Visual Impact Assessment

for the Proposed BioTherm Enamandla PV 3 Solar Energy Project, near Aggeneys, Northern Cape

JANUARY 2017

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FINAL

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LIST OF ABBREVIATIONS AND ACRONYMS

BioTherm	BioTherm Energy (Pty) Ltd
CSP	Concentrated Solar Power
DEADP	Department of Environmental Affairs and Development Planning
ECO	Environmental Control Officer
EGI	Electricity Grid Infrastructure
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme Report
EWR	Environmental Water Requirement
GPS	Global Positioning System
ha	hectares
I&APs	Interested and Affected Parties
km	kilometers
kV	kilovolt
m	meters
m^3	Cubic meter
Ma	Mega-annum
masl	Meters above sea level
mm	millimetres
MW	Megawatt
NEMA	National Environmental Management Act
PGWC	Provincial Government of the Western Cape

PSDF	Provincial Spatial Development Framework
PV	Photovoltaic
REDZ	Renewable Energy Development Zone
SACAA	South African Civil Aviation Authority
SACAR	South African Civil Aviation Regulations
SDF	Spatial Development Framework
ToR	Terms of Reference
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
ZVI	Zone of Visual Influence

1. INTRODUCTION

BioTherm Energy (Pty) Ltd. (BioTherm) is proposing the development of a photovoltaic (PV) solar power facility in the Northern Cape; namely Enamandla PV 3. The facility will have a maximum generation capacity of 75MW and is one of seven solar projects being proposed by BioTherm on the Farm Hartebeest Vlei 86. These projects include: Letsoai CSP Site 1, Letsoai CSP Site 2, Enamandla PV 1, Enamandla PV 2, Enamandla PV 3, Enamandla PV 4 and Enamandla PV 5.

Farm Hartebeest Vlei 86 is situated in the Northern Cape, in the Khâi-Ma Local Municipality. It is south of the N14 which runs between Springbok and Upington, approximately 15km south of the town of Aggeneys and approximately 50km south-west of the town of Pofadder (see **Figure 1**). Enamandla PV 3 is situated along the northern border of the site, to the east of Enamandla PV 1 and Enamandla PV 2. It runs adjacent to the farm access road to the west of the road. The power lines extend from the site in a north, north-west and north-easterly direction, traversing additional properties.

The project is situated within the Northern Electricity Grid Infrastructure (EGI) Corridor, one of 5 corridors earmarked for electricity infrastructure development. Although a solar project, it should be noted that it is also positioned within the proposed Springbok Wind Renewable Energy Development Zone (REDZ), one of the eight areas that have been identified through an extensive process for the development of renewable energy installations.

The National Environmental Management Act (NEMA) and Environmental Impact Assessment (EIA) Regulations require that an EIA be undertaken for the proposed project and associated infrastructure, since they include listed activities in terms of these regulations. A separate assessment is being conducted for the power lines as well as for each of the other six solar projects. The environmental assessments are being conducted by WSP | Parsons Brinckerhoff.

This Visual Impact Assessment (VIA) is one of many specialist studies that have been undertaken by specialists as part of the EIA. It should be read in conjunction with the relevant Environmental Impact Report (EIR) and other specialist studies. This report has been preceded by a Visual Scoping Study that was undertaken in the first phase of the assessment.

1.1 SCOPE OF WORK

During the first phase of the assessment (Scoping Phase) the scope of work included:

1. Undertaking a field study to establish a baseline description of the visual characteristics of the landscape. The site visit was conducted in summer from 27-30 January 2016;

2. Defining the visual resources and sense of place of the area;

3. Identifying and mapping existing sensitive receptors, buffers, important viewpoints and view corridors;

4. Identifying and screening potential visual concerns;

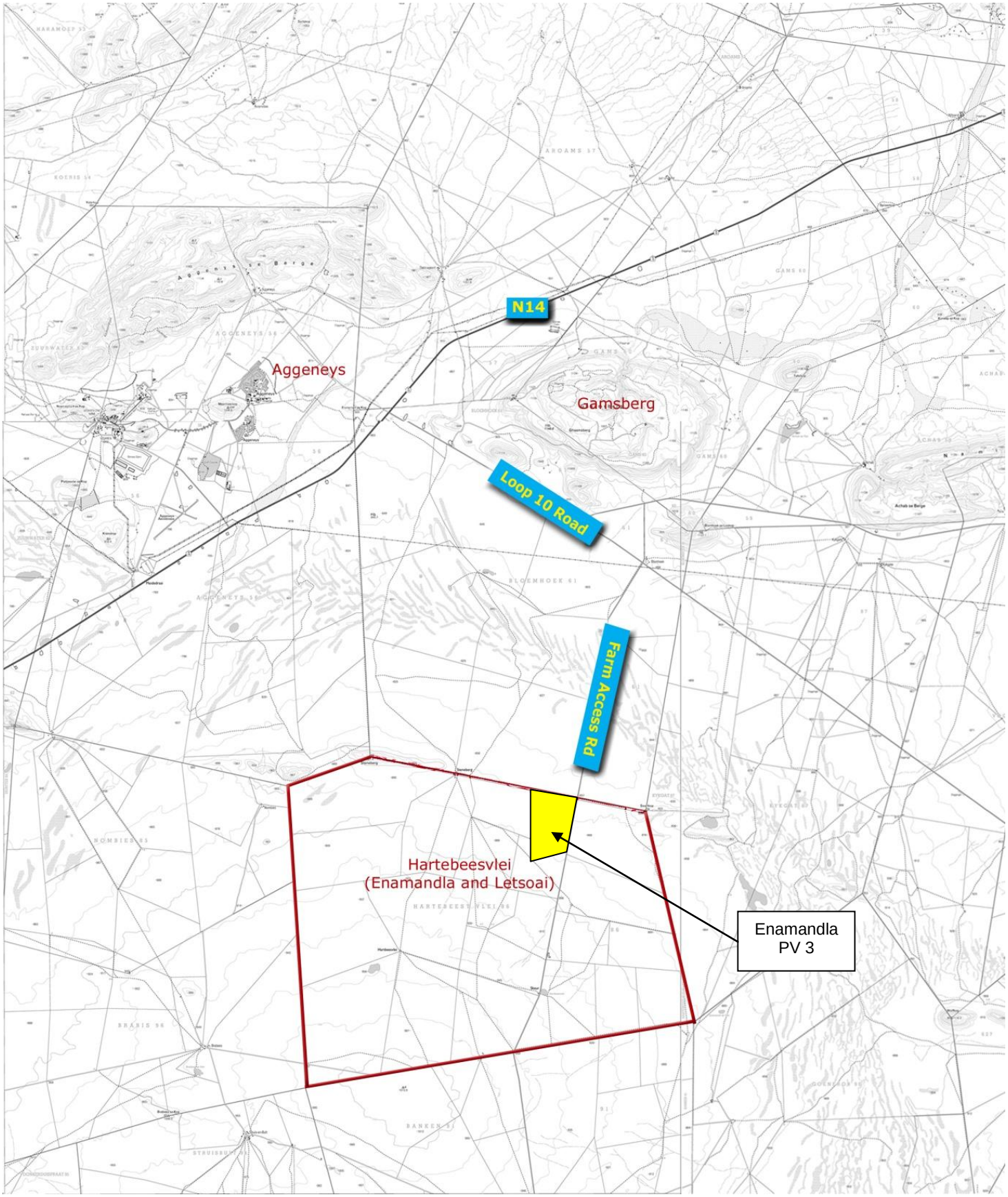
5. Ensuring that the visual assessment will be in compliance with relevant standards, policies, laws and regulations; and

6. Providing recommendations for the impact assessment phase.

During the second phase of the assessment (Assessment Phase) the scope of work included:

1. Refining the baseline (Scoping) description of the visual character of the site and zone of visual influence (ZVI);

2. Refining the list of identified visual impacts resulting from the proposed installations (with consideration of any public and/or relevant authorities' concerns);



BIOTHERM ENERGY

Enamandla PV 3 Location Plan

Date: Dec 2016	Complied by: GEBH
Revision: 2	Fig No: 1

3. Evaluating the visual impacts based on standard VIA rating criteria, namely:

    - Quality of landscape – the aesthetic excellence and significance of the visual resources and scenery;
    - Visual absorption capacity – the potential of the landscape to conceal the proposed development;
    - Visibility – including:
        - the ZVI as defined in the scoping report;
        - viewshed analysis – the geographic area from which the project may be visible (view catchment);
        - visibility from selected viewpoints;
    - Visual intrusion (or integrity) – the level of congruence or integration with existing landscape; and
    - Viewer sensitivity – the level of viewer sensitivity as influenced by the type and number of visual receptors.

