Eskom Holdings SOC Limited

PROPOSED NEW OLIFANTSHOEK 10MVA 132/11KV SUBSTATION AND 31KM POWERLINE, NORTHERN CAPE PROVINCE

VISUAL IMPACT ASSESSMENT REPORT

DECEMBER 2016

Prepared by:
Afzelia Environmental Consultants and Environmental Planning and Design
P.O. Box 37069,
Overport,
4067
Tel: 031 303 2835
Fax: 086 692 2547
Email: info@afzelia.co.za

Prepared for:
Savannah Environmental (Pty) Ltd
1st Floor, Block 2, 5 Woodlands Drive Office Park
Cnr Woodlands Drive & Western Service Road
Woodmead

2191
Tel: 011 656 3237
Fax: 086 684 0547
Email: ashleigh@savannahsa.com

PREPARED BY

Afzelia ENVIRONMENTAL CONSULTANTS

76 Valley View Road, Morningside, Durban, 4001
PO Box 37069, Overport, Durban. 4067

Tel: +27 (0)31 3032835
Fax: +27 (0)86 692 2547

ENVIRONMENTAL PLANNING AND DESIGN

PO BOX 2122, WESTVILLE, 3630, SOUTH AFRICA

TABLE OF CONTENTS

1 INTRODUCTION 4
1.1 GENERAL 4
1.2 PROJECT LOCATION 4
1.3 BACKGROUND OF SPECIALIST 4
1.4 BRIEF AND RELEVANT GUIDELINES 5
2. PROJECT DESCRIPTION AND CONTEXT 7
2.1 MOTIVATION 7
2.2 PROJECT DESCRIPTION 7
3 DESCRIPTION OF RECEIVING ENVIRONMENT AND POSSIBLE RECEPTORS 10
3.1 LANDSCAPE CHARACTER 10
3.1.1 Landform and Drainage 10
3.1.2 Nature of Development and Land Uses 11
3.1.3 Vegetation Patterns 11
3.1.4 Landscape Character Areas, Visual Absorption Capacity (VAC) and Significance 12
3.2 VISUAL RECEPTORS 13
4 THE NATURE OF POTENTIAL VISUAL IMPACTS 21
4.1 GENERAL 21
4.2 THE NATURE OF LIKELY VIEWS OF THE DEVELOPMENT 21
4.2.1 Overhead Powerlines 21
4.2.2 Sub-station 23
5 VISIBILITY OF THE PROPOSED DEVELOPMENT 26
5.1 ZONES OF THEORETICAL VISIBILITY 26
5.2 ASSESSMENT LIMIT 26
5.3 APPROACH TO THE ASSESSMENT 26
5.3.1 ZTV for Proposed Alternatives 26
5.4 VISIBILITY OF DEVELOPMENT ALTERNATIVES 27
5.4.1 General 27
5.4.2 Alternative Power Line Alignments 27
5.4.3 Alternative Substation Locations. 27
5.5 CUMULATIVE IMPACTS 28
5.6 KEY VIEWPOINTS 28
6 VISUAL IMPACT ASSESSMENT 39
6.1 ASSESSMENT METHODOLOGY 39
6.2 ASSESSMENT 40
6.2.1 Impact of the Proposed Development on General Landscape Character 40
6.2.2 Impact of the Proposed Development on Identified Sensitive Receptors 42
7 IMPACT STATEMENT 48
7.1 LANDSCAPE CHARACTER 48
7.2 PROPOSED DEVELOPMENT 48
7.3 IDENTIFIED SENSITIVE RECEIVERS 48
7.4 Visual Impact AND MITIGATION POTENTIAL 48
7.5 CUMULATIVE IMPACT 49
7.7 CONCLUSION 49

APPENDICES

I SPECIALIST'S BRIEF CV
II GUIDELINES FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES (CONTENTS PAGES ONLY)
III FORMULA FOR DERIVING THE APPROXIMATE VISUAL HORIZON
IV CUMULATIVE ASSESSMENT
V ENVIRONMENTAL MANAGEMENT PLAN

MAPS

1 SITE LOCATION
2 LANDFORM AND DRAINAGE
3 LANDUSE

4 VEGETATION TYPES
5 LANDSCAPE CHARACTER AREAS
6 ZONES OF THEORETICAL VISIBILITY
7 ALIGNMENT ALTERNATIVES
8 SUBSTATION ALTERNATIVES

PHOTOGRAPHIC PLATES

1 SUB-STATION BUS BARS
2 TRANSFORMER WITH OIL STORAGE TANK ABOVE
3 SUB-STATION & COMMUNICATION TOWER
4 23-28M HIGH, 132KV LATTICE TOWER
5 URBAN LANDSCAPE CHARACTER AREA
6 MINING LANDSCAPE CHARACTER AREA
7 LOWLAND LANDSCAPE CHARACTER AREA
8 UPLAND LANDSCAPE CHARACTER AREA
9 HOUSES IN THE URBAN AREA CLOSE TO SUBSTATION ALTERNATIVES 1 AND 2
10 RURAL HOMESTEADS CLOSE TO THE POWERLINE
11 THE N14
12 A VIEW ALONG THE LINE OF A 132KV OVERHEAD POWER LINE WITH MONOPOLE TOWERS
13 A VIEW ALONG THE LINE OF AN EXISTING SIMILAR OVERHEAD POWER LINE WITH STEEL LATTICE TOWERS
14 400KV DOUBLE OVERHEAD TRANSMISSION LINES
15 DISTANCE VIEW (1.5-2.0KM) OF THE EXISTING HAMMERSDALE 400KV SUB STATION
16 VP1
17 VP2
18 VP3
19 VP4
20 VP5
21 VP6
22 VP7
23 VP8
24 VP9
25 VP10 WEST
26 VP10 EAST

1 INTRODUCTION

1.1 GENERAL

This visual impact assessment (VIA) study forms part of the Basic Assessment that is being undertaken for the Proposed New Olifantshoek 10MVA 132/11KV Substation And 31km Powerline, Northern Cape Province by Savannah Environmental (Pty) Ltd on behalf of Eskom Holdings SOC Limited.

In terms of the EIA Regulations promulgated under the amended National Environmental Management Act (NEMA) Act No. 107 of 1998, the proposed development of the facilities requires environmental authorisation. An impact to be assessed comprises the visual impact that the facilities will have on surrounding areas.

1.2 PROJECT LOCATION

The project is located in the Olifantshoek region of the Northern Cape Province, within ward 3 and ward 4 of the Gamagara Local Municipality and ward 6 of the Tatsebane Local Municipality, (Map 1: Locality Map).

The study area extends from a power line connection point at its northern extremity at the Transnet Emil switching station and extends for approximately 31km to the south to a new proposed substation on the eastern edge of the town of Olifantshoek.

Two alternative substation locations and two 132kV power line alignments have been identified. The majority of the new power line route will follow the existing Ferrum/Nieuwehoop 400kV and Ferrum/Lewensaar 132kV power lines.

The approximate geographic coordinates for the alternative substation locations and connection to the existing Emil Switching Station are;

CONNECTION POINT TO EMIL SWITCHING STATION			
South	27^0	44’	10.04”
East	22^0	55’	13.52”
ALTERNATIVE 1 SUBSTATION LOCATION			
South	27^0	55’	52.95”
East	22^0	44’	54.38”
ALTERNATIVE 2 SUBSTATION LOCATION			
South	27^0	56’	11.27”
East	22^0	44’	28.95”

1.3 BACKGROUND OF SPECIALIST

Jon Marshall (Pr. LArch, CMLI, EAPSA, Dip LA) qualified as a Landscape Architect in 1978. He is also a certified Environmental Impact Assessment Practitioner. He has been involved in Visual Impact Assessment over a period of approximately 30 years. He has developed the necessary computer skills to prepare viewshed analysis (zone of theoretical visibility) and three dimensional modelling to illustrate impact assessments. He has undertaken visual impact assessments for major buildings, mining, industrial development, mining and infrastructure projects and has been involved in the preparation of visual guidelines for large scale developments. Jon is responsible for report writing and visual impact assessment.

Refer to **Appendix I** for brief Curriculum Vitae.

1.4 BRIEF AND RELEVANT GUIDELINES

The brief is to assess the visual impact that the facility will have on surrounding areas.

Work is to be undertaken in accordance with the following guideline documents;

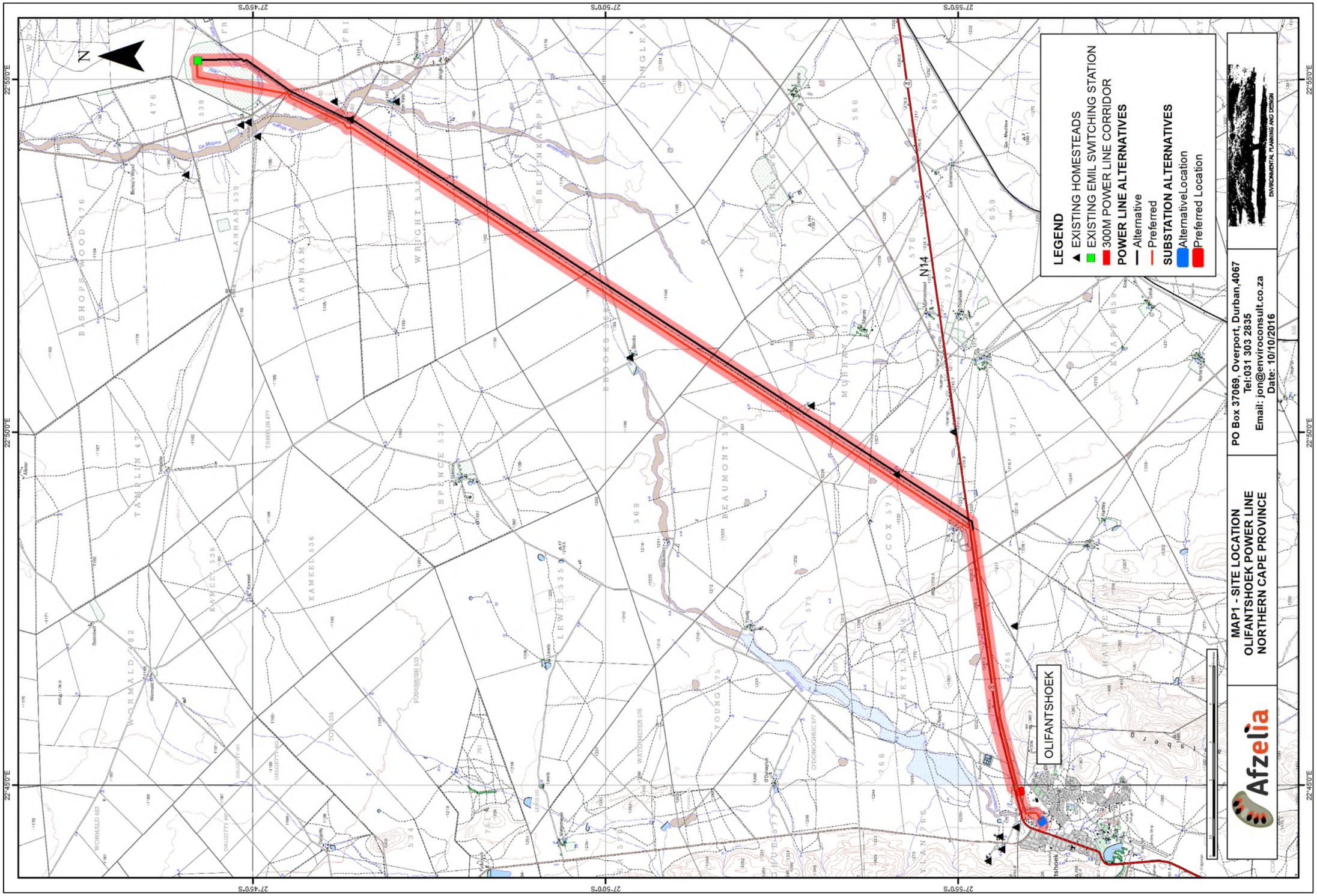
a. The Government of the Western Cape Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (Western Cape Guideline), which is the only local relevant guideline, setting various levels of assessment subject to the nature of the proposed development and surrounding landscape, and

b. The Landscape Institute and Institute of Environmental Management and Assessment (UK) Guidelines for Landscape and Visual Impact Assessment which provides detail of international best practice (UK Guidelines).

Refer to **Appendix II** for the Western Cape Guideline.

A Level 3 Assessment has been undertaken in accordance with the Western Cape Guidelines. This typically requires;

- Identification of issues raised in scoping phase, and site visit;
- Description of the receiving environment and the proposed project;
- Establishment of view catchment area, view corridors, viewpoints and receptors;
- Indication of potential visual impacts using established criteria;
- Inclusion of potential lighting impacts at night;
- Description of alternatives, mitigation measures and monitoring programmes.
- Review by independent, experienced visual specialist (if required).


LEGEND
EXISTING HOMESTEADS
EXISTING EMIL SWITCHING STATION
300M POWER LINE CORRIDOR
POWER LINE ALTERNATIVES
Alternative
Preferred
SUBSTATION ALTERNATIVES
AlternativeLocation
Preferred Location
N
OLIFANTSHOEK
N14
MAP1 - SITE LOCATION
OLIFANTSHOEK POWER LINE
NORTHERN CAPE PROVINCE
ENVIRONMENTAL PLANNING AND DESIGN
PO Box 37069, Overport, Durban,4067
Tel:031 303 2835
Email: jon@enviroconsult.co.za
Date: 10/10/2016
Afzelia
22°45'0"E
22°50'0"E
22°55'0"E
27°45'0"S
27°50'0"S
27°55'0"S

2. PROJECT DESCRIPTION AND CONTEXT

2.1 MOTIVATION

Eskom Holdings SOC Limited (Eskom) is proposing to establish a **substation and power line** which will be used to increase customers Notified Maximum Demand (NMD) from 2.5MVA to 10 MVA as a provision for future developments within the Olifantshoek region.

2.2 PROJECT DESCRIPTION

The Olifantshoek Substation and power line will be comprised of the following:

- A new 10MVA **on-site substation** (100m X 100m) to constructed adjacent to the existing 22/11kV Olifantshoek substation.
- A new **overhead** 132 kV **power line** approximately 31 km long to connect directly to the Emil switching station via the new on site substation. The majority of the new power line route will follow the existing Ferrum/Nieuwehoop 400kV and Ferrum/Lewensaar 132kV power lines. The possible development corridor of the new power line is 300m with a servitude of 32 m wide. There are 2 alternative power line routes proposed, all which transect the Olifantsloop non-perennial river and the Ga-mogara perennial river.
- The decommissioning of the existing 22/11kV Olifantshoek Substation

Substations generally have switching, protection and control equipment, and transformers.

The proposed substation will be located within a fenced enclosure.

Sub-station components and their functions

Equipment	Function
Transformers	To step-down or step-up voltage and transfer power from one current to another. The windings of such large transformers are immersed in transformer oil, which is a highly refined mineral oil that is stable at high temperatures and has excellent electrical insulating properties. Its functions are to insulate, suppress corona and arcing, and to serve as a coolant for transformers.
Circuit breakers	Automatic switching during normal or abnormal conditions
Feeder bay	Steelwork housing for circuits
Reactors	Equipment for the efficient operation of long transmission power lines as they compensate the voltage on power lines to avoid uncontrolled voltage rise, especially on lightly loaded lines
Isolators	Equipment for de-energising a circuit for maintenance and repair
Bus bars	Incoming and outgoing circuits of the same voltage tie into a common node called a busbar, which consists of a number of tubular conductors made of aluminium

Oil holding dams	For containment of accidental oil spills from transformers
Loop-in lines	Incoming power lines (connected to busbars)
Loop-out lines	Outgoing power lines (connected to busbars)
Telecommunication mast	Equipment used for remote communication with the sub-station
Buildings	Administrative office, control room, ablution blocks, equipment and storage areas
Lighting	For safety and security as well as for night-time emergency operations and maintenance

The highest elements within a substation are generally the bus bars that facilitate the transfer of electrical current into and out of the facility. These are likely to be in the order of 10 – 15m high.

The proposed substation will have a footprint of approximately of ± 100 m x 100 m

Two alternative locations have been identified for the proposed substation, including;

- Approximately 500m east of the urban area of Olifantshoek and 50m south of the N14. This is considered to be the preferred substation location.
- Approximately 30m to the east of the existing Olifantshoek substation. This is considered to be the alternative substation location

The existing Olifantshoek substation will be decommissioned on completion of the new proposed substation.

The new substation will be connected to the Emil switching station by approximately 31km of 132kV overhead power line.

