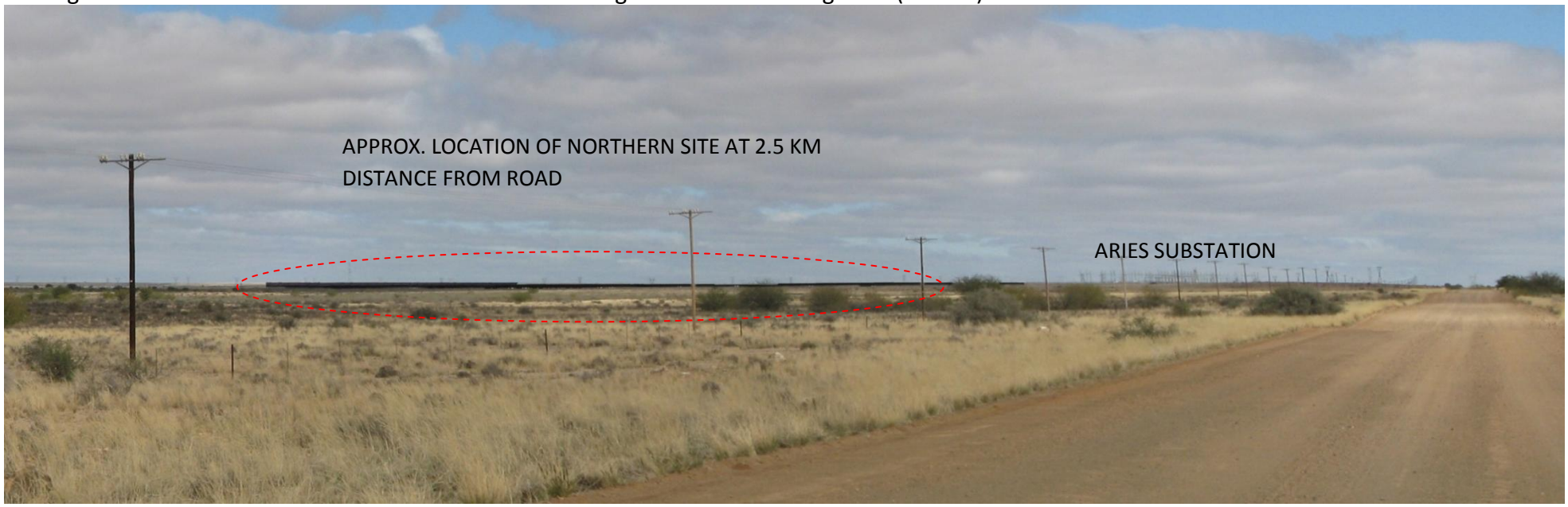


Modified view

For illustrative purposes only

PLATE 23: PHOTOMONTAGE: VIEW FROM GPS 15 (DISTRICT ROAD)

Existing view south to south east towards the site from the gravel road travelling west (GPS 13)



Modified view

For illustrative purposes only

PLATE 24: PHOTOMONTAGE: GRAVEL ROAD (GPS 20)

PLATE 25: GOOGLE EARTH GPS POINT MAP