4. Assessing the significance of the visual impacts, rated according to the Hacking Methodology (provided by the Environmental Consultants), which includes:

    - Severity, extent, duration and probability to determine consequence; and
    - Consequence considered with status (positive or negative impact) and confidence to determine significance.

5. Developing mitigation measures to reduce visual impacts and enhance any positive visual benefits; and

6. Responding to stakeholder's queries and concerns, as required.

1.2 OBJECTIVES OF THE REPORT

The goal of visual assessment is not to predict whether individual receptors will find solar energy projects attractive or not. Instead, the goal is to identify important visual characteristics of the surrounding landscape, especially the features and characteristics that contribute to scenic quality, as the basis for determining how and to what degree the proposed project will affect those scenic values (Vissering, 2011).

Thus the primary aim of the impact assessment phase will be to ensure that visual impacts are adequately assessed and considered so that the relevant authorities can decide if the proposed solar energy facility has unreasonable or undue visual impacts. The secondary aim is to identify effective and practical mitigation measures, where possible.

1.3 LEGISLATIVE FRAMEWORK

There is little legislation relating directly to visual impact assessment. However there are guidelines that provide direction for visual assessment as well as a number of laws which aim to protect visual resources and others that apply to specialists in general. The most relevant guidelines and laws are listed below however, the list is not exhaustive:

- **The National Environmental Management Act (107 of 1998) EIA Regulations No. R 543 (2010)**: The EIA Regulations contain three listing notices (GNR 983, 984 and 985) which identify activities that are subject to either a Basic Assessment or Scoping and EIA in order to obtain environmental authorisation. Enamandla PV 3 includes activities listed in GNR 983, GNR 984 and GNR 985 and therefore a Scoping and EIA process is required for authorisation. The NEMA EIA Regulations also contain broad guidelines for the preparation of specialist studies that are relevant to this study.
- **The National Heritage Resources Act (25 of 1999)** is applicable to visual resources including cultural landscapes, proclaimed buildings and sites, nature reserves, proclaimed scenic routes and urban conservation areas. In terms of the Section 38 of NHRA, any person who intends to undertake a linear development exceeding 300m in length or a development that exceeds 5000m^2 must notify the heritage resources authority and undertake the necessary assessment requested by that authority. For this assessment a detailed Heritage Impact Assessment has been undertaken by ACO Associates and this VIA will address some of the issues relevant to the NHRA requirements.

- **DEA&DP Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (CSIR, 2005):** These guidelines are applicable in the Western Cape, but give good general guidance for the preparation of visual specialist input into EIA processes. The guidelines document the requirements for visual impact assessment, factors that trigger the need for specialist visual input, timing and nature of visual input as well as choice of visual specialists, preparation of terms of reference and guidance for specialist input / visual assessment methodology.

- **Renewable Energy Development Zones (REDZ) and Electricity Grid Infrastructure (EGI) Corridors:** In February 2016 the Cabinet approved the gazetting of 8 REDZ and 5 EGI Corridors. These are geographical areas where wind and solar technologies are to be incentivized and where grid expansion is to be directed. The REDZs and Power Corridors support 2 of the 18 Strategic Integrated Projects (SIPs) which were identified in the Infrastructure Development Plan, aimed at promoting catalytic infrastructure development to stimulate economic growth and job creation. Once gazetted, regulatory processes within these zones will be streamlined and environmental authorisation will only require a Basic Assessment, not a full EIA. Enamandla PV 3 falls within the Northern EGI Corridor and the Springbok Wind REDZ.

- **Astronomy Geographic Advantage areas Act (No. 21 of 2007):** In February 2010, the Minister of Science and Technology declared all land in the Northern Cape Province situated 250km from the centre of the South African Large Telescope (SALT) dome as an astronomy advantage area and the whole of the territory of the Northern Cape Province, excluding Kimberly, as an astronomy advantage area for radio astronomy purposes. The proposed Enamandla PV 3 is situated over 350km away from the SALT.

- **Civil Aviation Act (No.13 of 2009):** This Act provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. All proposed developments or activities in South Africa that potentially could affect civil aviation must thus be assessed by SACAA in terms of the SACARs and South African Civil Aviation Technical Standards (SA CATS) in order to ensure aviation safety. Potential impacts from the solar facilities must be reviewed by these authorities.

- **Government of the Western Cape (PGWC), 2006: A Strategic Initiative to Introduce Commercial and Land Based Wind Energy Development to the Western Cape:** Although the proposed energy farm falls within the Northern Cape and is a solar facility, the report prepared by the Provincial Government provides some helpful indicators for solar energy facilities and recommend buffers for sensitive visual and ecological resources.

- **Environmental Impact Assessment Guideline for Renewable Energy Projects (Notice 989 of 2015):** This guideline provides guidance on the environmental management legal

framework applicable to renewable energy operations. It aims to ensure that all potential environmental issues pertaining to renewable energy projects are adequately and timeously assessed and addressed so as to ensure sustainable roll-out of these technologies.

- **Northern Cape Provincial Spatial Development Framework (PSDF)** is a policy document that promotes a 'developmental state' in accordance with national and provincial legislation and directives. It aligns with the Northern Cape Provincial Growth and Development Strategy which has committed the Northern Cape to 'building a prosperous, sustainable and growing provincial economy which reduces poverty and improves social development'. The PSDF makes reference to the need to ensure the availability of energy and the potential for renewable energy generation within the province. The PSDF states that the total area of high radiation in South Africa amounts to approximately 194 000km^2, of which the majority falls within the Northern Cape. Further detail regarding PSDF plans for solar energy targets and zones/corridors are contained within the Scoping Report (WSP, 2016).

1.4 STUDY APPROACH AND METHODOLOGY

In order to meet the terms of reference and the DEA&DP's Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (2005), the following methodology was applied:

1. All the required **data were collected**, which included data on topography, existing visual character and quality, plans of the proposed development and other background information;

2. **Fieldwork** (a site visit) was conducted from 27-30 January 2016. The objectives of the fieldwork were to:

    - familiarise the author with the site and its surroundings;
    - to identify key viewpoints/ corridors and visual receptors;
    - groundtruth the sensitivity of the landscape; and
    - determine the distance from which visual impacts are likely to become discernible.

3. **Landscape characterisation** was done by mapping the site location and context and describing the landscape character and sense of place. This considered geological and topographical features, vegetation and land-use.

4. The **landscape quality** was described using visual appeal criteria, based on Ramsay, Crawford, Arriaza and Young and is explained in the text below.

5. **Visual sampling** was undertaken using photography from a number of viewpoints within approximately 30km of the site. The location of the viewpoints was recorded with a GPS and photographs were taken at a depth of field between 45-55mm. A selection of these are used in the assessment phase of the VIA to illustrate the likely zone of influence and visibility.

6. ArcGIS Spatial Analyst extension was used to calculate the **viewshed** making use of a 20m contour interval SRTM Digital Elevation Model (DEM) as the input raster.

7. The **sensitivity of the landscape** was analysed, taking the following factors into consideration:

    - Slope and elevation;
    - Proximity of visual receptors (farmsteads, towns, motorists etc.);
    - Proximity of major roads and scenic routes;

- Nature reserves and National Parks; and
- Other relevant features and buffer guidelines.