Towers associated with the power line are expected to be an average height of 23m – 28m,which is comparable to the line into which it connects. The pylons are expected to be self-sustaining steel monopole structures.

The construction of the proposed 132kV overhead power line is likely to follow the following sequence;

- Excavation and concrete work for tower bases. Due to the dispersed nature of the bases, it is unlikely for concrete to be batched on site. It is likely that concrete will be ready mixed and brought in by concrete trucks as and when required.

- Erection of towers in a progressive manner. It is common for materials for a number of poles to be delivered to site at the same time. Erection requires the use of a mobile crane to hold prefabricated elements in position. This process is relatively rapid as each pole / pylon is prefabricated off site.

- Stringing of cables which also requires the use of cranes and mobile hoists to enable workers to fix insulators and attachments and to pull cables between towers.

The above process is relatively clean, rapid and only affects the area immediately surrounding each tower location.

An operating servitude will have to be registered in favour of Eskom to protect the alignment. The servitude will prevent development and any other use that could compromise the overhead line. It will not prevent current agricultural uses or access beneath the line.

The following typical dimensions are likely to apply to the project;

- Tower height: 23-28m subject to tower selection.
- Tower spacing: 200m – 400m subject to terrain.
- Operating servitude: 32m (16m x 2)

Refer to Map 1 for the proposed alignment alternatives and substation locations.

TYPICAL ELEMENTS INCLUDED IN THE PROJECT

Plate 1 - Sub-station Bus Bars maximum height 10-15m

Plate 2 – Transformer with oil storage tank above.

Plate 3 - Sub-station & Communication Tower

Plate 4 - 23-28m high, 132kV self-sustaining steel monopole tower.

3 DESCRIPTION OF RECEIVING ENVIRONMENT AND POSSIBLE RECEPTORS

3.1 LANDSCAPE CHARACTER

Landscape character is defined by the UK Guidelines as "a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another".

The proposed site is located within the floor of a broad valley system that generally falls from the south to the north.

The landscape surrounding the site is arid, comprising relatively flat drainage plains with rocky outcrops to the south, east and west forming the valley sides.

The majority of the area surrounding the proposed site appears relatively natural. On the eastern flank of the valley there is a large mining area. The settlements of Kathu and Olifantshoek are also located on the western and eastern sides of the valley respectively.

To the north, west and south of the proposed site the main land use appears to be agricultural and specifically low intensity grazing interspersed with isolated homesteads that are concentrated to the south west and north east of the proposed site.

Landscape Character is a composite of a number of influencing factors including:

- Landform and drainage;
- Nature and density of development; and
- Vegetation patterns.

From the site visit the following characteristics have been identified.

3.1.1 Landform and Drainage

The proposed power line will cross a broad valley floor from north east to south west, crossing two non-perennial water courses (Ga-Mogara and Olifansloop) that drain the valley towards the north.

Whilst the valley floor is relatively flat, because the proposed power line is aligned from the north eat to the south west and the valley falls towards the north, the elevation of the line increases as it runs to the south west. At its connection point at the Emil Switching Station the elevation is approximately 1170m amsl. As the power line approaches the N14, its elevation is approximately 1350m amsl.

At the N14, the alignment turns to the west and crosses steeper and rockier terrain associated with the valley side (Langberg) as it approaches Olifantshoek and the proposed substation where the ground elevation is approximately 1370m amsl.

The proposed substation will be located within the rockier terrain of the Langberg.

The visual implications of landform are;

- Because for the majority of its alignment the proposed power line traverses a largely flat area, landform is unlikely to play a major role in screening it.

- The proposed substation alternatives are all located within an area or more rugged topography, landform may help to screen these facilities.

Refer to Map 2, Landform and Drainage.

3.1.2 Nature of Development and Land Uses

The population density of the area immediately surrounding the proposed development varies.

Kathu is the largest town and Olifantshoek is the second largest town of five towns within the Gamagara Local Municipality. However both are relatively small towns. At the 2011 census, the municipality had a total population of approximately 41,617 people approximately 71% of which are based in urban areas.

The area of the Municipality is 2,619km^2.

Rural homesteads were found to have an average occupancy of 3.5 people. This means that there is a rural homestead for approximately every 0.75km^2.

Given the province's dry conditions and dependence on irrigation, many Northern Cape farmers are branching out into value-added activities such as game farming. This is apparent in rural areas surrounding the proposed alignment as low intensity grazing appears to be mixed with game farming, hunting operations and bush lodges.

Olifantshoek is primarily a rural service centre. It is likely also that a proportion of its economy is derived from local mining operations as well as its position on the N14 as it acts as a transit stop for travellers including tourists.

Apart from agriculture, mining is the largest industrial activity in the area. Kathu is the centre of this activity. Mines in the area include iron ore and manganese. The mine to the west of Kathu and east of the northern section of the proposed power line is the Mamatwan Manganese Mine that is operated by Anglo American.

In addition to Mamatwan, there are numerous areas of degraded land as indicated on **Map 3**. It is possible that these areas have resulted from informal mining operations.

Refer to Map 3, Landuse.

3.1.3 Vegetation Patterns

According to Mucina & Rutherford (2006), the proposed power line alignment crosses a relatively natural area. The vegetation types include;

- Olifantshoek Plains Thornveld
- Kathu Bushveld

Both vegetation types are usually open tree and shrub cover with a sparse grass layer.

From observations on site, the tree layer is often above eye level.

Visual implications include;

- Where the viewer is amongst natural vegetation, it is possible that there will be a degree of screening provided by the natural vegetation.

- Where the viewer is set back from natural vegetation or where ground elevation provides a slightly elevated overview of the landscape, the extent of screening provided by natural vegetation is likely to be limited.

Within and around the town of Olifantshoek where the proposed overhead power line terminates in a new substation, vegetation patterns have been highly modified. Within the main street and adjacent gardens there is many taller trees and shrubs that tend to limit visibility. The area around the town has also been degraded by human activity which has had the effect of reducing tree and shrub cover and opening up longer views than might be possible within more natural areas.

This has the following visual implications for the project;

- The substation is likely to be largely hidden from inside the town; and
- From adjacent fringes of the town, the substation may be visible.

Refer to Map 4, Vegetation Types.

3.1.4 Landscape Character Areas, Visual Absorption Capacity (VAC) and Significance

Landscape Character Areas (LCAs) are defined as "single unique areas which are the discrete geographical areas of a particular landscape type".

The overriding character differentiating factors within the subject landscape appear to be landform /drainage and development.

Visual Absorption Capacity (VAC) is *defined* as the landscape's ability to absorb physical changes without transformation in its visual character and quality. Where elements that contrast with existing landscape character are proposed, VAC is dependent on elements such as landform, vegetation and other development to provide screening of a new element. The scale and texture of a landscape is also critical in providing VAC, for example; a new large scale industrial development located within a rural small scale field pattern is likely to be all the more obvious due to its scale.

The landform appears to divide the landscape into four discrete areas including;

a) **The Upland Landscape Character Area** associated with the Langsberg on the valley sides which largely contain the development and within which the south western section of the overhead power line is located. This area is incised by minor valleys and is generally covered by natural thorn veld. Settlement is sparse and consists of isolated homesteads. The area is primarily important for agricultural production, however, it also provides a variety of environments for ecotourism activities. It also provides a backdrop to the lowland landscape. VAC due to landform is likely to be relatively high.
b) **The Lowland Landscape Character Area** which is comprised of the valley floor within which the majority of the proposed power line will be located**.** This generally consists of relatively flat topography that is covered with natural thorn veld. low intensity grazing is the predominant agricultural activity. In areas land owners have diversified into game farming, hunting and bush lodges. Scattered homesteads are apparent in the landscape. VAC is likely to be relatively low due to the flat topography, however, vegetation could limit views of the development.

c) **The Urban Landscape Character Area,** particularly the urban area of Olifantshoek that can be characterised by dense urban development. This area is primarily important as a living environment for residents. VAC within teh settlement is likely to be high due to vegetation and buildings. On the edges of the settlement however VAC may be reduced due to the degraded nature of natural vegetation.
d) **The Mining Landscape Character Area** which although are not directly affected they do add a significant industrial element to the character of the area surrounding them. The only focus of this area is the extraction of minerals.

The LCAs are indicated on **Map 5, Landscape Character Areas.**

3.2 VISUAL RECEPTORS

Visual Receptors are defined as "individuals and / or defined groups of people who have the potential to be affected by the proposal".

This section is intended to highlight possible Receptors within the landscape which due to use could be sensitive to landscape change. They include;

- Area Receptors that include the urban area of Olifantshoek.
- Point Receptors that include homesteads that are scattered throughout the area. It is likely that the focus for this area is agricultural production. Unless farms have diversified into the tourism market it is unlikely that this group of receptors will be overly sensitive to the likely landscape change as long as it does not impact on agricultural productivity.
- Linear Receptors that include the N14 and or local routes through the area. The N14 is a primary tourism route. Local routes surrounding the development are likely to be mainly used by local people and relate to agricultural activities.

LANDSCAPE CHARACTER AREAS

Plate 5, Urban Landscape Character Area

Plate 6, Mining Landscape Character Area

Plates 7, Lowland Landscape Character Area

LANDSCAPE CHARACTER AREAS

Plate 8, Upland Landscape Character Area

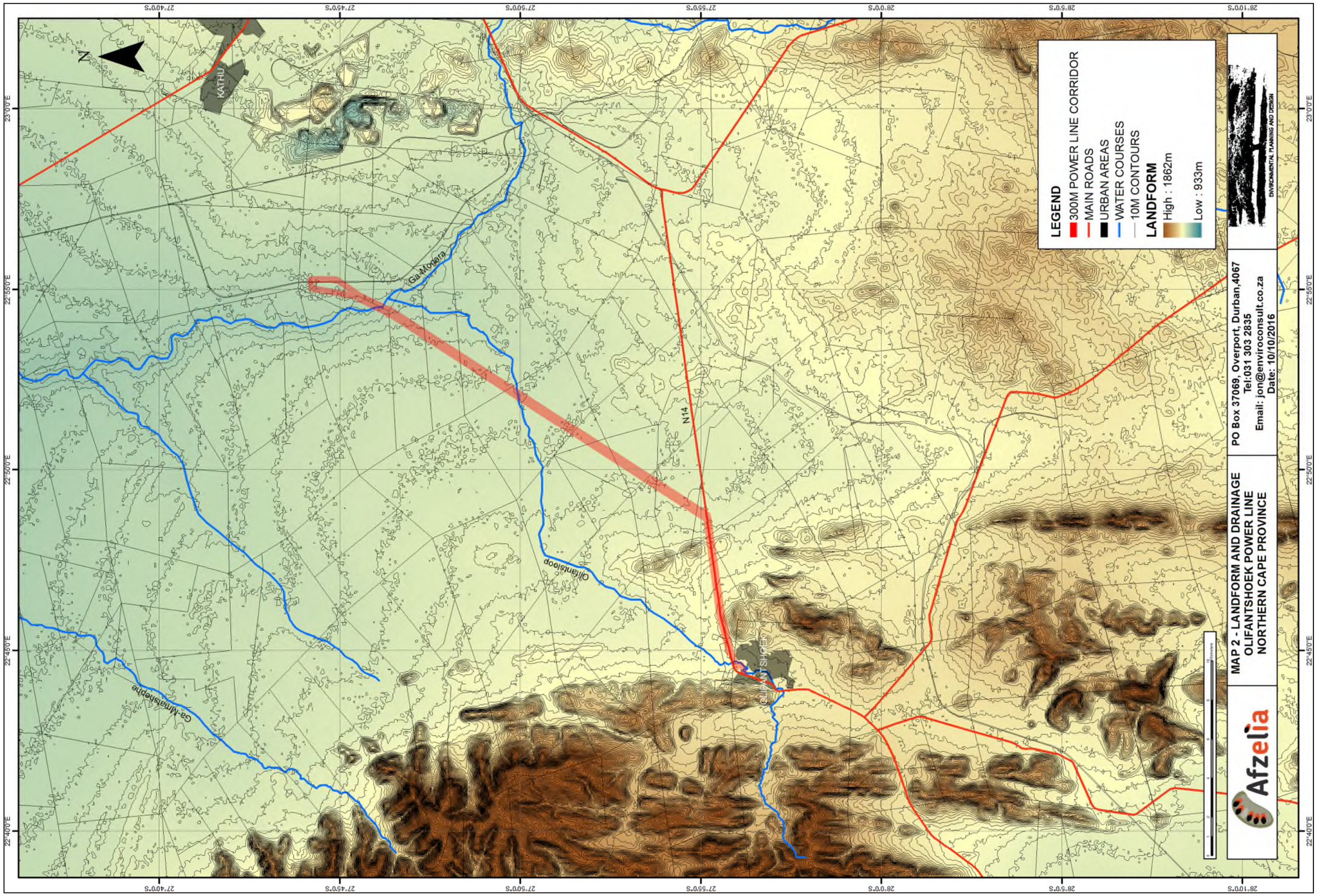
POSSIBLE SENSITIVE RECEIVERS

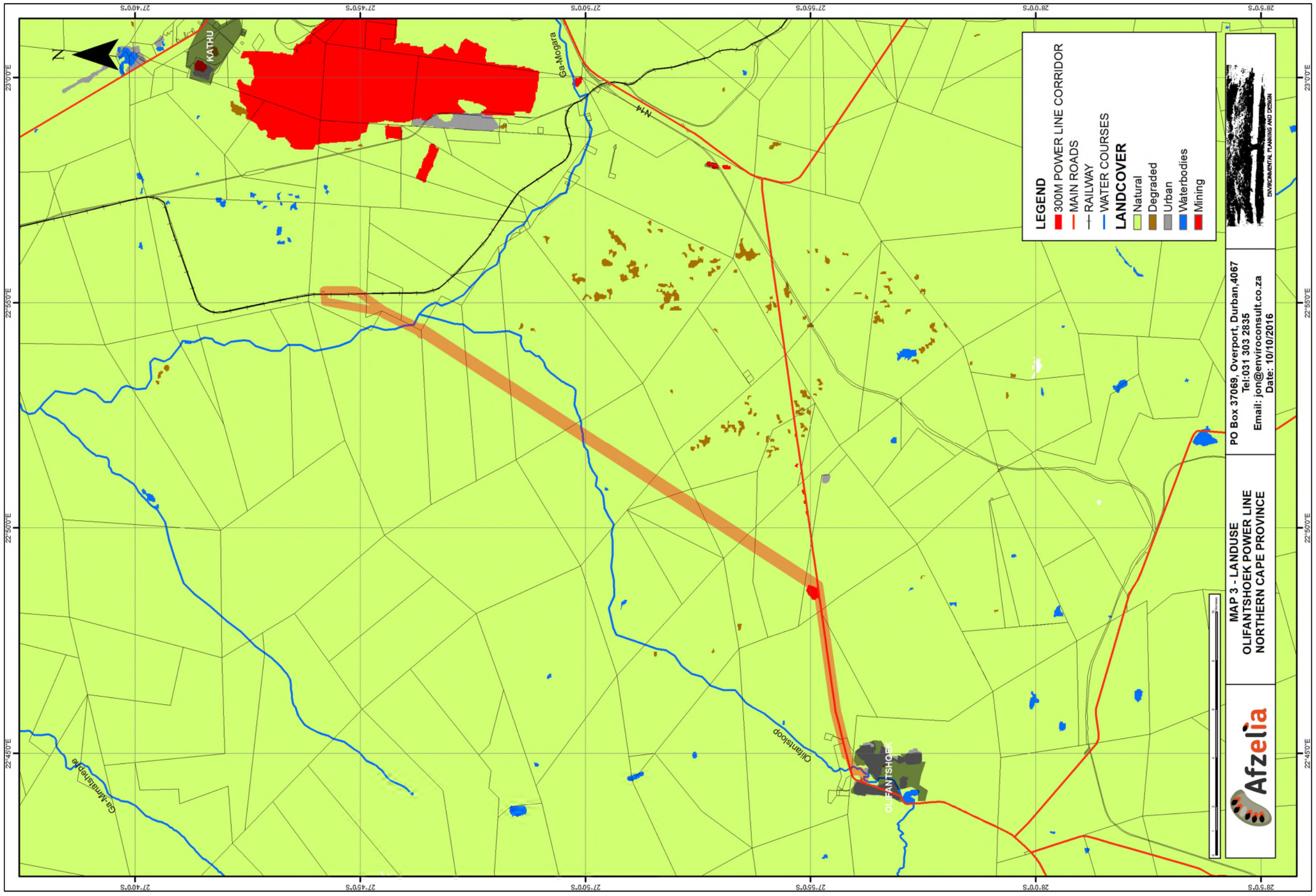
Plate 9, Houses in the Urban Area close to Substation Alternatives 1 and 2

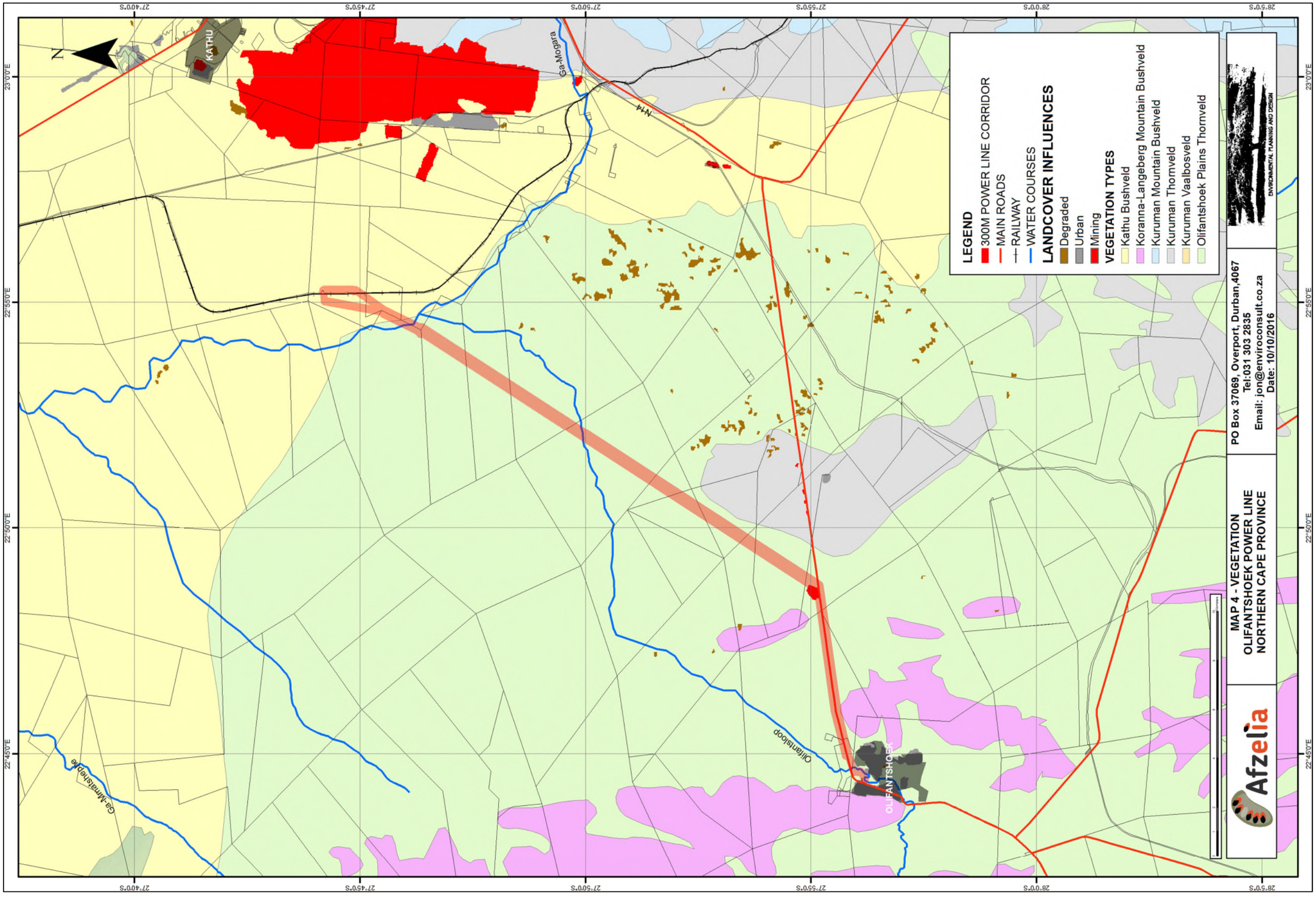
POSSIBLE SENSITIVE RECEIVERS

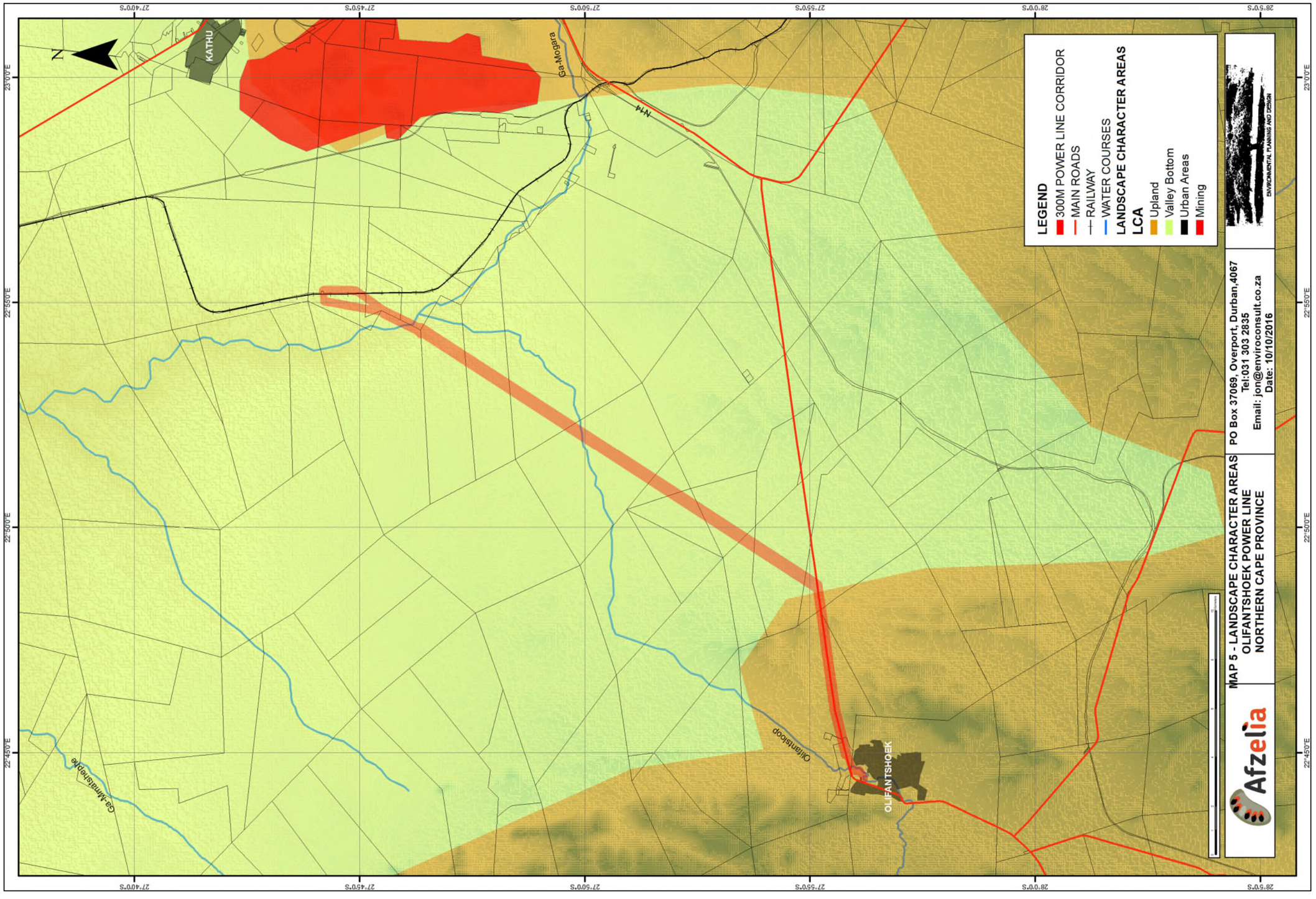
Plate 10, Rural Homesteads close to the Powerline.

Plate 11, The N14.


LEGEND
300M POWER LINE CORRIDOR
MAIN ROADS
URBAN AREAS
WATER COURSES
10M CONTOURS
LANDFORM
High : 1862m
Low : 933m
N
KATHU
Ga-Modera
N14
Olifantsloop
OLIFANTSHOEK
Ga-Mmatshephe
27°40'0"S
27°45'0"S
27°50'0"S
27°55'0"S
28°0'0"S
28°5'0"S
28°10'0"S
23°0'0"E
22°55'0"E
22°50'0"E
22°45'0"E
22°40'0"E
ENVIRONMENTAL PLANNING AND DESIGN
PO Box 37069, Overport, Durban,4067
Tel:031 303 2835
Email: jon@enviroconsult.co.za
Date: 10/10/2016
MAP 2 - LANDFORM AND DRAINAGE
OLIFANTSHOEK POWER LINE
NORTHERN CAPE PROVINCE
Afzelia


LEGEND
300M POWER LINE CORRIDOR
MAIN ROADS
RAILWAY
WATER COURSES
LANDCOVER
Natural
Degraded
Urban
Waterbodies
Mining
KATHU
Ga-Mogara
N14
Olifantsloop
OLIFANTSHOEK
Ga-Mmatshepha
N
27°40'0"S
27°45'0"S
27°50'0"S
27°55'0"S
28°0'0"S
28°5'0"S
23°0'0"E
22°55'0"E
22°50'0"E
22°45'0"E
ENVIRONMENTAL PLANNING AND DESIGN
PO Box 37069, Overport, Durban,4067
Tel:031 303 2835
Email: jon@enviroconsult.co.za
Date: 10/10/2016
MAP 3 - LANDUSE
OLIFANTSHOEK POWER LINE
NORTHERN CAPE PROVINCE
Afzelia


LEGEND
300M POWER LINE CORRIDOR
MAIN ROADS
RAILWAY
WATER COURSES
LANDCOVER INFLUENCES
Degraded
Urban
Mining
VEGETATION TYPES
Kathu Bushveld
Koranna-Langeberg Mountain Bushveld
Kuruman Mountain Bushveld
Kuruman Thornveld
Kuruman Vaalbosveld
Olifantshoek Plains Thornveld
KATHU
Ga-Mogara
N14
OLIFANTSHOEK
Olifantsloop
Ga-Mmatlhelpha
MAP 4 - VEGETATION
OLIFANTSHOEK POWER LINE
NORTHERN CAPE PROVINCE
PO Box 37069, Overport, Durban,4067
Tel:031 303 2835
Email: jon@enviroconsult.co.za
Date: 10/10/2016
ENVIRONMENTAL PLANNING AND DESIGN
Afzelia
27°40'0"S
27°45'0"S
27°50'0"S
27°55'0"S
28°0'0"S
28°5'0"S
23°0'0"E
22°55'0"E
22°50'0"E
22°45'0"E


LEGEND
300M POWER LINE CORRIDOR
MAIN ROADS
RAILWAY
WATER COURSES
LANDSCAPE CHARACTER AREAS
LCA
Upland
Valley Bottom
Urban Areas
Mining
MAP 5 - LANDSCAPE CHARACTER AREAS
OLIFANTSHOEK POWER LINE
NORTHERN CAPE PROVINCE
PO Box 37069, Overport, Durban,4067
Tel:031 303 2835
Email: jon@enviroconsult.co.za
Date: 10/10/2016
ENVIRONMENTAL PLANNING AND DESIGN
Afzelia
KATHU
OLIFANTSHOEK
N14
Ga-Mogara
Olifantsloop
Ga-Mmatsiapke
23°0'0"E
22°55'0"E
22°50'0"E
22°45'0"E
27°40'0"S
27°45'0"S
27°50'0"S
27°55'0"S
28°0'0"S
28°5'0"S

4 THE NATURE OF POTENTIAL VISUAL IMPACTS

4.1 GENERAL

Impacts could include general degradation of the Landscape Character Areas due to the development that may detract from the existing character as well as change of view for affected people and / or activities;

a. Generally landscape change or degradation. This is particularly important for protected areas where the landscape character might be deemed to be exceptional or rare. However it can also be important in non-protected areas particularly where landscape character is critical to a specific broad scale use such as tourism areas or for general enjoyment of an area. This is generally assessed by the breaking down of a landscape into components that make up the overall character and understanding how proposed elements may change the balance of the various elements. The height, mass, form and colour of new elements all help to make new elements more or less obvious as does the structure of an existing landscape which can provide screening ability or texture that helps to assimilate new elements. This effect is known as visual absorption capacity.
b. Change in specific views within the affected area from which the character of a view may be important for a specific use or enjoyment of the area.
    - Visual intrusion is a change in a view of a landscape that reduces the quality of the view. This can be a highly subjective judgement. Subjectivity has however been removed as far as is possible by classifying the landscape character of each area and providing a description of the change in the landscape that will occur due to the proposed development. The subjective part of the assessment is to define whether the impact is negative or positive. Again to make the assessment as objective as possible, the judgement is based on the level of dependency of the use in question on existing landscape characteristics.
    - Visual obstruction is the blocking of views or foreshortening of views. This can generally be measured in terms of extent.

    Due to the nature of the proposed development, visual impacts are expected to relate largely to intrusion.

4.2 THE NATURE OF LIKELY VIEWS OF THE DEVELOPMENT

4.2.1 Overhead Powerlines

The proposed development consists of a 132kV overhead power line. The maximum height of the power line is approximately 28m. The support towers are proposed as mono pole structures (**Plate 12**).

Plate 12. A view along the line of a 132kv overhead power line with monopole towers.

Towers are typically placed at changes in direction, at high points on the alignment and at spacing along the power line up to 400m apart. Towers used at changes in direction usually have a larger cross section in order to take directional loads imposed by the line.

Plate 12 indicates a view along the line of a 132kV overhead power line. The views are taken during a period of good visibility along the line of towers which have a spacing of +/- 250m. In total 9 towers are visible along the line before it connects to a line running at right angles. The last tower in the line which is a solid pole structure is just visible at +/-2.5km.

From the photographs and considering the backdrop, the following conclusions can be drawn;

a) Due largely to the monopole structure and matt grey colour of the galvanised steel from which it is constructed, visibility of overhead power line structures reduces significantly with distance.

b) The visual mass of the overhead power line is unlikely to be obvious from distances greater than 2.5km.

c) It was noted on site that the existing 132kV overhead power line is not visible from a distance of approximately 5km from the power line.

It should be noted that the majority of the proposed 132kV power line alternative run adjacent to an existing 400kV overhead power line. This facility is approximately 35m high and its structures have greater mass when compared with the 132kV facility. The

impact of the proposed 132kV facility will therefore fall within the impact area of the existing structure.

From observations of similar 400kV overhead power lines, the lines are obvious up to a distance of 5km **(Plate 13).**

The applicant's preferred alignment is to close and to the west of the existing 400kV power line with an alternative alignment close and to the east of the existing line.

Plate 13 - 400kV double overhead transmission lines. Pylons are obvious in the mid distance (approximately 2-3km) but are not highly conspicuous at a distance (approximately 5-6km) as they cross the ridgeline.

4.2.2 Sub-station

The construction process will include the following activities;

- Vegetation clearance – removal or cutting of any vegetation if present (bush cutting);
- Levelling and grading of the sub-station area. This will involve the use of large earthmoving and compaction equipment;
- Civils work including the construction of concrete bases, ducting, roads and treatment of the bulk of the sub-station area which may include soil poisoning and the laying of crushed stone;
- Building work which will include the construction of minor buildings and fences.
- Installation works which include the installation and energising of electrical equipment.

Initial activities are only likely to be visible from the immediate vicinity of the site and particularly from adjacent roads. During the latter half of the construction period as larger steel structures are erected, the facility will become obvious over a wider area.

Visual implications of development of the proposed sub-station can be gauged from viewing existing infrastructure.

Plates 1 to 3 inclusive indicate the nature of views of the various elements from close range where detail is visible and industrial nature of the steel structures is obvious.

From a distance however, due to the transparency of a large proportion of the structures, the influence of a sub-station generally reduces. **Plate 15** indicates a view of the existing Hector Sub-Station near Hammersdale. This indicates that from a distance of 1.5 – 2km the impact has reduced significantly. The detail of the majority of equipment is not obvious and the eye generally reads the stronger colours associated with vegetation and landform. Other than the extent of the compound, the most obvious elements are the pylons that support conductors linking into and out of the sub-station.

The proposed substation is significantly smaller than the Hammersdale facility. The principle noted above is likely to apply equally to the proposed facility however in that it is likely to be obvious for a similar distance as the 132kV overhead power lines that feed into it.