8. Visual concerns and potential **impacts were identified**;
9. The potential magnitude of visual impacts were **evaluated using standard VIA criteria** and rating methodologies, explained briefly in Chapter 5 below and further explained in **Annexure A**; and
10. Potential visual impacts for each project phase as well as cumulative impacts were **assessed** using a methodological framework developed by WSP | Parsons Brinckerhoff to meet the combined requirements of international best practice and NEMA, Environmental Impact Assessment Regulations, 2014 (GN No. 982). This methodology is explained in detail in **Annexure B**.

1.5 ASSUMPTIONS AND LIMITATIONS OF THIS STUDY

The following assumptions and limitations are relevant to the report:

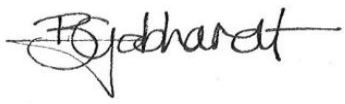
1. Documentation and project information supplied by WSP | Parsons Brinckerhoff and BioTherm is assumed to be accurate and representative of the project.
2. The Zone of Visual Influence (ZVI) and visual assessment has assumed a panel height of 6m.
3. Comments and concerns from interested and affected parties have been tabulated by WSP | Parsons Brinckerhoff and are assumed to be a complete and accurate representation of public comment.
4. Visual guidelines for solar facilities in the Northern Cape are not currently available. Rough guidelines for the potential visibility of solar facilities have been adapted from available literature.
5. Planning impacts are not considered within the scope of the visual study.
6. For cumulative impacts:
    - Proposed projects in close proximity to the site that have been considered in the evaluation of cumulative impacts are tabulated in **Table 11**. These include all approved and ongoing environmental authorisations within a 70km radius.
    - Due to the number of different significance rating methodologies utilised across the various projects, significance ratings have been simplified to include only Low, Medium and High ratings and were tabulated by WSP.
    - In the event that specialist studies were unable to be obtained, this has been noted.

1.6 DECLARATION OF INDEPENDENCE

I Belinda Gebhardt, as the appointed independent visual specialist, do hereby declare that:

- I act/have acted as the independent specialist in this application;
- I have perform the work relating to the application in an objective manner, even if this results/has resulted in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I have complied with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have disclosed/will disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of Specialist



Date

10/01/2017

The Visual Specialist was assisted by Mildred Goes with the preparation of some of the figures prepared in ArchView (GIS).

I Mildred Goes (GIS Practitioner), do hereby declare that:

- I act/have acted as the independent specialist in this application;
- I have perform the work relating to the application in an objective manner, even if this results/has resulted in views and findings that are not favourable to the applicant;

- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I have complied with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have disclosed/will disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of Specialist: 

Date: 23/11/2016

Specialist experience and expertise detailed within **Annexure C.**

2. DESCRIPTION OF THE PROJECT

As indicated in the Introduction above, Enamandla PV 3 is situated on Farm Hartebeest Vlei 86 approximately 15km south-east of Aggeneys, within the Khâi-Ma Local Municipality under the jurisdiction of the Namakwa District Municipality (**Figure 1**).

Enamandla PV 3 will comprise a utility-scale photovoltaic (PV) system designed for the supply of commercial power into the electricity grid, with a generating capacity of up to 75MW. Enamandla PV 3 will have a substation, which will include transformers for voltage step up from medium voltage to high voltage. The substation will occupy an area of 150m x 150m and be approximately 35m-40m high (WSP, 2016). A 132kv line will connect this substation to the larger common substation.

Two alternative sites were considered for Enamandla PV 3 (**Figure 2**). The first is the area shaded green in the image below, the second the area outlined in blue. In the second layout alternative, the additional area shaded in green becomes PV 2.

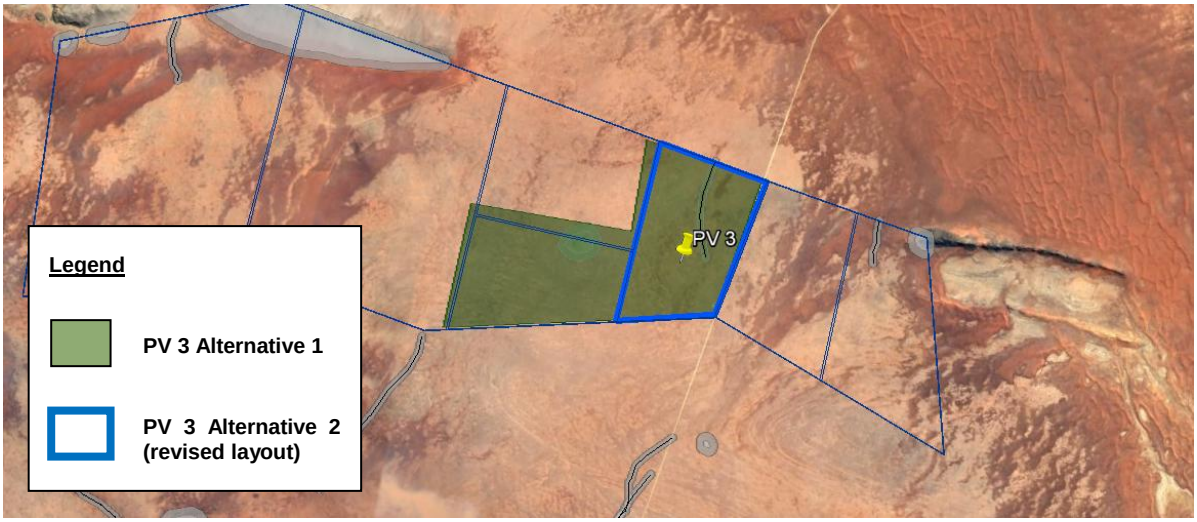


Figure 2: Alternative Sites for Enamandla PV 3

A detailed description of the project and PV technology is contained within the EIR (WSP, 2016). A brief summary of the project elements, as relevant to the visual assessment, is provided in the text and **Table 1** below.

Table 1: Description of Project Facilities (WSP, 2016)

INFRASCRUCTURE	HEIGHT	DIMENSIONS AND DETAILS
Photovoltaic Panels	4-6m	Photovoltaic Panels with either be fixed axis mounting or single axis tracking solutions. Panels will be crystalline silicon or thin film technology. There will be approximately 281,000 to 274,000 panels, each occupying an area of about 2m^2. The dimensions of each panel are 1956mm x 992mm x40mm The proposed area for the PV array is 350ha.
Operations and Maintenance building(s)	single storey (assume 8m)	Approximate footprint area of 225m^2. Will include: • Administrative buildings • Staff accommodation • Control station and workshop • Warehouse buildings
Cement Batching Plant	Silo max 20m	Gravel and sand located in separate heaps whilst the cement will be contained in a silo. Mixing of concrete will take place in a

		concrete truck. Footprint area approximately 2500m^2.
Laydown areas	Roughly level with ground	Temporary laydown area of 5ha.
Access Roads	Roughly level with ground	An existing road currently provides access to the site off the N14 (via Loop 10 Road). It is proposed that this road may be upgraded. Internal roads will be between 4 and 6m wide, length to be confirmed when facility layout is complete.
Sewage		Septic tanks (with portable toilets during construction)
Security Fencing	Assume 2m	Galvanized steel fencing.
Lighting	unknown	Lighting has not yet been specified but some security lighting will be included.
Substation and associated infrastructure	30-40m	There will be an onsite substation with a footprint area of approximately 2.25ha. It will have a capacity of up to 132 kV. It will be connected to the facility power island which is comprised of the steam turbine generator transformer. The power-island will be linked to the onsite substation using suitable underground cables (except where a technical assessment suggest that overhead lines are applicable).
Powerlines	132kV – approximately 25m 400kV – approximately 35-40m	The 132kV powerline servitude will have a width of 31-36m. Power towers will have a steel monopole structure, which may be self-support or guyed suspension. The 400kV powerlines are assessed in a separate report.

An image of PV technology with infrastructure similar to the proposed Enamandla PV 3 facility is provided below. Please note this is ***not*** a representation of the proposed Enamandla PV 3 facility but is provided as an example to give visual context (**Plate i**).

Plate i: Large-Scale PV Facility (Source: www.pv-magazine.com)

The main activities for the Construction, Operation and Decommissioning Phases of the project are briefly summarised below, further detail is contained within the EIR.