Plate 15, Distance view (1.5-2.0km) of the existing Hammersdale 400kV Sub Station. Note the 400kV pylons entering the site are the most obvious elements

It is possible that the substation will be lit for security and maintenance reasons.

Floodlighting may be used on high masts.

When it is on, it will provide a pool of bright within the yard. This will be obvious from a distance as a pool of bright light. It is possible that if the floodlighting is not designed appropriately that there will be light spillage outside the yard area. It is also possible if lighting is not orientated correctly that bulbs will be obvious from surrounding areas causing glare to affect sensitive receivers.

It is also possible that the boundary of the site will be lit with security lights mounted on low poles that will run around the site.

It is therefore likely that lighting could make the substation highly obvious at night. lighting will be visible intermittently from surrounding areas.

Subject to the light fittings selected and the lighting design is also possible for glare from tall mast lighting and security lighting to spill into surrounding areas.

The preferred substation location is located to the north east of the urban area between the N14 and the urban edge. It is unlikely to be highly conspicuous during day light hours however at night lighting may make it obvious from both receptors.

The alternative substation location is slightly to the east of the existing substation which is within the urban area and close to existing houses. It is likely that it will be obvious to residents. There is sufficient space to use screen planting to provide a degree of mitigation however.

5 VISIBILITY OF THE PROPOSED DEVELOPMENT

5.1 ZONES OF THEORETICAL VISIBILITY

Zones of Theoretical Visibility (ZTV) are defined as "a map usually digitally produced showing areas of land within which a development is theoretically visible".

ZVTs of the proposed development have been assessed using Arc Spatial Analyst GIS.

The assessment is based on terrain data that has been derived from satellite imagery. This data was originally prepared by NASSA and is freely available on the CIAT-CCAFS website (http://www.cgiar-csi.org). This data has been ground truthed using a GPS as well as an online mapping programme.

Whilst the ZTV has been calculated from terrain data only, existing vegetation and development could have a significant modifying effect on the areas indicated.

5.2 ASSESSMENT LIMIT

The GIS based assessment of Zones of Theoretical Visibility does not take the curvature of the earth or reduction in scale due to distance into account. In order to provide an indication of the likely limit of visibility due to this effect a universally accepted navigational calculation (**Appendix III**) has been used to calculate the likely distance that the proposed structures might be visible over. This indicates that in a flat landscape a structure 28m high could be visible at a distance of approximately 19km. However at this distance limitations of the human eye will not be able to distinguish elements of the project from other landscape features.

As indicated in Section 4, from observations of similar overhead power lines and substations, due to the visual mass of associated structures, the proposed 132kV overhead power line and 10MVA substation, it is unlikely to be obvious at a distance greater than 2.5 – 3.0km and is unlikely to be visible at a greater distance than 5km. Outside of this limit it is still possible that the project may be visible, however it is unlikely that there will be noticeable impact.

The assessment therefore focuses on an area within 3.0km of the proposed development.

5.3 APPROACH TO THE ASSESSMENT

5.3.1 ZTV for Proposed Alternatives

ZTV analysis has indicated that because the power line is located in close proximity to the substation alternatives, they potentially affect very similar areas.

Map 6 indicates the ZTV Analysis for all the proposed power line and substation alternative locations.

a 3km buffer from the power line alternatives and substations is indicated on the ZTV to highlight the area within which the proposed facility may be obvious. A 5km buffer is also indicated to highlight the area within which the 132kV facility may be visible and the existing 400kV power line may be obvious.

Whilst the ZTV analysis is a useful indicator of likely general areas of impact and because of subtle differences in alignments and locations as well as the proximity of a small number of receptors to the proposed development it is important that the development is considered in more detail.

Maps 7 and 8 indicate the alternative 132kV power line alignments as they affect the N14 and the proposed substation locations as they affect the urban edge of Olifantshoek respectively.

General conclusions are therefore drawn from the ZTV analysis with more detailed assessment focusing on Maps 7 and 8.

5.4 VISIBILITY OF DEVELOPMENT ALTERNATIVES

5.4.1 General

From the ZTV analysis, the following conclusions can be drawn;

a) The proposed 132Kv overhead power line will impact the entire area over which it is likely to be obvious as well as the entire area over which is likely to be visible and the 400kV overhead power line is obvious within the Lowland LCA.
b) Within the Upland LCA the topography is likely to help screen the development from small sections of the surrounding landscape.

5.4.2 Alternative Power Line Alignments

a) There are a number of homesteads within the Lowland LCA that lie close to the existing 400kV overhead power line and will potentially be closer to the 132kV power line. There are three of these properties that either lie within the 300m buffer or close to it on the eastern side of the existing 400kV overhead power line. Of these four homesteads one lies within 50m of the existing alignment and practically beneath the Alternative Alignment on the eastern side of the existing power line. Selecting the Preferred Alignment that lie on the western side of the existing power line would therefore largely address this issue.
b) The existing 400kV overhead power line crosses the N14 approximately 6.5km to the east of Olifantshoek. The two alternative alignments cross the N14 at the same location and follow the southern side of the N14 towards Olifanshoek. The proposed crossing point for both alternatives is therefore likely to minimise new impacts associated with road crossings.
c) All the proposed alternative alignments have similar potential to be visible from the N14. For the majority of both alignments there is reasonable tree cover which would help to soften views from the road. In terms of general impacts on the N14 therefore, both alternatives are likely to have a similar level of impact and both might be subject to a degree of mitigation.

5.4.3 Alternative Substation Locations.

a) The existing substation is located close to existing houses in the centre of the settlement and close to the substation alternative substation location. Whilst the substation alternative location is located slightly further from existing houses than the existing substation, the new facility will be approximately four times the area than the existing facility and will be in close proximity to houses (approximately 80m). It is therefore likely to impact on residents. This alternative is likely to be hidden from the N14 but they will impact the residential area.

b) The Preferred Alternative is located on the eastern fringes of Olifantshoek, approximately 100m from an area of existing informal settlement and 60m from the N14. There is potential therefore for the facility to be visible from the N14 and the adjacent informal settlement area. However, existing trees will help to mitigate impacts it is also possible that mitigation in the form of screen planting may be undertaken.

5.5 CUMULATIVE IMPACTS

For the majority of its alignment, the proposed 132kV overhead power line will follow an existing 400kV overhead power line. Because the zone of visual influence of the proposed line will fall within the zone of visual influence of the existing line, there will be no extension of the impact area. Subject to the alternative alignment that is selected it is possible that the proposed 132kV line could intensify existing impacts for four homesteads.

Both proposed 132kV power line alternatives will add additional electrical infrastructure to the roadside landscape of the N14 for approximately 6km of its length.

Substation alternatives have the potential to intensify visual impacts on the urban area associated with the existing Olifantshoek Substation.

The Preferred Substation has the potential to create new views of a substation from the N14.

5.6 KEY VIEWPOINTS

Key viewpoints that are adjudged to provide an indication of typical views towards the proposed development and are representative of views of the identified visual receptors / LCAs are located on **Map 6**. Photographs from these viewpoints are indicated in **Plates 16 to 26** inclusive.

The viewpoints include;

1. **VP1 (Plate 16)** is located close to the north eastern extremity of the proposed 132kV overhead line at a distance of less than 1km to the east of the line. This view is intended to illustrate views from close to the proposed power line within the Lowland LCA. The existing 400kV overhead power line is obvious. The proposed 132kV line will also be obvious either slightly to the east or west of the existing line. Pylons / supports for the proposed line will be slightly less obvious than the existing structures due to their smaller section and slightly lower height.
2. **VP2 (Plate 17)** is located close to an existing homestead that is located close and on the eastern side of the existing 400kV overhead power line. This view is intended to illustrate a similar issue associated with three other similarly located homesteads. The Alternative Alignment will be closer to the homestead than the existing line. It could be as little as 70m from the homestead. The Preferred Alignment is on the opposite side of the existing line and could be up to 500m away from the homestead. By placing the new power line on the western side of the existing power line it will still be visible from the vicinity of the homestead. However being seen with the existing line in the foreground the significance of the new line will be significantly diminished. It is also likely that existing tall vegetation around the homestead will help to mitigate impacts.

3. **VP3 (Plate 18)** is located approximately 2km to the east of the existing 400kV overhead power line. The viewpoint is intended to illustrate the nature of views of the line from close to the approximate limit of visual influence within the Lowland LCA. The existing 400kV overhead power line is visible but not highly obvious. The proposed 132kV power line will also be visible adjacent to the existing line. It is however likely to be less obvious than the existing line due to the lower height and smaller mass of its supports.
4. **VP4 (Plate 19)** is located on the N14 at approximately 4.5km to the east of the existing 400kV overhead power line. This is the first point on the road for the west bound motorist that the existing power line is visible. The existing line is just visible on the horizon to the right of picture. It is possible that the proposed 132kV overhead power line may be just visible next to the existing line, however, it is highly unlikely to be obvious.
5. **VP5 (Plate 20)** is located on the N14 at the crossing point of the existing 400kV overhead power line looking north east along the line. The Preferred Alignments will be seen running adjacent and to the left (west) of the existing line and the Alternative Alignment will be seen to the right (east) of the existing power line.
6. **VP6 (Plate 21)** is located on the N14 approximately 1.5km to the east of the point that the existing line crosses the road and looking towards the existing road crossing. Both proposed 132kV overhead power line alternatives will cross the road adjacent to the existing line and will run down the southern side of the N14, to right of picture.
7. **VP7 (Plate 22)** is located on the N14 looking east towards Olifantshoek approximately 1.4km from the Preferred Location for the Substation. Due to existing vegetation, it is unlikely that the Preferred substation will be obvious until the viewer is almost opposite it on the road. Both 132kV overhead power line alternatives will be seen running parallel to the south side of the road to left of picture.
8. **VP8 (Plate 23)** is located on the N14 looking to the south directly at the site of the Preferred Substation Location. The substation will be set back from the road approximately 60m. In the mid distance informal settlement can be seen. The Preferred Substation will be approximately 80m from this. It is likely that the substation will be visible from the road as the viewer approaches the viewpoint. There is space to include screen planting to divert views from and soften impacts associated with the substation.
9. **VP9 (Plate 24)** is located on the N14 within the town of Olifantshoek looking to the east towards alternative substation sites 1 and 2. The existing substation is slightly closer to the viewpoint and is just visible through the road side vegetation. Substation alternatives 1 and 2 may also be visible. It should be noted however that this is the only viewpoint on the urban section of the road from which the existing substation is visible and views of the substation structures are softened considerably by vegetation.
10. **VP10 (Plate 25)** looking east away from the existing substation. The Alternative Substation is to the right of the image in the area of alien vegetation. It should be noted that residential properties pictured in Plate 9 are located adjacent to the viewpoint out of shot. Subject to the use that the land on which the existing substation is located after it is decommissioned, it is possible that this alternative could result in reduced visual impact for local residents. It does however have the potential to maintain current levels of impact.

Plate 16 - VP1 located close to the north eastern extremity of the proposed 132kV overhead line at a distance of less than 1km to the east of the line.

Plate 17 - VP2 located close to an existing homestead that is located close and on the eastern side of the existing 400kV overhead power line.

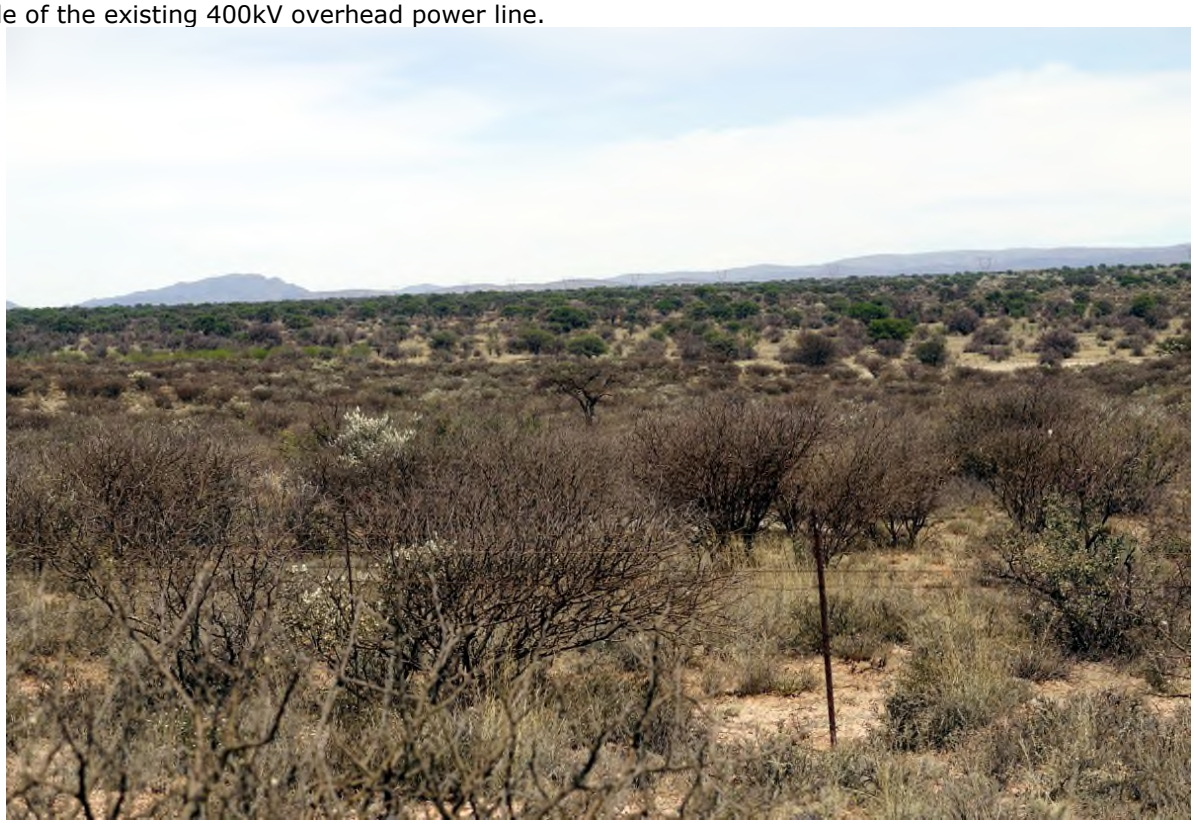


Plate 18 - VP3 located approximately 2km to the east of the existing 400kV overhead power line.

Plate 19 - VP4 located on the N14 at approximately 4.5km to the east of the existing 400kV overhead power line.

Plate 20 – VP5 located on the N14 at the crossing point of the existing 400kV overhead power line looking north east along the line.

Plate 21 – VP6 located on the N14 approximately 1.5km to the east of the point that the existing line crosses the road and looking towards the existing road crossing.

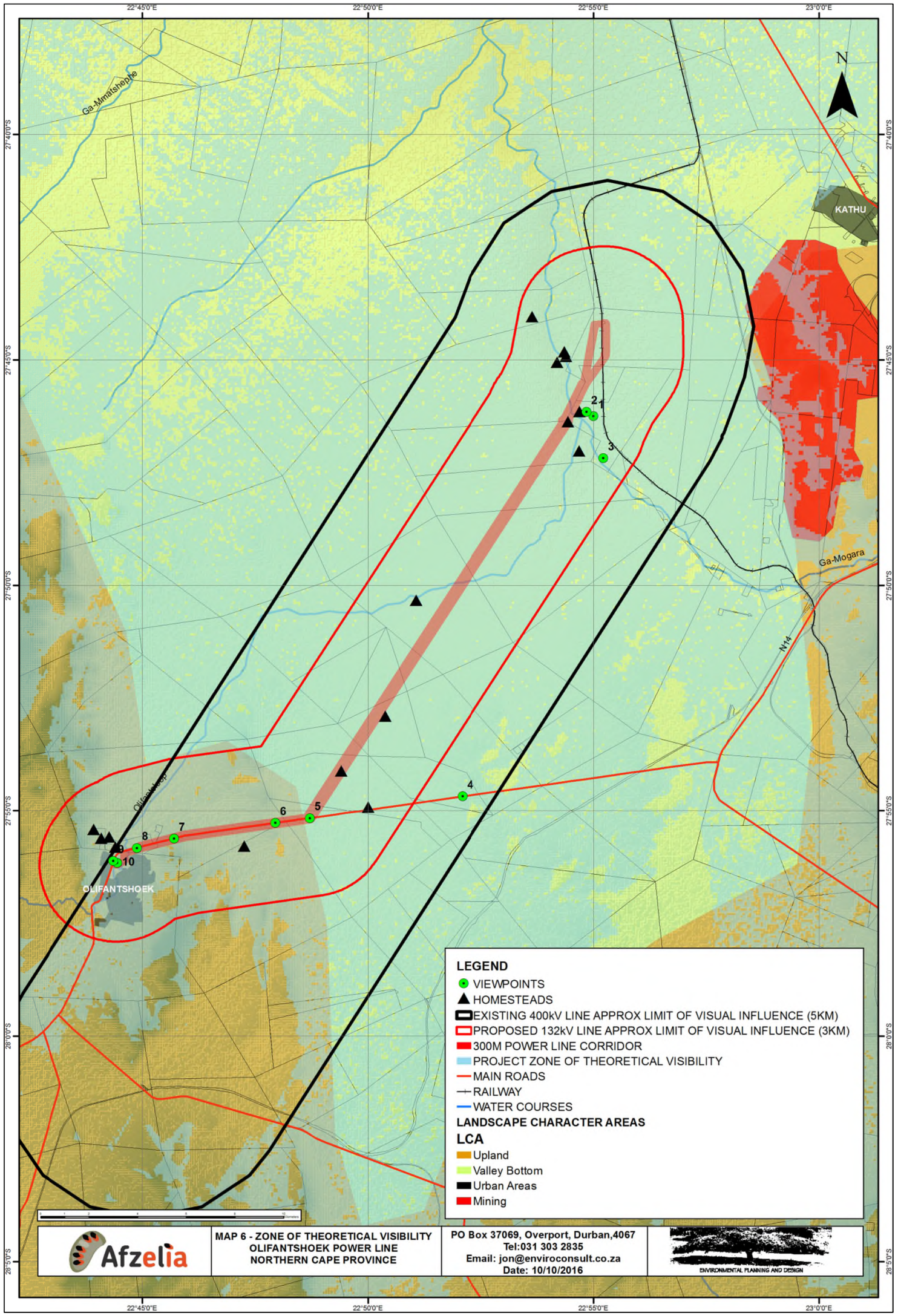
Plate 22 – VP7 located on the N14 looking east towards Olifantshoek approximately 1.4km from alternative substation 3 and the point that alternative 132kV overhead power lines 3 and 4 would cross the road towards the substation.

Plate 23 – VP8 located on the N14 looking to the south directly at the site of the preferred substation alternative.

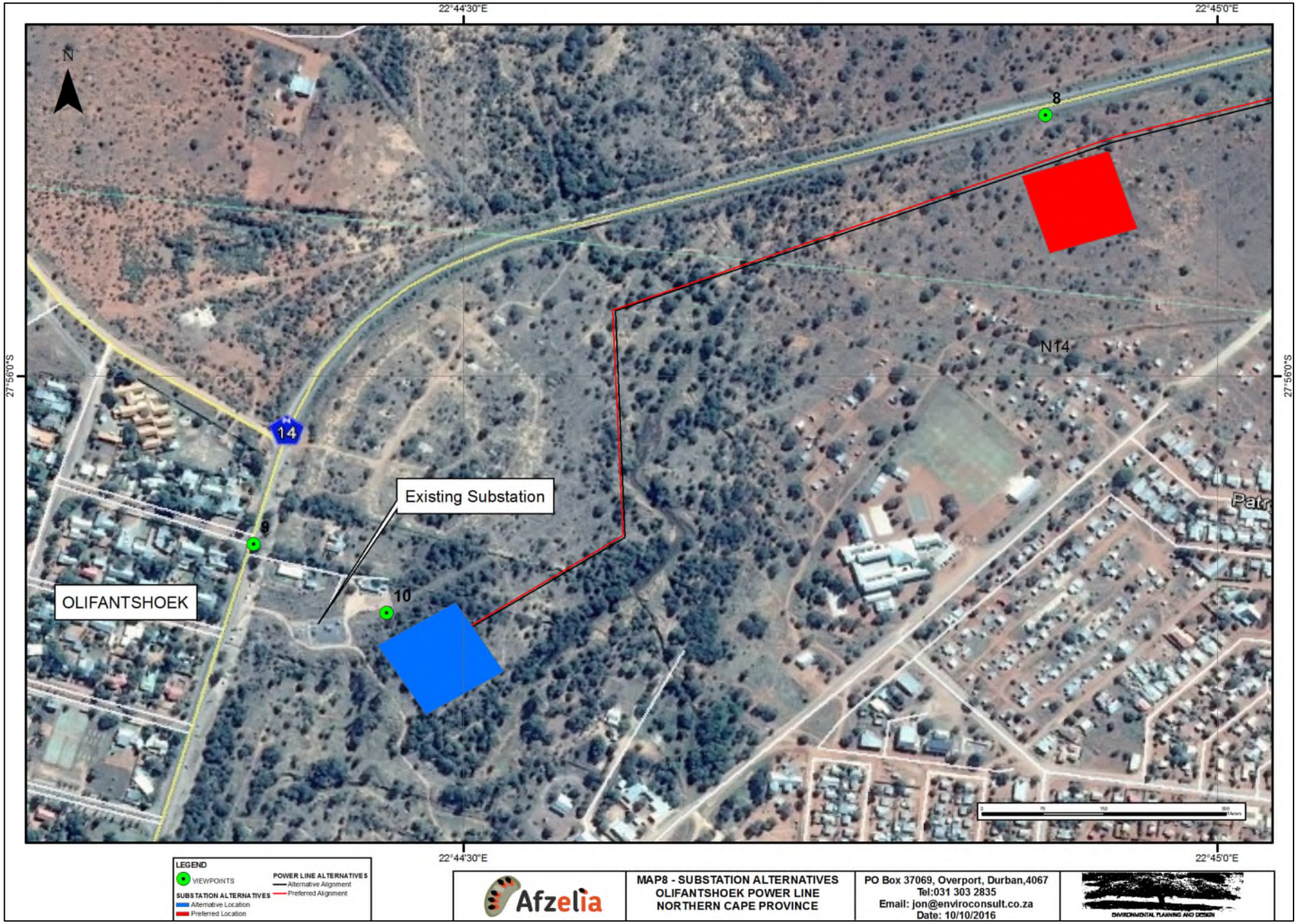
Plate 24 – VP9 located on the N14 within the town of Olifantshoek looking to the east towards the alternative substation site.

Plate 25 – VP10 looking west towards the existing substation.

Plate 26 – VP10 looking east away from the existing substation.


22°45'0"E
22°50'0"E
22°55'0"E
23°0'0"E
27°40'0"S
27°45'0"S
27°50'0"S
27°55'0"S
28°0'0"S
28°5'0"S
N
Ga-Mmatshephe
KATHU
Ga-Mogara
N14
Olifantshoop
OLIFANTSHOEK
1
2
3
4
5
6
7
8
9
10
LEGEND
VIEWPOINTS
HOMESTEADS
EXISTING 400kV LINE APPROX LIMIT OF VISUAL INFLUENCE (5KM)
PROPOSED 132kV LINE APPROX LIMIT OF VISUAL INFLUENCE (3KM)
300M POWER LINE CORRIDOR
PROJECT ZONE OF THEORETICAL VISIBILITY
MAIN ROADS
RAILWAY
WATER COURSES
LANDSCAPE CHARACTER AREAS
LCA
Upland
Valley Bottom
Urban Areas
Mining
Afzelia
MAP 6 - ZONE OF THEORETICAL VISIBILITY
OLIFANTSHOEK POWER LINE
NORTHERN CAPE PROVINCE
PO Box 37069, Overport, Durban,4067
Tel:031 303 2835
Email: jon@enviroconsult.co.za
Date: 10/10/2016
ENVIRONMENTAL PLANNING AND DESIGN


22°48'0"E
22°45'0"E
27°57'0"S
N14
5
6
7
8
10
Existing Substation
Olifantshoek
Van Rebbeck St
14
N
LEGEND
VIEWPOINTS
SUBSTATION ALTERNATIVES
Alternative Location
Preferred Location
POWER LINE ALTERNATIVES
Alternative Alignment
Preferred Alignment
300M POWER LINE CORRIDOR
Afzelia
MAP 7 - ALIGNMENT ALTERNATIVES
OLIFANTSHOEK POWER LINE
NORTHERN CAPE PROVINCE
PO Box 37069, Overport, Durban,4067
Tel:031 303 2835
Email: jon@envroconsult.co.za
Date: 10/10/2016


22°44'30"E
22°45'0"E
27°56'0"S
N
8
N14
14
Existing Substation
9
10
OLIFANTSHOEK
LEGEND
VIEWPOINTS
POWER LINE ALTERNATIVES
Alternative Alignment
Preferred Alignment
SUBSTATION ALTERNATIVES
Alternative Location
Preferred Location
Afzelia
MAP8 - SUBSTATION ALTERNATIVES
OLIFANTSHOEK POWER LINE
NORTHERN CAPE PROVINCE
PO Box 37069, Overport, Durban,4067
Tel:031 303 2835
Email: jon@enviroconsult.co.za
Date: 10/10/2016
ENVIRONMENTAL PLANNING AND DESIGN

6 VISUAL IMPACT ASSESSMENT

6.1 ASSESSMENT METHODOLOGY

The previous section of the report identified specific areas where visual impacts may occur. This section will quantify these impacts in their respective geographical locations and in terms of the identified issues (see Section 1.5).

The methodology for the assessment of potential visual impacts includes:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional:
    - local extending only as far as the development site area – assigned a score of 1;
    - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
    - will have an impact on the region – assigned a score of 3;
    - will have an impact on a national scale – assigned a score of 4; or
    - will have an impact across international borders – assigned a score of 5.
- The **duration**, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
    - 0 is small and will have no effect on the environment;
    - 2 is minor and will not result in an impact on processes;
    - 4 is low and will cause a slight impact on processes;
    - 6 is moderate and will result in processes continuing but in a modified way;
    - 8 is high (processes are altered to the extent that they temporarily cease); and
    - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale, and a score assigned:
    - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
    - Assigned a score of 2 is improbable (some possibility, but low likelihood);
    - Assigned a score of 3 is probable (distinct possibility);
    - Assigned a score of 4 is highly probable (most likely); and
    - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
- The **status**, which will be described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.

- The *degree* to which the impact can be *mitigated.*
- The **significance** is determined by combining the criteria in the following formula:
    - S=(E+D+M)P; where S = Significance weighting, E = Extent, D = Duration, M = Magnitude, P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

6.2 ASSESSMENT

The following assessment focuses first on general landscape change that will occur due to the proposed development which provides context for the assessment of impacts on identified sensitive receptors. Key receptors that are considered include;

- Homesteads;
- Travellers on the N14; and
- residents of Olifantshoek.

6.2.1 Impact of the Proposed Development on General Landscape Character

Nature of impact: Degradation of the character of the existing landscape. This is particularly relevant to existing natural and urban areas (Lowland and Upland LCAs) where there is a possibility that the development could introduce industrial components.		
	Without mitigation	**With mitigation**
Extent	**Both Power Line Alternatives** Immediate surroundings, **(2)** **Both Substation Alternatives** Immediate surroundings, **(2)**	Immediate surroundings, **(2)** Immediate surroundings, **(2)**
Duration	**Both Power Line Alternatives** Immediate surroundings, **(4)** **Both Substation Alternatives** Immediate surroundings, **(4)**	Long term, **(4)** Long term, **(4)**
Magnitude	**Both Power Line Alternatives** Low, **(4)** **Substation Alternative** Moderate, **(6)** **Substation Preferred Alternative** Low, **(4)**	Minor, **(2)** Low, **(4)** Minor, **(2)**
Probability	**Both Power Line Alternatives** Probable, **(3)**	Improbable, **(2)**

	Substation Alternative Highly probable, **(4)** **Substation Preferred Alternative** Probable, **(3)**	Probable, **(3)** Improbable, **(2)**
Significance	**Both Power Line Alternatives** Low / Medium, **(30)** **Alternative Substation Location** Medium, **(48)** **Preferred Substation Location** Low / Medium, **(30)**	Low, **(16)** Low / Medium, **(30)** Low, **(16)**
Status	The character of the urban and rural landscape will be changed. It is likely that the influence of industrial elements will not be highly obvious to the majority of people. It is likely that the majority of people will not consider the sight of a small overhead power line and a substation as a negative impact. **Neutral - negative**	**Neutral - negative**
Irreplaceable loss	**No irreplaceable loss**	**No irreplaceable loss**
Can impacts be mitigated?	**Yes**	

Mitigation / Management:

Planning and construction:

- The alignment of the proposed 132kV overhead power line as far from the N14 as possible.
- Plan and implement screening for the substation.
- Ensure that the use of the decommissioned substation site is put to is consistent with residential use.
- Rehabilitate decommissioned substation site and construction disturbance.

Operational:

- Maintain screen planting around substations

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate disturbed areas.

Cumulative Impacts:

The affected natural landscape (Lowland and Upland LCAs) is not a highly natural area as it is already impacted by existing infrastructure including a larger 400kV overhead power line.

The affected urban area is also currently affected by existing electrical infrastructure including LV cables and an existing substation

The proposed 132kV overhead power line will add marginally to the local intensity of existing impacts within the Lowland LCA. They will also extend the impact into the Upland LCA as the alignments run along the N14 towards Olifantshoek. The Alternative Substation Location will increase the extent of electrical infrastructure that is obvious within the urban area. The Preferred Alternative will largely impact the urban fringe / Upland LCA. Cumulative impacts of power line alternatives is assessed as Medium but with mitigation becomes low. Cumulative impacts of the Substation Alternatives is assessed as Medium but may be mitigated to low. Cumulative impacts of the Preferred Substation Location is assessed as Low/Medium but may be mitigated to low.
Residual Risks: Lack of rehabilitation on decommissioning is likely to result in degraded areas.

6.2.2 Impact of the Proposed Development on Identified Sensitive Receptors

Potential visual impacts on sensitive receptors that have been identified through the site visit include;

a) The visibility of the facility to and visual impact on Local homesteads.
b) The visibility of the facility to and visual impact on the N14.
c) The visibility of the facility to and visual impact on urban residential areas.
d) The impact of lighting.

a) The visibility of the facility to and visual impact on rural homesteads.

Nature of impact:
Four homesteads located either within or close to the eastern side of the development corridor within the Lowland LCA are at risk of impact.

Developing the proposed overhead power line to the west of the existing power line (Alternatives Alignment) and as close to the western edge of the development corridor as possible would largely address this issue.

It is only the powerline that will impact on rural homesteads. The substation alternatives are therefore not included in this section of the assessment.

	Without mitigation	With mitigation
Extent	**Both Power Line Alternatives** Immediate surroundings, **(2)**	Immediate surroundings, **(2)**
Duration	**Both Power Line Alternatives** Long Term, **(4)**	Long Term, **(4)**
Magnitude	**Alternative Alignment** High, **(8)** **Preferred Alignment** Low, **(4)**	Moderate, **(6)** Minor to low, **(3)**
Probability	**Alternative Alignment** Highly probable, **(4)**	Probable, **(3)**

	Preferred Alignment Probable, **(3)**	Improbable, **(2)**
Significance	**Alternative Alignment** Medium, **(56)** **Preferred Alignment** Low to medium, **(30)**	Medium, **(36)** Low, **(18)**
Status	The character of the rural landscape around a small number of rural homesteads will be changed. It is likely that the majority of people will not consider the sight of an additional overhead power line close to their home as a negative intrusion. **Negative.**	**Negative**
Irreplaceable loss	**No irreplaceable loss**	**No irreplaceable loss**
Can impacts be mitigated?	**Yes**	

Mitigation / Management:

Planning and construction:

- Both Alignments - Align power line as far from homesteads as possible within the identified corridor.
- Alternative Alignment - Undertake deviations around the closest homesteads within the development corridor.
- Rehabilitate disturbed areas.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate disturbed areas.

Cumulative Impacts:

The cumulative impact of the Alternative Alignment is assessed as a medium significance both with and without mitigation.

The cumulative impact of Preferred Alignment is assessed as a low to medium significance without mitigation and low significance with mitigation.

Residual Risks:

Lack of rehabilitation on decommissioning is likely to result in degraded areas.

b) The visibility of the facility to and visual impact on the N14.

Nature of impact:

Only the southernmost portion of the power line alternatives will impact on the N14 as they will cross the road and run close and parallel with it for approximately 6km.

The proposed substations are also likely to be visible to the N14. The Alternative Location will be located away from the road but a short view will be possible through vegetation and buildings. The Preferred Location will be located closer to the road on the urban edge. Existing vegetation is likely to result in views of this alternative only being obvious as the viewer is close to and opposite the facility but without additional mitigation the full extent of the substation is likely to be open to view.