2.1 CONSTRUCTION PHASE

- **Establishment of an access road to the site** – The PV site will be accessed along an existing road that connects to the N14. This road may require widening to ensure that it is suitable for use. At this stage it is proposed that the road will remain unsurfaced.
- **Establishment of internal access roads** – Internal access roads will be constructed onsite. These roads will be between 4m and 6m in width. The length of these roads will be determined once the design layouts have been finalised. Currently it is proposed that the internal access roads will be unsurfaced and will remain in use during the operational phase.
- **Site Preparation** – Site preparation includes the clearance of vegetation and any bulk earthworks that may be required.
- **Transport of components and equipment to site** – All construction material (i.e. PV support structure materials), machinery and equipment (i.e. graders, excavators, trucks, cement mixers etc.) will be transported to site utilising the national, regional and local road network. Large components (such as substation transformers) may be defined as abnormal loads in terms of the Road Traffic Act (No. 29 of 1989).
- **Establishment of a laydown area on site** – Construction materials, machinery and equipment will be kept at relevant laydown and/or storage areas. A 5ha laydown area has been proposed for this project. The laydown area will also be utilised for the assembly of the PV panels. The laydown area will limit potential environmental impacts associated with the construction phase by limiting the extent of the activities to one designated area.
- **Erection of PV Panels** – The PV panels will be arranged in arrays. The frames will be fixed onto vertical posts that will be driven into ground utilising the relevant foundation method identified during the geotechnical studies. The height of the structures will be between 4m and 6m.
- **Construction of substation and inverters** – The facility output voltage will be stepped up from medium voltage to high voltage in the transformer. The medium voltage cables will be run underground in the facility (except where a technical assessment suggest that overhead lines are applicable) to a common point before being fed to the onsite substation.
- **Establishment of ancillary infrastructure** – Ancillary infrastructure will include a workshop, storage areas, office and a temporary laydown area for contractor's equipment.
- **Water requirements** – The PV project will require water for dust suppression, concrete batching and potable water during the construction phase. Approximately 17m^3 per day will be required during the construction phase. It is understood that this water will be available from Sedibeng Water.
- **Undertake Site Rehabilitation** – The site will be rehabilitated once the construction phase is complete and all construction equipment and machinery have been removed from site.

2.2 OPERATIONAL PHASE

Enamandla PV 3 is anticipated to have a minimum life of 20 years. It will operate 7 days a week during daylight hours. While Enamandla PV 3 is considered to be self-sufficient, maintenance and monitoring activities will be required. It is estimated that 7m^3 per day of water supplied by Sedibeng Water will be required for the cleaning of panels, maintenance and for potable water for permanent staff.

2.3 DESOMMISSIONING PHASE

Following the initial 20 year operational period of Enamandla PV 3, its continued economic viability will be investigated. If it is still deemed viable its life may be extended; if not it will be decommissioned. If it is completely decommissioned, all the components will be disassembled,

reused and recycled or disposed of. The site will be returned to its current use i.e. agriculture (grazing).

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

This chapter describes the basic elements that have created and shaped the visual character and quality of the area and establishes the visual context against which visual impacts can be assessed.

3.1 STUDY AREA IN GENERAL

GEOLOGY, CLIMATE AND TOOGRAPHY

The area is very arid and hot with an average rainfall of 100mm per annum. Daytime summer temperatures can reach or exceed 40^{o}C and the dry winters are mild in the day and very cold at night (averaging below 0^{o}C).

The geology of the area is part of the Precambrian Namaqualand Metamorphic Complex, which is sub-divided into several (tectonically bound) terrains. The study area is situated in the Bushmanland Terrain which is a volcanic-sedimentary assemblage that has a complex history of deformation and metamorphosis (Joubert, 1996). It is composed of underlying basement granitic rock, supracrustal sequences of sedimentary and volcanic origin and intrusive charnokite (Cornel *et al*., 2006). In the Aggeneys-Gamsberg region various phases of deformation have lead to the formation of the flat expansive plains, with clusters of higher-lying koppies and mountains protruding from the plain. The ranges of hills, mountains and inselbergs in the area display some of the most diverse and complex geology in Southern Africa including some of the richest known concentrations of copper, lead and zinc.

The flatter portions of the area – including those where the proposed facility is located - are underlain by a range of unconsolidated superficial sediments of Late Cainozoic age. These include sands and gravels of probable fluvial or sheet wash origin that are locally overlain by unconsolidated aeolian (i.e. wind-blown) sands of the Quaternary Gordonia Formation (Kalahari Group) (John E. Almond, 2011).

The sedimentary rocks comprising the inselberg (to the north-east of the site) have been folded into a basin like structure, with the sedimentary horizons dipping into the basin. A hard quartzite horizon forms the resistant outer rim of the inselberg. The Northern Cape is dominated by such inselbergs, which represent the original Cretaceous land surface below.

The topography on the greater site (Hartebeest Vlei 86) is flat, gently sloping from about 920masl to 860masl in a north-easterly direction. On its north-eastern boundary the site is marked by a koppie on each side of the access road (Steneberg and Swartkop). The surrounding terrain is generally flat with the Aggeneys se Berge and the Gamsberg Inselberg to the north of the site rising to an elevation of about 1140masl. To the south of the site are flat expansive plains.

VEGETATION

The site is situated within the Nama-Karoo biome close to the transition to the Succulent Karoo Biome, which is the only arid region in the world to be internationally recognised as a ‘hotspot’ of botanical diversity. According to the National Vegetation Map (SANBI, 2012) the study area falls within the Bushmanland Arid Grassland vegetation type, classified as Least Threatened. It is an extensive vegetation type and occupies an area of 45 478 km^2, extending from the study area around Aggeneys in the east to Prieska in the west (Todd, 2016). In the vicinity are also the rare and unique Bushmanland Inselberg Shrubland and Aggeneys Gravel Vygieveld.

Visually, these plants comprise mostly low growing, fleshy-leafed succulents, small arid shrubs and tufted grasses in colours of muted olive greens, browns and greys (**Plate ii – v**). Although there is diversity, when viewed from a distance the vegetation is monotonous as plants tend to be small and indistinguishable from afar. Given the arid conditions and rocky shallow soil, vegetation cover is also sparse with rocks and open land between vegetation (**Plate iii**). The vegetation therefore provides little visual cover for structures. Occasional thorn trees (usually close to homesteads, roads or windmills) and Kokerboom trees dot the landscape, providing some height and visual interest (**Plate iv**).

Plate ii: Low growing tufted grasses

Plate iii: Muted greens and greys contrasting with the reddish soils

Plate iv: Occasional thorn tree

Plate v: Low growing, fleshy-leafed succulents

LAND USE

The predominant land use in the area is mining and stock farming (including cattle, sheep, game or goat farming), with a small percentage reserved for tourism and conservation. Since rainfall is low and water is scarce, crop farming accounts for only a very small portion of the land use in the greater area.

While the province has several National Parks and conservation areas including the Kgalagadi Transfrontier Park; there are no National Parks or conservation areas in close proximity to the proposed site.

Generally the farming activities in the area have a low impact on the natural visual environment, as farms are large and carrying capacity low. However, land degradation from over-grazing is evident in some areas. Prominent visual features resulting from farming activities typical of the region include windmills, powerlines, cattle kraals, fences and occasional clusters of shade trees (**Plate vi**).

Most infrastructure present in the greater study area stems from mining activities and is concentrated around the town of Aggeneys. Mining activities have an industrial visual character and larger scale and result in a more pronounced impact on the natural character of the landscape (**Plate vii**).

The proposed site is currently used for cattle farming and is zoned for agricultural use (**Plate viii**). The carrying capacity of the arid, grassy, shrubland is very low, with vegetation cover varying with rainfall.

It should also be noted that the area falls within the Springbok Wind REDZ and Northern EGI Corridor. These areas are targeted for renewable energy and electricity grid infrastructure development.