	Without mitigation	With mitigation
Extent	**Both Power Line Alternatives** Immediate surroundings, **(2)** **Both Substation Alternatives** Immediate surroundings, **(2)**	Immediate surroundings, **(2)** Immediate surroundings, **(2)**
Duration	**Both Power Line Alternatives** Long term, **(4)** **Both Substation Alternatives** Long term, **(4)**	Long term, **(4)** Long term, **(4)**
Magnitude	**Both Power Line Alternatives** Moderate, **(6)** **Substation Alternative Location** Small to minor, **(1)** **Substation Preferred Location** Low, **(4)**	Minor to low, **(3)** Small, **(0)** Minor, **(2)**
Probability	**Both Power Line Alternatives** Probable, **(3)** **Substation Alternative Location** Improbable, **(2)** **Substation Preferred Location** Probable, **(3)**	Probable, **(3)** Improbable, **(2)** Improbable, **(2)**
Significance	**Both Power Line Alternatives** Medium, **(36)** **Substation Alternative Location** Low, **(14)** **Substation Preferred Location** Low to medium, **(30)**	Low, **(27)** Low, **(12)** Low, **(16)**
Status	The character of the rural landscape adjacent to the affected section of the N14 will be modified. It is likely that the majority of people will not consider the sight of an additional overhead power line and substation close to the road as a negative intrusion. **Negative.**	**Negative**
Irreplaceable loss	**No irreplaceable loss**	**No irreplaceable loss**
Can impacts be mitigated?	**Yes**	
Mitigation / Management: Planning and construction:		

- Both Powerline Alternatives - Align power line as far from the road as possible within the identified corridor.
- Implement screen planting for substations.

Operations:

- Maintain screen planting around substations.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate disturbed areas.

Cumulative Impacts:

Cumulative impacts associated with both power line alternatives is assessed as medium significance. This may be reduced to low significance with mitigation.

The Alternative Substation Location is assessed as having a low cumulative impact.

The Preferred Substation Location is assessed as having a medium cumulative impact that may be reduced to low significance with mitigation.

Residual Risks:

Lack of rehabilitation on decommissioning is likely to result in degraded areas.

c) The visibility of the facility to and visual impact on urban residential areas.

Nature of impact:

Only the southernmost portion of the proposed power line alternatives that are linked to the alternative substation locations will impact on urban areas. These sections are common to both alternatives. This impact will therefore be subject to the location of the substation and is therefore included as part of the assessment of the substations.

The Alternative Substation Location is located within the urban area close to existing homes.

The Preferred Substation Location is located approximately 80m from and will be visible to a small number of dwellings within an existing informal settlement area on the edge of Olifantshoek.

	Without mitigation	**With mitigation**
Extent	**Both Substation Alternatives** Immediate surroundings, **(2)**	Immediate surroundings, **(2)**
Duration	**Both Substation Alternatives** Long term, **(4)**	Long term, **(4)**
Magnitude	**Alternative Substation Location** Low, **(4)** **Preferred Substation Location** Low to minor, **(3)**	Minor to low, **(3)** Minor, **(2)**
Probability	**Alternative Substation Location** Probable, **(3)** **Preferred Substation Location** Probable, **(3)**	Probable, **(3)** Improbable, **(2)**
Significance	**Alternative Substation Location** Low to medium, **(30)**	Low, **(27)**

	Preferred Substation Location Low, **(27)**	Low, **(16)**
Status	It is likely that the majority of people will consider the sight of a large substation in close proximity to a residential area as a negative impact. **Negative.**	**Negative**
Irreplaceable loss	**No irreplaceable loss**	**No irreplaceable loss**
Can impacts be mitigated?	**Yes**	

Mitigation / Management:

Planning and construction:

- Implement screen planting for substations.
- Rehabilitate decommissioned substation

Operations:

- Maintain screen planting around substations.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate disturbed areas.

Cumulative Impacts:

The Alternative Substation Location – Low to medium negative impact without mitigation, low impact with mitigation.

The Preferred Substation Location - Low to medium positive impact without mitigation, medium positive impact with mitigation.

Residual Risks:

Lack of rehabilitation on decommissioning is likely to result in degraded areas.

d) Lighting Impacts.

Nature of impact:

Lighting may be associated with the substation in the form of flood lighting and / or possibly security lighting.

The area within which the substations are located are either close to (Preferred Location) or within the urban area (Alternative Location). The issue of light pollution within an otherwise dark night time landscape is therefore not relevant.

More relevant however, it's the possibility that lighting could cause a nuisance to neighbours.

No specific detail has been provided regarding lighting of the substation. However observations on site and reference to **Plate 25** indicates that the existing substation is floodlit.

	Without mitigation	**With mitigation**
Extent	**Both Substation Alternatives** Immediate surroundings **(2)**	Immediate surroundings **(2)**
Duration	**Both Substation Alternatives** Long term **(4)**	Long term **(4)**

Magnitude	**Alternative Substation Location** Low **(4)** **Preferred Substation Location** Minor, **(2)**	 Minor, **(2)** Small, **(0)**
Probability	**Alternative Substation Location** Probable **(3)** **Preferred Substation Location** Improbable, **(2)**	 Improbable, **(2)** Very improbable, **(1)**
Significance	**Alternative Substation Location** Low to Medium **(30)** **Preferred Substation Location** Improbable, **(2)**	 Low, **(16)** Low, **(8)**
Status	Light spill that impacts on a residential area is likely to be seen by affected parties as a negative impact. **Negative.**	If the lights are generally not impacting on a residential area then the impact is likely to be seen is neutral. **Neutral.**
Irreplaceable loss	No irreplaceable loss.	No irreplaceable loss
Can impacts be mitigated?	Yes	

Mitigation / Management:

Planning:

- Plan to motion sensor triggered lighting;
- Ensure that lighting is focused on the development with no light spillage outside the site.

Cumulative Impacts:

The Alternative Substation Location could result in a low to medium negative impact but with appropriate mitigation will result in a low positive cumulative impact.

The Preferred Substation Location could result in a low positive impact without mitigation and a medium positive impact with mitigation.

Residual Risks:

No residual risk has been identified.

7 IMPACT STATEMENT

7.1 LANDSCAPE CHARACTER

The affected landscape can be divided into the Lowland and Upland LCAs that are both relatively natural and the Urban LCA of Olifantshoek.

Both the Lowland and Upland LCAs are covered by relatively open thorn veld which will provide limited visual absorption capacity.

The Upland LCA has significantly greater visual absorption capacity due to the relatively rugged terrain.

The proposed development corridor within the Lowland LCA is currently impacted by a larger 400kV overhead power line.

The urban LCA is also impacted by an existing substation which sits close to an existing residential area.

No protected areas are likely to be affected.

7.2 PROPOSED DEVELOPMENT

The proposed development can be divided into;

Two 132kV overhead power line alternatives that follow an existing 400kV overhead power line for approximately 22.5km from the north east to the south west, through the Lowland LCA and across relatively inaccessible farm land from the existing Emil Switching Station to the N14. The Preferred Alignment is proposed to run along the eastern side of the existing 400kV overhead power line whilst the Alternative Alignment is proposed to run down the western side of the existing power line.

At the N14, the alternatives turn to the west to run parallel with and close to the N14. Both alternatives cross the N14 in line with the existing 400kV overhead power line road crossing to run along the southern side of the road.

Two substation alternative sites are considered. The Preferred Location is on the eastern edge of the urban area and close to the southern edge of the N14. The alternative is located within the urban area close to the existing Olifantshoek substation which will be decommissioned on completion of the project.

7.3 IDENTIFIED SENSITIVE RECEIVERS

The following sensitive receivers have been identified;

a) Local rural homesteads located between the Emil Switching Station and the N14. Four existing homesteads have been identified close to or within the 300m development corridor on the eastern side of the proposed development corridor;
b) The N14 between the existing 400kV overhead power line road crossing and Olifantshoek. This section of the road is approximately 6.5km long; and
c) The urban areas of Olifantshoek which will largely be affected due to the proximity of the substation alternatives.

7.4 VISUAL IMPACT AND MITIGATION POTENTIAL

The assessment found that;

Subject to the power line location within the 300m development corridor, The Preferred Alignment that runs close to the eastern side of the existing overhead power line could have an impact of medium significance on four local homesteads. The Alternative Alignment that runs close to the western side of the existing power line is likely to impact homesteads to a lesser degree with a significance rating of low to medium. These impacts may be mitigated to medium and low significance respectively through ensuring that the final alignment is located as far from existing homesteads as the development corridor will allow.

Both alternatives were found to have impacts of medium significance on the N14 without mitigation. However by locating the alignments as far from the road as the development corridor allows, these impacts would be mitigated to low significance.

Impacts on the urban area of Olifantshoek are largely related to the location of the proposed substation. The Alternative Location is close to the centre of the urban area and also close to the existing substation that will be decommissioned on completion of the project, there is potential for existing visual impacts associated with electrical infrastructure to be replaced and possibly increased with this alternative. The Preferred Location is on the eastern urban fringe of the settlement and will largely be visible to an area of informal settlement. There appears to be space around both substation alternatives to provide mitigation with screen planting. The assessment found that the Alternative Location is likely to result in a visual impact of low to medium significance and The Preferred Location is likely to result in a visual impact of low significance without mitigation. After mitigation both impact levels are likely to reduce and will fall within the low category.

Potential lighting impacts are also associated with the proposed substation. The issue is likely to relate to nuisance for neighbours due to light spill from floodlighting.

7.5 CUMULATIVE IMPACT

Propose overhead power lines will add additional infrastructure to corridors that are already impacted by the existing 400kV overhead power line, the road and LV electrical infrastructure close to the N14, this is likely to result in the proposed development adding slightly to the intensity of existing impacts. This is not likely to be significant and is far more preferable than creating new development areas that impact on previously undeveloped landscapes. The exception to this however is the Preferred Alignment for the power line as it is likely to be significantly closer to homes than existing facilities.

Because the proposed project will result in decommissioning of the existing Olifantshoek substation which is located close to the centre of the urban area with homes in close proximity, with sensitive development and ensuring that the old substation site is put to a use that is compatible with adjacent residential use, there is potential for the development to result in a positive cumulative impact in terms of its influence on the urban area.

7.7 CONCLUSION

On visual grounds, the Alternative Alignment for the 132kV power line is favoured due to the fact that it will help to minimise impacts on rural homesteads. It should be noted however, that during the site visit access was not possible to the affected homesteads, there use is therefore not known and a worst case assumption that they are inhabited has been made.

Because The Preferred Alignment for the power line is likely to impact on local homesteads it is not favoured. If selected, it is suggested that more detailed alignment planning may be required in order to maximise distances between inhabited buildings and the power line. Additional consultation with owners and inhabitants should also be undertaken to ensure that they are fully aware of the proposed location of structures relative to the buildings.

When considering the substation locations, the Preferred Location stands out as providing the largest potential to provide positive cumulative impacts for the urban area. The Alternative Location would be acceptable subject to adequate mitigation in the form of screen planting providing a buffer between the infrastructure and residents.

REFERENCES

Guidelines for involving visual and aesthetic specialists in EIA processes, Author; Bernard Oberhozer. Published by the Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning, 2005

Guidelines for landscape and visual impact assessment (third edition), authors; the Landscape Institute and Institute of Environmental Assessment and Management, published by E & FN Spon, 2013.

Manual of Environmental Appraisal, UK Department of Transport, 1992

Visual Impact Assessment Guidebook, Second Edition. Province of British Colombia. January 2001

APPENDIX I

SPECIALIST'S BRIEF CV

Name	JONATHAN MARSHALL
Nationality	British
Year of Birth	1956
Specialisation	Landscape Architecture / Landscape & Visual Impact Assessment / Environmental Planning / Environmental Impact Assessment.

Qualifications

Education	Diploma in Landscape Architecture, Gloucestershire College of Art and Design, UK (1979) Environmental Law, University of KZN (1997)
Professional	Registered Professional Landscape Architect (South Africa) Chartered Member of the Landscape Institute (UK) Certified Environmental Assessment Practitioner of South Africa. Member of the International Association of Impact Assessment, South Africa

Languages	English	-	Speaking	- Excellent
		-	Reading	- Excellent
		-	Writing	- Excellent

Contact Details

Post: PO Box 2122
Westville
3630
Republic of South Africa

Phone: +27 31 2668241, Cell: +27 83 7032995

Key Experience

Jon qualified as a Landscape Architect (Dip LA) at Cheltenham (UK) in 1979. He has also been a Certified Environmental Assessment Practitioner of South Africa since 2009.

During the early part of his career (1981 - 1990) He worked with Clouston (now RPS) in Hong Kong and Australia. During this period he was called on to undertake visual impact assessment (VIA) input to numerous environmental assessment processes for major infrastructure projects. This work was generally based on photography with line drawing superimposed to illustrate the extent of development visible.

He has worked in the United Kingdom (1990 - 1995) for a major supermarket chain and prepared CAD based visual impact assessments for public enquiries for new green field store development. He also prepared the VIA input to the environmental statement for the Cardiff Bay Barrage for consideration by the UK Parliament in the passing of the Barrage Bill.

His more recent VIA work (1995 to present) includes a combination of CAD and GIS based work for a new international airport to the north of Durban, new heavy industrial operations, overhead

electrical transmission lines, mining operations in West Africa and numerous commercial and residential developments.

VIA work undertaken during the last eighteen months includes assessments for proposed new mine developments in Ghana and Guinea, numerous solar plant projects for Eskom and private clients, proposed wind farm development and a proposed tourism development within the Isimangaliso Wetland Park World Heritage Site .

Jon has also had direct experience of working with UNESCO representatives on a candidate World Heritage Site and has undertaken VIAs within and adjacent to other World Heritage Sites.

Relevant Visual Impact Assessment Projects

1. **Isundu Sub- Station Development -** Visual impact assessment for a mnew major sub – station in KwaZulu Natal for Eskom.
2. **Bhangazi Lake Tourism Development** – Visual impact assessment for a proposed lodge development within the Isimangaliso Wetland Park World Heritage Site. This work is ongoing.
3. **Quarry Development for the Upgrade of Sani Pass –** Visual Impact Assessments for two proposed quarry developments on the edge of the uKhalamba-Drakensburg World Heritage Site.
4. **Mtubatuba to St Lucia Overhead Power Line** – Visual Impact Assessment for a proposed power line bordering on the Isimangaliiso Wetland Park World Heritage Site for Eskom.
5. **St Faiths 400/132 kV Sub-Station and Associated Power Lines** - Visual Impact Assessment for a proposed new major sub-station and approximately 15km of overhead power line for Eskom.
6. **Clocolan to Ficksburg Overhead Power Line** – Visual Impact Assessment for a proposed power line for Eskom.
7. **Solar Plant Projects including Photovoltaic and Concentrating Solar Power Plants** – Numerous projects for Eskom and private clients in the Northern Cape, Limpopo, Mpumalanga and the Free State.
8. **Moorreesburg Wind Farm.** Visual impact assessment for a proposed new wind farm in the Western Cape.
9. **AngloGold Ashanti, Dokyiwa (Ghana)** – Visual Impact Assessment for proposed new Tailings Storage Facility at a mine site working with SGS as part of their EIA team.
10. **Camperdown Industrial Development** - Visual Impact Assessment for proposed new light industrial area to the north o Camperdown for a private client.
11. **Wild Coast N2 Toll Highway** – Peer review of VIA undertaken by another consultant.
12. **Gamma to Grass Ridge 765kv transmission line** – Peer review of VIA undertaken by another consultant.
13. **Gateway Shopping Centre Extension (Durban)** – Visual Impact Assessment for a proposed shopping centre extension in Umhlanga, Durban.
14. **Kouroussa Gold Mine (Guinea)** – Visual impact assessment for a proposed new mine in Guinea working with SGS as part of their EIA team.
15. **Mampon Gold Mine (Ghana)** - Visual impact assessment for a proposed new mine in Ghana working with SGS as part of their EIA team.
16. **Telkom Towers** – Visual impact assessments for numerous Telkom masts in KwaZulu Natal
17. **Dube Trade Port, Durban International Airport** – Visual Impact Assessment for a new international airport.
18. **Sibaya Precinct Plan** – Visual Impact Assessment as part of Environmental Impact Assessment for a major new development area to the north of Durban.
19. **Umdloti Housing** – Visual Impact Assessment as part of Environmental Impact Assessment for a residential development beside the Umdloti Lagoon to the north of Durban.