Plate vi: Agriculture: cattle farming

Plate vii: Mining: Black Mountain tailings dam

Plate viii: Agriculture: low carrying capacity, landscape dotted with occasional windmills

3.2 ENAMANDLA PV 3

Landscape character is the description of the pattern of the landscape, resulting from particular combinations of natural (physical and biological) and cultural (land use) factors, as discussed above. It focuses on the inherent nature of the land.

The site is situated in an area that is very arid and hot with very low average rainfall. This, together with the geology has resulted in expansive dry plains, with low growing, xerophytic plants interspersed with protruding rocky land forms.

These land forms provide dramatic, rugged focal points, emphasised by the flat, low nature of the plains and the high clear skies which serve as backdrops to the landscape. The colours of the land are soft greys and muted greens against rich reddish browns which contrast dramatically with the high blue skies, sometimes scattered with cloud. Occasional clusters of trees, the only taller vegetation in the region, dot the landscape and are visually conspicuous features in the landscape.

The land-use in the area does not significantly alter the natural visual character, although mining activities concentrated around Aggeneys have a more industrial character. The study area is remote and sparsely populated, with less than 1 person per km^2 (Statistics South Africa, 2012). Linear

patterns created by the long straight roads, powerlines and fences, with few dwellings or other man-made structures add to the sense of barrenness and isolation.

As noted above, this character is likely to change when proposed WEFs in the vicinity are constructed. The tall, clean lines of the turbines will create a more futuristic, modern character which may dominate the immediate visual landscape.

SENSITIVITIES

Visually there are no sensitive features or no-go areas on the site itself. In the surrounding area the following are considered to be visually sensitive:

- **Topographic Features**
  - Prominent ridgelines in the landscape are visually sensitive; these include Steneberg and Swartkop but they are excluded from the current footprint area.
  - Gamsberg inselberg, which lies to the north-east of the site, is a visually sensitive geological feature, which is prominent in the landscape. It is however well outside the current footprint area, and it is not located within the viewshed area.
- **Surrounding homesteads**
  - The area around the site is largely uninhabited; the only homesteads likely to be affected by the proposed development include Nombies, Struis-en-Bult, Brabees and Blomhoek.
- **Towns/urban areas**
  - The town of Aggeneys is situated approximately 15km from Enamandla PV 3and is unlikely to be affected by the PV facility.
  - The town of Pofadder is located approximately 50km from Enamandla PV 3 and will not be affected by the proposed development.
- **Roads**
  - The N14 national road is approximately 13,5km from Enamandla PV 3 and is not likely to be significantly affected by the PV facility.
  - Loop 10 Road and other farm roads are low traffic, gravel roads. Loop 10 Road is about 8,5km from the site at its closest point and the facility will be visible from portions of this road and from other farm roads in the area.

4. IDENTIFICATION OF IMPACTS (FINDINGS)

During the Scoping Phase of the EIA, the following potential impacts were identified.

4.1 CONSTRUCTION PHASE

1. **Construction equipment and dust:** construction vehicles, dust and equipment will have a visual impact on viewers and general visibility (clarity of the air) within close proximity to the site. The visual impacts during construction are over a limited time period and will be temporary.

2. **Clearing**: loss of vegetation during land clearing increases the visibility of contrasting soils, resulting in changes to the colour and texture of the site. Clearing vegetation will also result in increased windblown dust, reducing visibility of both day and night skies.

4.2 OPERATIONAL PHASE

1. **Intrusion on the sense of place and scenic landscape**: The remote and rural character of the area is typical of the Northern Cape Karoo. It is characterised by the flat topography with rugged koppies and hills, low vegetation and clear air. The strongly regular geometric patterns and reflective surfaces will differ from the current visual landscape and will have an impact on the current sense of place and scenic nature of the landscape.
2. **PV Panels**: Although PV panels have lower profiles and the lowest reflection potential (compared to troughs and heliostats) they can be reflective and usually appear as expansive black, blue, grey or silver/white surfaces in the landscape and contrast with the natural landscape's colour and texture.

3. **Substation, inverter housing and other buildings and infrastructure**: The proposed substation will have a maximum height of 35m-40m (higher than the PV panels) and, together with the O&M facilities, inverter boxes and security fencing may have visual impacts on inhabitants and motorists.

4. **Reflection and shimmer from facilities**: Unlike the solar reflectors for CSP technologies, PV panel surfaces are not designed to reflect light and so are significantly less reflective than the mirrored surfaces of the solar collectors for the other technologies. They therefore have reduced potential for glint and glare. However, the panels and other components do reflect some light that may impact inhabitants and motorists in close proximity to the site.

5. **Lighting**: Security and other lighting around and on support structures and buildings could contribute to light pollution. Maintenance activities conducted at night, such as mirror or panel washing, might require vehicle-mounted lights, which could also contribute to light pollution.

6. **Roads and /or road widening**: Access and on-site roads could also contribute to visual impacts during operations. In addition to vegetative clearing, roads may introduce long-term visual contrasts to the landscape colour and texture.

4.3 DE-COMMISSIONING PHASE

1. **Construction equipment and dust:** In terms of visual impact the decommissioning process is anticipated to be broadly similar to that of the construction phase, effects on visual receptors and landscape character during decommissioning are anticipated to be consistent with those assessed for the construction phase.

4.4 CUMULATIVE IMPACTS

Please see **Section 5.3**.

5. ASSESSMENT OF IMPACTS

5.1 MAGNITUDE OF THE VISUAL IMPACTS EVALUATED USING VISUAL CRITERIA

The following section outlines the evaluation that was done to inform the magnitude (or severity) of all of the identified visual impacts resulting from the proposed development activities. Various quantitative and qualitative factors were considered in the evaluation including; visual quality, visual absorption capacity, visibility, integrity with the existing landscape and sensitivity of viewers.

These criteria are explained and applied below and the visual criteria rating tables that were utilised in the study are included in **Annexure A**.

VISUAL QUALITY

Visual value is frequently addressed by reference to international, national, regional and local policy designations determined by statutory and planning agencies. Absence of such a designation, however, does not imply that the landscape lacks quality or value. People's perceptions and experiences of landscapes vary. In addition to responding to the visual qualities of landscapes, people also perceive landscapes through the senses of hearing, smell, touch and taste. Memory and association are also important. As such, value is difficult to quantify in absolute terms. Studies in perceptual psychology have shown that humans prefer landscapes with higher complexity and landscape quality can be said to increase when:

- Natural landscape increases and man-made landscape decreases;
- Well-preserved, compatible man-made structures are present;
- Diverse or vivid patterns of grasslands and trees occur;
- Water forms are present;
- Topographic ruggedness and relative relief increases; and
- Where land use compatibility increases (Crawford, 1994, Arriaza, 2004).

Greater aesthetic value is also attached to places where:

- Rare, distinguished or uncommon features are present;
- The landscape/townscape evokes particularly strong responses in community members or visitors;
- The landscape/townscape has existing, long-standing meaning or significance to a particular group; and
- Landmark quality features are present. (Ramsay, 1993).

The visual quality of the area is summarised in **Table 2** below.

Table 2: Visual Quality Enamandla PV 3

VISUAL CRITERIA	COMMENT	RATING
Visual Quality	• Appealing and evocative landscape, which is dramatically arid and striking in its expansive, remote nature. • Topographic ruggedness, provided by the inselbergs (particularly the Gamsberg), Aggeneys Mountains, Namies Mountains and other koppies. These increase the	High

	visual interest and appeal. • Few intrusive man-made features, although the area is ear-marked for wind energy and energy infrastructure development. • While no significant meaning can easily be ascribed, the landscape is distinguishable and evocative. • In some areas the landscape quality is compromised by mining activities and land degradation/erosion.	

VISUAL ABSORPTION CAPACITY

Visual absorption capacity (VAC) is the potential for an area to conceal additional human intervention (activities and structures) without significant loss of character or visual quality. Landscapes or townscapes that have a high VAC (i.e. are able to conceal activities and structures) are visually less sensitive than environments that have a low VAC (i.e. are unable to conceal activities and structures).

Factors contributing to the VAC include:

- Topography and vegetation that is able to provide screening in a landscape. A topographically diverse landscape is better able to absorb visual impacts and is less sensitive;
- The degree of urbanisation compared to open space / undeveloped land. A highly urbanised landscape is better able to absorb the visual impacts of similar developments; and
- The scale and density of surrounding development. A developed urban fabric that is dense or where buildings and structures are large is better able to offer visual screening.

The VAC of the landscape around the site is summarised in **Table 3** below.

Table 3: Visual Absorption Capacity Enamandla PV 3

VISUAL CRITERIA	COMMENT	RATING
Visual Absorption Capacity	• The topography is generally flat with large open dry plains which provide little screening. However, the Aggeneys Mountains, Namies Mountains and Gamsberg Inselberg provide good screening from the north and north-east. Koppies and undulations also provide effective screening from the R358 east of the site. • The low growing, sparse vegetation, provides little to no screening. • Large expansive, undeveloped space with little urban development or buildings to provide screening. • Within the towns, houses and other buildings provide effective screening from most viewpoints.	Medium-Low

VISIBILITY AND VISUAL EXPOSURE

Visibility is partially determined by the Zone of Visual Influence (ZVI) and viewshed area.

Zone of Visual Influence (ZVI)

The distance of a viewer from an object is an important determinant of the visibility, sometimes referred to as the visual exposure. This is due to the visual impact of an object diminishing/attenuating as the distance between the viewer and the object increases. The ZVI is the maximum extent around an object, beyond which the visual impact will be insignificant, primarily due to distance. This was determined and discussed in greater detail in the Scoping Phase (see Visual Scoping Report) and

was defined for the PV facility as a ***6km radius, with 10km being the outer limit of analysis***. This is further defined as follows:

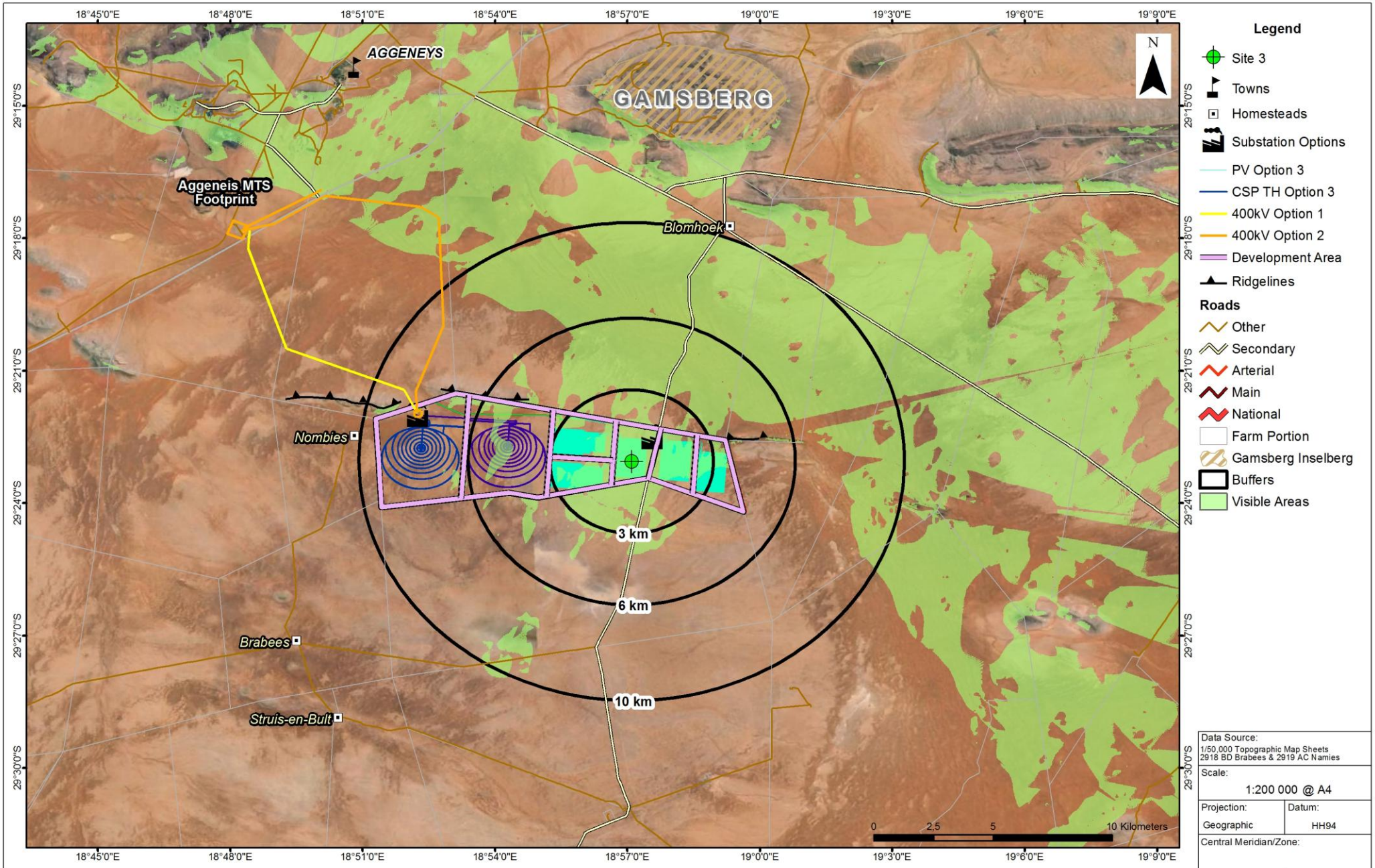
- less than 3km – solar facility and glare likely to be a prominent feature, dominating perception;
- between 3km and 6km – solar facility likely to dominate perception to some extent; and
- more than 6km – solar facility may be visible, but the nearest objects generally would dominate perception.

The Viewshed

The viewshed is the topographically defined area, including all the major observation sites, from which proposed structures/activities may be visible. The boundary of the viewshed connects high points in the landscape and demarcates an area of potential visibility. The viewshed calculations are based on worst-case scenario using 360^{o} line-of-sight calculations on a Digital Elevation Model (at 20m contour intervals). The height of existing buildings, trees and small undulations in the surrounding area are not included in the calculation of the viewshed. *It is therefore important to remember that the proposed development will not be visible from all points within the viewshed*, as views may be obstructed by visual elements such as built structures, minor local variations in topography and vegetation. For this reason it is often referred to as the 'zone of theoretical visibility'.

The viewshed for Enamandla PV 3 (**Figure 3**) indicates the area from which the facility (at 6 m high) is potentially visible; it is calculated within a 10km radius, but visibility beyond **10km** will be marginal (see ZVI). As can be seen from the figure:

- Almost the entire area within the 3km radius falls within the viewshed area.
- Beyond 3km, the viewshed area lies predominantly to the north-east with some visibility directly to the south and south-east of the site
- A stretch of approximately 10km along the N14 close to Aggeneys is included in the viewshed area and a stretch of approximately 35km of Loop 10 Road, but both are situated outside the 10km radius.
- The town of Aggeneys is largely excluded from the viewshed, except for a portion of the access road.
- Although elevated the Gamsberg Inselberg is excluded from the viewshed area.