20. **Tata Steel Ferrochrome Smelter** - Visual impact assessment of proposed new Ferrochrome Smelter in Richards Bay as part of EIA undertaken by the CSIR.
21. **Diamond Mine at Rooipoort Nature Reserve near Kimberley** – Visual impact assessment for a proposed diamond mine within an existing nature reserve for De Beers.
22. **Durban Solid Waste Large Landfill Sites –** Visual Impact Assessment of proposed development sites to the North and South of the Durban Metropolitan Area. The project utilised 3d computer visualisation techniques.
23. **Hillside Aluminium Smelter, Richards Bay -** Visual Impact Assessment of proposed extension of the existing smelter. The project utilised 3d computer visualisation techniques.
24. **Estuaries of KwaZulu Natal Phase 1 and Phase 2 –** Visual character assessment and GIS mapping as part of a review of the condition and development capacity of eight estuary landscapes for the Town and Regional Planning Commission. The project was extended to include all estuaries in KwaZulu Natal.
25. **Signage Assessments** – Numerous impact assessments for proposed signage developments for Blast Media.
26. **Signage Strategy** – Preparation of an environmental strategy report for a national advertising campaign on National Roads for Visual Image Placements.
27. **Zeekoegatt, Durban** - Computer aided visual impact assessment. Acted as advisor to the Province of KwaZulu Natal in an appeal brought about by a developer to extend a light industrial development within a 60 metre building line from the National N3 Highway.
28. **La Lucia Mall Extension** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed extension to shopping mall for public consultation exercise.
29. **Redhill Industrial Development** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed new industrial area for public consultation exercise.
30. **Avondale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
31. **Hammersdale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
32. **Southgate Industrial Park, Durban** - Computer Aided Visual Impact Assessment and Landscape Design for AECI.
33. **Sainsbury's Bryn Rhos (UK)** - Computer Aided Visual Impact Assessment/ Planning Application for the development of a new store within the Green Wedge North of Swansea.
34. **Ynyston Farm Access (UK)** - Computer Aided Impact Assessment of visual intrusion of access road to proposed development in Cardiff for the Land Authority for Wales.
35. **Cardiff Bay Barrage (UK)** - Concept Design, Detail Design, Documentation, and Visual Input to Environmental Statement for consideration by Parliament in the debate prior to the passing of

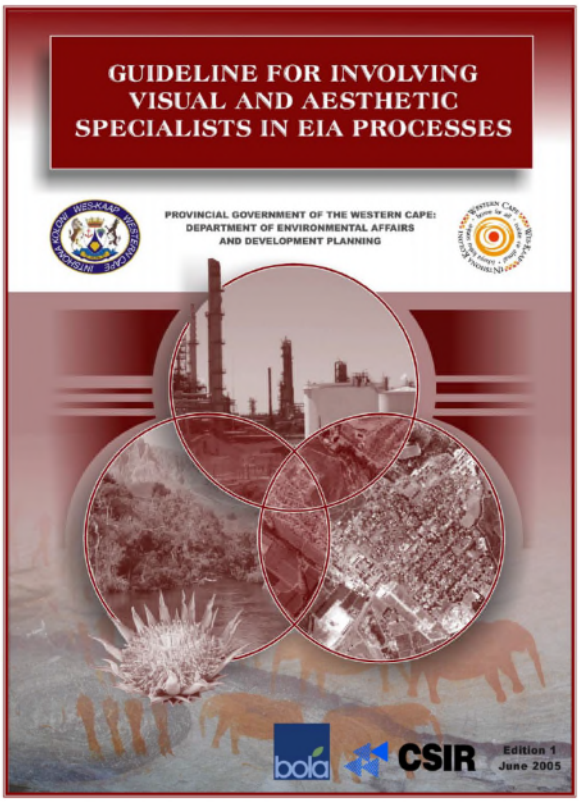
the Cardiff Bay Barrage Bill. The work was undertaken for Cardiff Bay Development Corporation.

36. **A470, Cefn Coed to Pentrebach (UK)** - Preparation of frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
37. **Sparkford to Illchester Bye Pass (UK)** - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
38. **Green Island Reclamation Study (Hong Kong)** - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
39. **Route 3 (Hong Kong)** - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
40. **China Border Link (Hong Kong)** - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
41. **Route 81, Aberdeen Tunnel to Stanley (Hong Kong)** - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.

APPENDIX II

GUIDELINES FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

(Preface, Summary and Contents for full document go to the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning web site, http://eadp.westerncape.gov.za/your-resource-library/policies-guidelines)


GUIDELINE FOR INVOLVING
VISUAL AND AESTHETIC
SPECIALISTS IN EIA PROCESSES
PROVINCIAL GOVERNMENT OF THE WESTERN CAPE:
DEPARTMENT OF ENVIRONMENTAL AFFAIRS
AND DEVELOPMENT PLANNING
bola
CSIR
Edition 1
June 2005

GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

Edition 1

Issued by:
Provincial Government of the Western Cape
Department of Environmental Affairs and Development Planning
Utilitas Building, 1 Dorp Street
Private Bag X9086
Cape Town 8000
South Africa

Prepared by:
Bernard Oberholzer Landscape Architect
PO Box 26643
Hout Bay, 7872, South Africa
email: bola@wol.co.za

Coordinated by:
CSIR Environmentek
P O Box 320
Stellenbosch 7599
South Africa

Contact person:
Frauke Münster
Tel: +27 21 888-2538
(fmunster@csir.co.za)

This guideline should be cited as:

Oberholzer, B. 2005. *Guideline for involving visual & aesthetic specialists in EIA processes: Edition 1.* CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

ACKNOWLEDGEMENTS

Steering committee:

Paul Hardcastle	-	DEA&DP
Ayub Mohammed	-	DEA&DP
Susie Brownlie	-	de Villiers Brownlie Associates
Keith Wiseman	-	City of Cape Town
Mike Burns	-	CSIR Environmentek
Paul Lochner	-	CSIR Environmentek
Pete Ashton	-	CSIR Environmentek

Focus group participants:

Paul Hardcastle	-	DEA&DP
Washiela Anthony	-	DEA&DP
Danie Smit	-	DEAT
Eileen Weinronk	-	City of Cape Town
Menno Klapwijk	-	Cave Klapwijk and Associates
Graham Young	-	Landscape Consultant
Bernard Oberholzer	-	Bernard Oberholzer Landscape Architect (BOLA)
Nicolas Baumann	-	Baumann & Winter Heritage Consultants
Sarah Winter	-	Baumann & Winter Heritage Consultants
Tanya de Villiers	-	Chittenden Nicks deVilliers Africa
Frauke Münster	-	CSIR Environmentek

Internal review:

Mike Burns	-	CSIR Environmentek
Eileen Weinronk	-	City of Cape Town
Paul Hardcastle	-	DEA&DP
Washiela Anthony	-	DEA&DP

Stakeholders engaged in the guideline development process:

These guidelines were developed through a consultative process and have benefited from the inputs and comments provided by a wide range of individuals and organizations actively working to improve EIA practice. Thanks are due to all who took the time to engage in the guideline development process.

In particular, thanks are due to Jan Glazewski (University of Cape Town), Keith Wiseman (City of Cape Town), Paul Britton (SANPARKS), Graham Young (University of Pretoria), Lisa Parkes (Ninham Shand) and Paul Claassen (Environomics) for providing useful information and in-depth comments.

Finalisation of report figures and formatting:

Magdel van der Merwe and Elna Logie, DTP Solutions

PREFACE

The purpose of an Environmental Impact Assessment (EIA) is to provide decision-makers (be they government authorities, the project proponent or financial institutions) with adequate and appropriate information about the potential positive and negative impacts of a proposed development and associated management actions in order to make an informed decision whether or not to approve, proceed with or finance the development.

For EIA processes to retain their role and usefulness in supporting decision-making, the involvement of specialists in EIA needs to be improved in order to:

- Add greater value to project planning and design;
- Adequately evaluate reasonable alternatives;
- Accurately predict and assess potential project benefits and negative impacts;
- Provide practical recommendations for avoiding or adequately managing negative impacts and enhancing benefits;
- Supply enough relevant information at the most appropriate stage of the EIA process to address adequately the key issues and concerns, and effectively inform decision-making in support of sustainable development.

It is important to note that not all EIA processes require specialist input; broadly speaking, specialist involvement is needed when the environment could be significantly affected by the proposed activity, where that environment is valued by or important to society, and/or where there is insufficient information to determine whether or not unavoidable impacts would be significant.

The purpose of this series of guidelines is to improve the efficiency, effectiveness and quality of specialist involvement in EIA processes. The guidelines aim to improve the capacity of roleplayers to anticipate, request, plan, review and discuss specialist involvement in EIA processes. Specifically, they aim to improve the capacity of EIA practitioners to draft appropriate terms of reference for specialist input and assist all roleplayers in evaluating whether or not specialist input to the EIA process is appropriate for the type of development and environmental context. Furthermore, they aim to ensure that specialist inputs support the development of effective, practical Environmental Management Plans where projects are authorised to proceed (refer to *Guideline for Environmental Management Plans*).

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist assessment" and "studies" to indicate that the scope of specialists' contribution (if required) depends on the nature of the project, the environmental context and the amount of available information and does not always entail detailed studies or assessment of impacts.

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist

assessment" and "studies" to indicate that the scope of specialists' contribution depends on the nature of the project, the environmental context and the amount of available information.

	ISSUES
TIMING	▪ When should specialists be involved in the EIA process; i.e. at what stage in the EIA process should specialists be involved (if at all) and what triggers the need for their input?
SCOPE	▪ Which aspects must be addressed through specialist involvement; i.e. what is the purpose and scope of specialist involvement? ▪ What are appropriate approaches that specialists can employ? ▪ What qualifications, skills and experience are required?
QUALITY	▪ What triggers the review of specialist studies by different roleplayers? ▪ What are the review criteria against which specialist inputs can be evaluated to ensure that they meet minimum requirements, are reasonable, objective and professionally sound?

The following guidelines form part of this first series of guidelines for involving specialists in EIA processes:

- Guideline for determining the scope of specialist involvement in EIA processes
- Guideline for the review of specialist input in EIA processes
- Guideline for involving biodiversity specialists in EIA processes
- Guideline for involving hydrogeologists in EIA processes
- Guideline for involving visual and aesthetic specialists in EIA processes
- Guideline for involving heritage specialists in EIA processes
- Guideline for involving economists in EIA processes

The *Guideline for determining the scope of specialist involvement in EIA processes* and the *Guideline for the review of specialist input in EIA processes* provide generic guidance applicable to any specialist input to the EIA process and clarify the roles and responsibilities of the different roleplayers involved in the scoping and review of specialist input. It is recommended that these two guidelines are read first to introduce the generic concepts underpinning the guidelines which are focused on specific specialist disciplines.

Who is the target audience for these guidelines?

The guidelines are directed at authorities, EIA practitioners, specialists, proponents, financial institutions and other interested and affected parties involved in EIA processes. Although the guidelines have been developed with specific reference to the Western Cape province of South Africa, their core elements are more widely applicable.

What type of environmental assessment processes and developments are these guidelines applicable to?

The guidelines have been developed to support project-level EIA processes regardless of whether they are used during the early project planning phase to inform planning and design decisions (i.e. during pre-application planning) or as part of a legally defined EIA process to obtain statutory approval for a proposed project (i.e. during screening, scoping and/or impact assessment). Where specialist input may be required the guidelines promote early, focused and appropriate involvement of specialists in EIA processes in order to encourage proactive consideration of potentially significant impacts, so that negative impacts may be avoided or

effectively managed and benefits enhanced through due consideration of alternatives and changes to the project.

The guidelines aim to be applicable to a range of types and scales of development, as well as different biophysical, social, economic and governance contexts.

What will these guidelines not do?

In order to retain their relevance in the context of changing legislation, the guidelines promote the principles of EIA best practice without being tied to specific legislated national or provincial EIA terms and requirements. They therefore do not clarify the specific administrative, procedural or reporting requirements and timeframes for applications to obtain statutory approval. They should, therefore, be read in conjunction with the applicable legislation, regulations and procedural guidelines to ensure that mandatory requirements are met.

It is widely recognized that no amount of theoretical information on how best to plan and coordinate specialist inputs, or to provide or review specialist input, can replace the value of practical experience of coordinating, being responsible for and/or reviewing specialist inputs. Only such experience can develop sound judgment on such issues as the level of detail needed or expected from specialists to inform decision-makers adequately. For this reason, the guidelines should not be viewed as prescriptive and inflexible documents. Their intention is to provide best practice guidance to improve the quality of specialist input.

Furthermore, the guidelines do not intend to create experts out of non-specialists. Although the guidelines outline broad approaches that are available to the specialist discipline (e.g. field survey, desktop review, consultation, modeling), specific methods (e.g. the type of model or sampling technique to be used) cannot be prescribed. The guidelines should therefore not be used indiscriminately without due consideration of the particular context and circumstances within which an EIA is undertaken, as this influences both the approach and the methods available and used by specialists.

How are these guidelines structured?

The specialist guidelines have been structured to make them user-friendly. They are divided into six parts, as follows:

- **Part A**: Background;
- **Part B**: Triggers and key issues potentially requiring specialist input;
- **Part C**: Planning and coordination of specialist inputs (drawing up terms of reference);
- **Part D**: Providing specialist input;
- **Part E**: Review of specialist input; and
- **Part F**: References.

Part A provides grounding in the specialist subject matter for all users. It is expected that authorities and peer reviewers will make most use of Parts B and E; EIA practitioners and project proponents Parts B, C and E; specialists Part C and D; and other stakeholders Parts B, D and E. Part F gives useful sources of information for those who wish to explore the specialist topic.

SUMMARY

This guideline document, which deals with specialist visual input into the EIA process, is organised into a sequence of interleading sections. These follow a logical order covering the following:

- the background and context for specialist visual input;
- the triggers and issues that determine the need for visual input;
- the type of skills and scope of visual inputs required in the EIA process;
- the methodology, along with information and steps required for visual input;
- finally, the review or evaluation of the visual assessment process.

Part A is concerned with defining the visual and aesthetic component of the environment, and with principles and concepts relating to the visual assessment process. The importance of the process being logical, holistic, transparent and consistent is stressed in order for the input to be useful and credible.

The legal and planning context within which visual assessments take place indicate that there are already a number of laws and bylaws that protect visual and scenic resources. These resources within the Western Cape context have importance for the economy of the region, along with the proclaimed World Heritage Sites in the Province.

The role and timing of specialist visual inputs into the EIA process are outlined, with the emphasis being on timely, and on appropriate level of input, from the early planning stage of a project, through to detailed mitigation measures and management controls at the implementation stage.

Part B deals with typical factors that trigger the need for specialist visual input to a particular project. These factors typically relate to:

(a) the nature of the receiving environment, in particular its visual sensitivity or protection status;
(b) the nature of the project, in particular the scale or intensity of the project, which would result in change to the landscape or townscape.

The correlation between these two aspects are shown in a table, in order to determine the varying levels of visual impact that can be expected, i.e. from little or no impact, to very high visual impact potential.

Part C deals with the choice of an appropriate visual specialist, and the preparation of the terms of reference (TOR) for the visual input. Three types of visual assessment are put forward, each requiring different expertise, namely:
Type A: assessments involving large areas of natural or rural landscape;
Type B: assessments involving local areas of mainly built environment;
Type C: assessments involving smaller scale sites with buildings, or groups of buildings.

The scope of the visual input would in summary relate to the following:

- the issues raised during the scoping process;
- the time and space boundaries, i.e. the extent or zone of visual influence;

- the types of development alternatives that are to be considered;
- the variables and scenarios that could affect the visual assessment;
- the inclusion of direct, indirect and cumulative effects.

Approaches to the visual input relate to the level of potential impact and range from minimal specialist input, to a full visual impact assessment (VIA). A list of the typical components of a visual assessment is given, and the integration with other studies forming part of the EIA process is discussed.

Part D provides guidance for specialist visual input, and on the information required by specialists. Notes on predicting potential visual impacts are given, along with suggested criteria for describing and rating visual impacts. The assessment of the overall significance of impacts, as well as thresholds of significance are discussed.

Further aspects that need to be considered by visual specialists in EIA processes include:

- affected parties who stand to benefit or lose,
- risks and uncertainties related to the project,
- assumptions that have been made, and their justification,
- levels of confidence in providing the visual input or assessment,
- management actions that can be employed to avoid or mitigate adverse effects and enhance benefits, and
- the best practicable environental option from the perspective of the visual issues and impacts.

Finally, pointers for the effective communication of the findings are given.