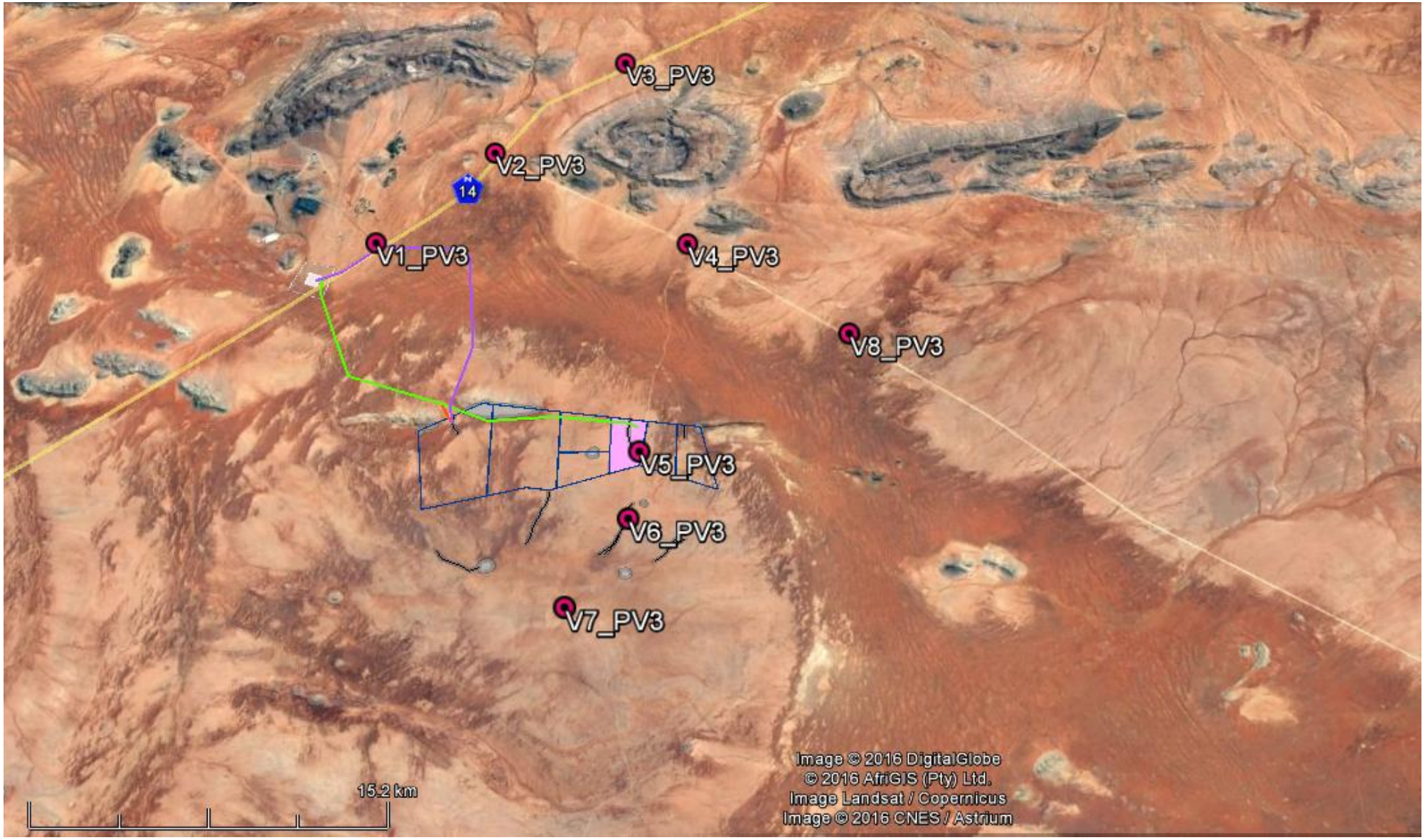


Data Source:	1/50,000 Topographic Map Sheets 2918 BD Brabees & 2919 AC Namies
Scale:	1:200 000 @ A4
Projection:	Geographic
Datum:	HH94
Central Meridian/Zone:	
Date:	10/11/2016
Compiled by:	GOES
Revision: A Date: 10 11 2016	Fig No: 3

BIOTHERM SOLAR ENERGY

ENAMANDLA PV SITE 3 VIEWSHED

Path: C:\Users\Mildred\Documents\Projects\Belinda_Gebhardt\MXDs\Enamandla_Viewsheds_Site3.mxd



BIOTHERM ENERGY

Location of Viewpoints for Enamandla PV 3

Date: Nov 2016	Complied by: GEBH
Revision: 1	Fig No: 4

Visibility from Viewpoints

The potential visibility of the proposed project was further gauged by photographs, taken from over 50 viewpoints. From these photographs 8 viewpoints were included in the report. These are indicated on **Figure 4**, represented in the accompanying photographs (**Plates ix - xvi**) and discussed in the **Table 4** below[1].

Table 4: Visibility from Viewpoints for Enamandla PV 3

VIEWPOINT	WAYPOINT REFERENCE	LOCATION DESCRIPTION	DIRECTION	APPROXIMATE DISTANCE FROM SITE	VISIBILITY
VP 1	P11	N14	S	9,8km	Visible
VP 2	P15	N14 at Loop 10 Road T-junction	SSE	13,,5km	Visible
VP 3	P77	N14	SSW	19,2km	Not Visible
VP 4	PGC	Turn off from Loop 10 Road	SSW	9,2km	Visible
VP 5	P26	At farm access road opposite the site	W	1,5km	Highly visible
VP 6	P28	Farm access road south of site	NW	3,9km	Highly visible
VP 7	P36	Near Bra-Bees	N	7,3km	Highly visible
VP 8	P64	Loop 10 Road	W	17km	Marginally visible

Plate ix: Viewpoint 1

[1] Arrows indicate approximate location of site in landscape.

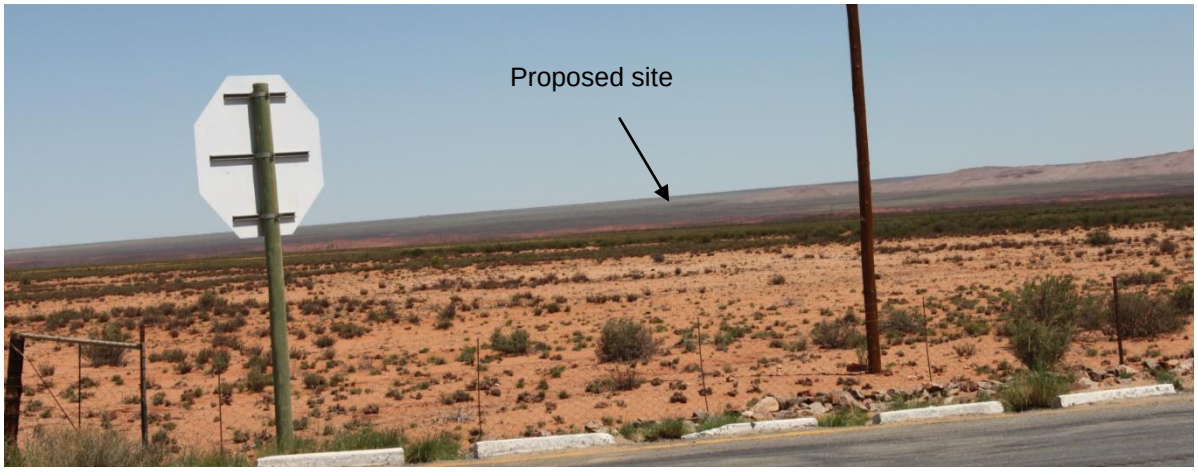


Plate x: Viewpoint 2

Plate xi: Viewpoint 3 (not visible beyond landforms)