Part E lists specific evaluation criteria for reviewing visual input by a specialist, where this becomes necessary. Further guidance on this is given in the document on *Guideline for the review of specialist input in EIA processes.*

CONTENTS

Acknowledgements i
Preface ii
Summary v

PART A : BACKGROUND 1

1. INTRODUCTION 1
2. PRINCIPLES AND CONCEPTS UNDERPINNING VISUAL SPECIALIST INVOLVEMENT IN EIA PROCESSES 2
3. CONTEXTUALISING SPECIALIST INPUT 4
3.1 Legal, policy and planning context for involving a visual specialist 5
3.2 Environmental context for specialist input 6
4. THE ROLE AND TIMING OF SPECIALIST INPUT WITHIN THE EIA PROCESS 6

PART B: TRIGGERS AND KEY ISSUES POTENTIALLY REQUIRING SPECIALIST INPUT 9

5. TRIGGERS FOR SPECIALIST INPUT 9
6. KEY ISSUES REQUIRING SPECIALIST INPUT 10

PART C: PLANNING AND COORDINATION OF SPECIALIST INPUTS (DRAWING UP THE TERMS OF REFERENCE) 13

7. QUALIFICATIONS, SKILLS AND EXPERIENCE REQUIRED 13
8. DETERMINING THE SCOPE OF SPECIALIST INPUTS 14
8.1 Identifying and responding to issues 15
8.2 Establishing appropriate time and space boundaries 16
8.3 Clarifying appropriate development alternatives 16
8.4 Establishing environmental and operating scenarios 17
8.5 Addressing direct, indirect and cumulative effects 17
8.6 Selecting the appropriate approach 18
8.7 Clarifying the timing, sequence and integration of specialist input 20
8.8 Ensuring appropriate stakeholder engagement 20
8.9 Clarifying confidentiality requirements 21

PART D: PROVIDING SPECIALIST INPUT 22

9. INFORMATION REQUIRED TO PROVIDE SPECIALIST INPUT 22
9.1 Relevant project information 22
9.2 Information describing the affected environment 23
9.3 Legal, policy and planning context 24
9.4 Information generated by other specialists in the EIA process 24
10. SPECIALIST INPUT TO IMPACT ASSESSMENT AND RECOMMENDING MANAGEMENT ACTIONS 25
10.1 Predicting potential impacts 25
10.2 Interpreting impact assessment criteria 26
10.3 Establishing thresholds of significance 29
10.4 Describing the distribution of impacts – beneficiaries and losers 30
10.5 Identifying key uncertainties and risks 30
10.6 Justifying underlying assumptions 31
10.7 Defining confidence levels and constraints to input 31
10.8 Recommending management actions 31
10.9 Identifying the best practicable environmental option 32
10.10 Communicating the findings of the specialist input 32
11. SPECIALIST INPUT TO MONITORING PROGRAMMES 33

PART E: REVIEW OF THE SPECIALIST INPUT 36

12. SPECIFIC EVALUATION CRITERIA 36

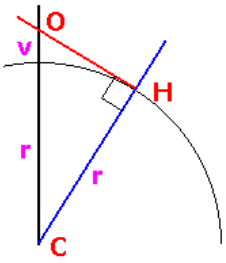
PART F: REFERENCES 37

APPENDIX III

FORMULA FOR DERIVING THE APPROXIMATE VISUAL HORIZON

The Mathematics behind this Calculation

This calculation should be taken as a guide only as it assumes the earth is a perfect ball 6378137 metres radius. It also assumes the horizon you are looking at is at sea level. A triangle is formed with the centre of the earth (C) as one point, the horizon point (H) is a right angle and the observer (O) the third corner. Using Pythagoras's theorem we can calculate the distance from the observer to the horizon (OH) knowing CH is the earth's radius (r) and CO is the earth's radius (r) plus observer's height (v) above sea level.



Sitting in a hotel room 10m above sea level a boat on the horizon will be 11.3km away. The reverse is also true, whilst rowing across the Atlantic, the very top of a mountain range 400m high could be seen on your horizon at a distance of 71.4 km assuming the air was clear enough.

APPENDIX IV

CUMULATIVE IMPACT ASSESSMENT

1 GENERAL LANDSCAPE CHANGE AND DEGRADATION OF NATURAL / URBAN LANDSCAPE CHARACTERISTICS.

Nature of impact:

The affected natural landscape (Lowland and Upland LCAs) is not a highly natural area as it is already impacted by existing infrastructure including a larger 400kV overhead power line.

The affected urban area is also currently affected by existing electrical infrastructure including LV cables and an existing substation

The proposed 132kV overhead power line will add marginally to the local intensity of existing impacts within the Lowland LCA. They will also extend the impact into the Upland LCA as the alignments run along the N14 towards Olifantshoek.

The propose substation Alternative Location will increase the extent of electrical infrastructure that is obvious within the urban area. The Preferred Alternative 3 will largely impact the urban fringe / Upland LCA.

	Without mitigation	**With mitigation**
Extent	**Both Power Line Alternatives** Immediate surroundings, **(2)** **Both Substation Alternatives** Immediate surroundings, **(2)**	Immediate surroundings, **(2)** Immediate surroundings, **(2)**
Duration	**Both Power Line Alternatives** Immediate surroundings, **(4)** **Both Substation Alternatives** Immediate surroundings, **(4)**	Long term, **(4)** Long term, **(4)**
Magnitude	**Both Power Line Alternatives** Minor, **(2)** **Alternative Substation Location** Low, **(4)** **Preferred Substation Location** Low, **(4)**	Small, **(0)** Minor, **(2)** Minor, **(2)**
Probability	**Both Power Line Alternatives** Probable, **(3)** **Alternative Substation Location** Highly probable, **(4)** **Preferred Substation Location** Probable, **(3)**	Improbable, **(2)** Probable, **(3)** Improbable, **(2)**
Significance	**Both Power Line Alternatives** Low, **(24)**	Low, **(12)**

	Alternative Substation Location Medium, **(40)** **Preferred Substation Location** Low / Medium, **(30)**	Low, **(24)** Low, **(16)**
Status	Negative	Negative
Reversibility	High	High
Loss of Resources?	No	No
Confidence in findings	High	
Can impacts be mitigated?	Yes	

Mitigation / Management:

Planning and construction:

- The alignment of the proposed 132kV overhead power line as far from the N14 as possible.
- Plan and implement screening for the substation.
- Ensure that the use of the use that the decommissioned substation site is put to is consistent with residential use.
- Rehabilitate decommissioned substation site and construction disturbance.

Operational:

- Maintain screen planting around substations

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate disturbed areas.

2 THE VISIBILITY OF THE FACILITY TO, AND POTENTIAL VISUAL IMPACT ON RURAL HOMESTEADS.

Nature of impact:

Four homesteads located either within or close to the eastern side of the development corridor within the Lowland LCA are at risk of impact.

Developing the proposed overhead power line to the west of the existing power line (Alternative Alignment) and as close to the western edge of the development corridor as possible would largely address this issue.

It is only the power line proposals that will impact on rural homesteads. The substation alternatives are therefore not included in this section of the assessment.

	Without mitigation	**With mitigation**
Extent	**Both Power Line Alternatives** Immediate surroundings, **(2)**	Immediate surroundings, **(2)**
Duration	**Both Power Line Alternatives** Immediate surroundings, **(4)**	Long term, **(4)**
Magnitude	**Preferred Alignment** High, **(8)** **Alternative Alignment** Low, **(4)**	Moderate, **(6)** Minor to low, **(3)**
Probability	**Preferred Alignment** Highly probable, **(4)**	Probable, **(3)**

	Alternative Alignment Probable, **(3)**	Improbable, **(2)**
Significance	**Preferred Alignment** Medium, **(56)** **Alternative Alignment** Low to medium, **(30)**	Medium, **(36)** Low, **(18)**
Status	Negative	Negative
Reversibility	High	High
Loss of Resources?	No	No
Confidence in findings	High	
Can impacts be mitigated?	Yes	

Mitigation / Management:

Planning and construction:

- Both alternatives - Align power line as far from homesteads as possible within the identified corridor.
- Preferred Alignment - Undertake deviations around the closest homesteads within the development corridor.
- Rehabilitate disturbed areas.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate disturbed areas.

3 THE VISIBILITY OF THE FACILITY TO, AND POTENTIAL VISUAL IMPACT ON THE N14.

Nature of impact:

Only the southernmost portion of the proposed power line alternatives will impact on the N14 as they will cross the road and run close and parallel with it for approximately 6km. They will add to the extent of infrastructure including LV power lines that are visible in the landscape

The proposed substations are also likely to be visible to the N14. The Alternative Location is away from the road but a short view will be possible of them through vegetation and buildings. This is likely to be similar in extent to the existing substation and so cumulative impacts are likely to be low

The Preferred Location is closer to the road on the urban edge. Existing vegetation is likely to result in views of this alternative only being obvious as the viewer is close to and opposite the facility but without additional mitigation the full extent of the substation is likely to be open to view. The proposed substation will however extend the views of development as seen from the N14.

	Without mitigation	**With mitigation**
Extent	**Both Power Line Alternatives** Immediate surroundings, **(2)** **Both Substation Alternatives** Immediate surroundings, **(2)**	Immediate surroundings, **(2)** Immediate surroundings, **(2)**
Duration	**Both Power Line Alternatives** Long term, **(4)**	Long term, **(4)**

	Both Substation Alternatives Long term, **(4)**	Long term, **(4)**
Magnitude	**Both Power Line Alternatives** Low, **(4)** **Alternative Substation Location** Small, **(0)** **Preferred Substation Location** Low, **(4)**	Low, **(3)** Low, **(4)** Small, **(0)** Minor, **(2)**
Probability	**Both Power Line Alternatives** Probable, **(3)** **Alternative Substation Location** Improbable, **(2)** **Preferred Substation Location** Probable, **(3)**	Probable, **(3)** Improbable, **(2)** Improbable, **(2)**
Significance	**Both Power Line Alternatives** Medium, **(36)** **Alternative Substation Location** Low, **(12)** **Preferred Substation Location** Low to medium, **(30)**	Low, **(27)** Low, **(12)** Low, **(16)**
Status	Negative	Negative
Reversibility	High	High
Loss of Resources?	No	No
Confidence in findings	High	
Can impacts be mitigated?	Yes	

Mitigation / Management:

Planning and construction:

- Both Alternative Power Line Alignments - Align power line as far from homesteads as possible within the identified corridor.
- Preferred Power Line Alignment - Undertake deviations around the closest homesteads within the development corridor.
- Rehabilitate disturbed areas.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate disturbed areas.

4 THE VISIBILITY OF THE FACILITY TO, AND POTENTIAL VISUAL IMPACT ON URBAN RESIDENTIAL AREAS.

Nature of impact:

Only the southernmost portion of the proposed power line alternatives that are linked to the alternative substation locations will impact on urban areas. These sections are common to both alternatives. This impact will therefore be subject to the location of the substation and is therefore included as part of the assessment of the substations.

The Alternative Substations Location is within the urban area close to existing homes. The proposed development is significantly larger than the existing facility that it will replace. It will therefore increase the cumulative impact on the residential area.

The Preferred Substation Location is approximately 80m from and will be visible to a small number of dwellings within an existing informal settlement area on the edge of Olifantshoek. The development will also result in the removal of the existing substation from within the residential area. It is likely therefore that this alternative will result in a positive cumulative impact.

	Without mitigation	**With mitigation**
Extent	**Both Substation Alternatives** Immediate surroundings, **(2)**	Immediate surroundings, **(2)**
Duration	**Both Substation Alternatives** Long term, **(4)**	Long term, **(4)**
Magnitude	**Alternative Substation Location** Low, **(4)** **Preferred Substation Location** Low, **(4)**	Minor to low, **(3)** Moderate, **(6)**
Probability	**Alternative Substation Location** Probable, **(3)** **Preferred Substation Location** Probable, **(3)**	Probable, **(3)** Highly probable, **(4)**
Significance	**Alternatives Substation Location** Low to medium, **(30)** **Preferred Substation Location** Low to medium, **(30)**	Low, **(27)** Medium, **(48)**
Status	**Alternatives Substation Location** Negative **Preferred Substation Location** Positive	Negative Positive
Reversibility	High	High
Loss of Resources?	No	No
Confidence in findings	High	
Can impacts be mitigated?	Yes	

Mitigation / Management:

Planning and construction:

- Implement screen planting for substations.
- Rehabilitate decommissioned substation

Operations:

- Maintain screen planting around substations.

Decommissioning: • Remove infrastructure not required for the post-decommissioning use of the site. • Rehabilitate disturbed areas.

5 LIGHTING IMPACTS.

Nature of impact:
Lighting impacts are likely to be associated with nuisance caused by light spill from substation lighting.

The existing substation located close to the Alternative Substations Location already has floodlighting. The existing substation that is to be decommissioned is also located closer to existing houses than the Alternative .

Because the Preferred Substation Location is outside the urban area, it is likely that positive cumulative impacts could be associated it.

If planned appropriately, it is also possible that positive impacts could be associated with the Alternative Substation Location. with all alternatives if appropriate mitigation is undertaken.

	Without mitigation	**With mitigation**
Extent	**Both Substation Alternatives** Immediate surroundings, **(2)**	Immediate surroundings, **(2)**
Duration	**Both Substation Alternatives** Long term, **(4)**	Long term, **(4)**
Magnitude	**Alternative Substation Location** Small, **(0)** **Preferred Substation Location** Small, **(0)**	Minor to low, **(3)** Moderate, **(6)**
Probability	**Alternative Substation Location** Probable, **(3)** **Preferred Substation Location** Probable, **(3)**	Probable, **(3)** Probable, **(3)**
Significance	**Alternative Substation Location** Low, **(18)** **Preferred Substation Location** Low, **(18)**	Low, **(27)** Medium, **(36)**
Status	**Alternative Substation Location** Negative **Preferred Substation Location** Positive	Positive Positive
Reversibility	High	High
Loss of Resources?	No	No
Confidence in findings	Medium	
Can impacts be mitigated?	Yes	
Mitigation / Management:		

Planning and construction: • Plan to motion sensor triggered lighting; • Ensure that lighting is focused on the development with no light spillage outside the site.

APPENDIX V

ENVIRONMENTAL MANAGEMENT PLAN

Project component/s	Olifantshoek 10MVA 132/11KV Substation and 31km Powerline Construction, Operation and Decommissioning		
Potential Impact	Change in Landscape Character Visual impact affecting rural homesteads Visual impact affecting travellers on the N14 Visual impact affecting residents of Olifantshoek Lighting impacts		
Activity/risk source	Vegetation clearance and rehabilitation during construction and decommissioning opening up views of power line and substation alternatives to homesteads, the N14 and urban residents. Lack of screening and management of vegetation opening up views of both substation alternatives to local community. Lack of screening and management of vegetation opening up views of preferred substation alternative to N14. Nuisance caused by light pollution from the Substation particularly the alternative substation. Decommissioning activities.		
Mitigation: Target/Objective	Minimise and reinstate vegetation loss. Undertake screen planting between the substation, residents and the N14. Maintain and augment screen planting as necessary Manage lighting to ensure that only necessary lighting for operations is obvious and light pollution is minimised. Remove structures and rehabilitate site on decommissioning.		
Mitigation: Action/control		**Responsibility** Contractor (C) Environmental Control Officer (ECO) Environmental Liaison Officer (ELO)	**Timeframe** Construction Phase (C) Operational Phase (O) Decommissioning Phase (D)
Minimise disturbance and maintain existing vegetation as far as is possible		C, ECO, ELO	C

both within and surrounding the development area.		
Reinstate any areas of vegetation that have been disturbed during construction.	C, ECO, ELO	C
Undertake and maintain screen planting between the substation, residents and the N14 during the operational phase	C, ECO, ELO	C, D
Rehabilitate areas to their natural state on decommissioning.	C, ECO, ELO	C, D
Monitor rehabilitated areas post-construction and post-decommissioning and implement remedial actions.	C, ECO, ELO	C, D
Remove all temporary works.	C, ECO, ELO	C
Remove infrastructure not required for the post-decommissioning use of the site.	C, ECO, ELO	D
During the operational phase, minimise night lighting with motion sensors and use of infra-red security system. Maintain lighting focused on the substation and angled low.	ECO, ELO	O

Performance Indicators	Vegetation presence and density. Presence of unnecessary infrastructure. Viewing of substations to ensure this is minimised from residential areas and the N14. Viewing of night lighting to ensure lighting is minimised and concentrated on site.
Monitoring	Evaluate vegetation before, during and after construction. Evaluate vegetation growth associated with screen planting and reinstatement during operations and for a year after decommissioning. Evaluate the performance of lighting and undertake liaison with residents during the operational phase. Responsibility: ECO and ELO. Prepare regular reports.