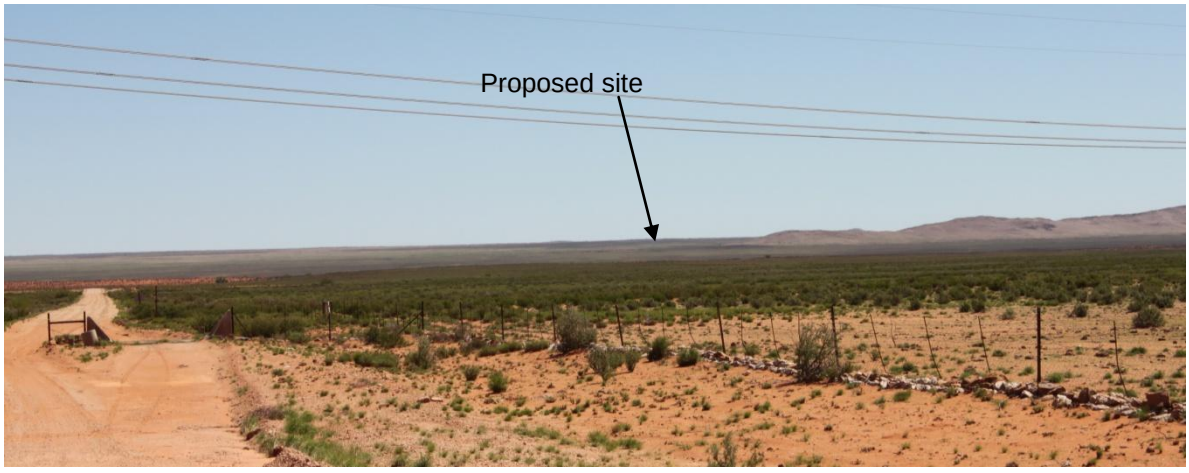


Plate xii: Viewpoint 4

Plate xiii: Viewpoint 5

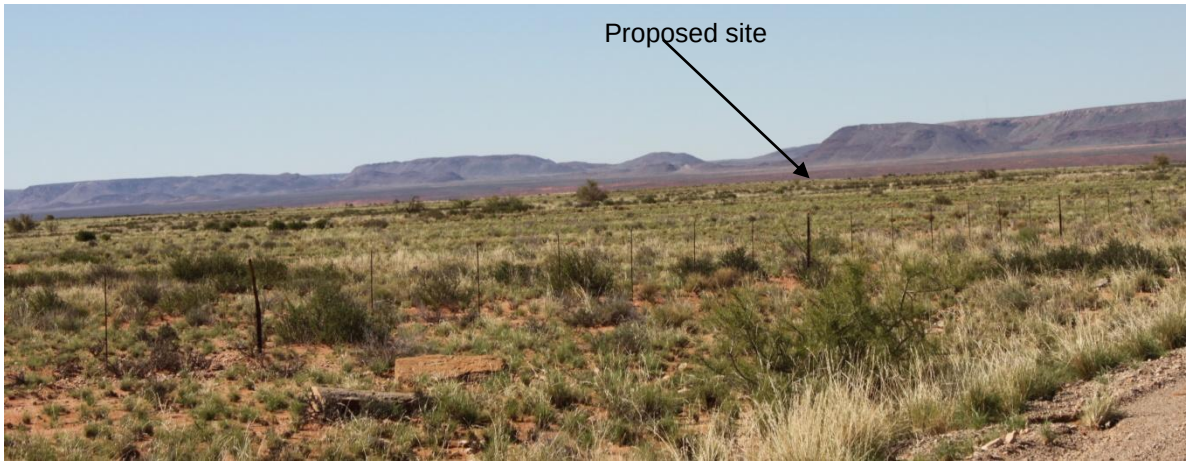


Plate xiv: Viewpoint 6

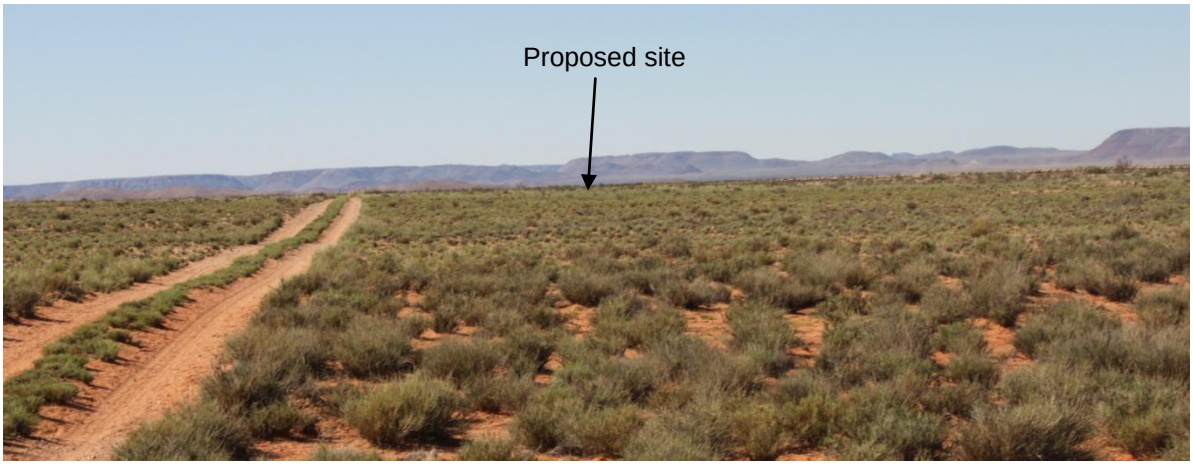


Plate xv: Viewpoint 7

Plate xvi: Viewpoint 8 (site not visible, facility may be marginally visible between the koppies to the left of image)

VISUAL INTRUSION (INTEGRITY)

The previous section considers how visible the proposed activities will be in the landscape. This should be considered together with what effect this visibility will have on the existing visual character/landscape. This is referred to as the level of visual intrusion (or visual integrity). Thus landscape (or visual) intrusion refers to the compatibility of the proposed activities with the existing landscape and/or townscape.

Factors which influence visual intrusion include:

- Consistency of type of development with the existing land use of the area;
- Sensitivity of facility design to the natural environment;
- The extent to which the texture (density) and layout of the proposed design is congruent with the current built environment;
- Congruency of proposed buildings with other buildings and architectural styles, if relevant; and
- The scale and size of the activities in comparison to nearby existing activities.

The visual intrusion or integrity is summarised in **Table 5** below.

Table 5: Visual Intrusion for Enamandla PV 3

VISUAL CRITERIA	COMMENT	RATING
Visual Intrusion	• The proposed solar facility differs in scale, size and function to the existing rural character of the landscape but is moderately consistent with mining and other power related facilities in the area. • The texture and strong geometric patterns of the facility are markedly different to the existing open spaces of the landscape. • The area is earmarked as an energy development zone, and the proposed facility is visually consistent with this land-use.	Medium

VIEWER SENSITIVITY

Visual receptors are important insofar as they inform visual sensitivity. They can include human viewers or valued viewpoints. The level of visual impact considered acceptable is dependent to some degree on the sensitivity of the visual receptors.

Table 6 below indicates the categories of viewer sensitivity as identified in the DEA&DP Guidelines of 2005.

Table 6: General categories of sensitivity for visual receptors (DEA&DP, 2005):

HIGH	MODERATE	LOW
• Residential areas • Nature reserves • Scenic routes / trails	• Sporting and recreational areas • Places of work	• Industrial areas • Active mining areas • Visually severely degraded areas

Various groups of viewers have been identified for the proposed solar development and their sensitivity is summarised in **Table 7** below.

Table 7: Viewer Sensitivity for Enamandla PV 3

VISUAL RECEPTOR	COMMENT	RATING
Motorists on N14	• These are considered moderately sensitive viewers, but the facility is only likely to be visible from a very short stretch of the N14, with screening provided by the Gamsberg Mountains and various koppies.	Medium
Motorists on Loop 10 Road and other farm roads	• Although stretches of Loop 10 Road are within the viewshed area, traffic levels are very low, with very few visitors/ tourists.	Low
Town of Aggeneys	• The town of Aggeneys is a small mining town, with a population of approximately 2 053. It falls outside of the viewshed area	Very Low
Motorists on R358	• Very few motorists and facility will not be close enough to be visible.	Very Low
Farmsteads	• Given the low density in the area, few homesteads will be affected by the proposed facility but inhabitants generally have a great affinity for the land and landscape. Most affected will be Nombies, Brabees, Struis-en-Bult and Blomhoek.	Medium

5.2 ASSESSMENT OF THE SIGNIFICANCE OF THE VISUAL IMPACTS

Based on the assessment in the section above, the visual impacts for each phase of the proposed project are assessed in the section below (see **Table 8, Table 9 and Table 10**). A detailed explanation of the impact rating methodology is provided in **Annexure B.**

Table 8: Impact Rating for Enamandla PV 3: Construction Phase

Construction Phase									
Enamandla PV 3 (Alternative 1 and 2)									
Potential Impact		**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
Visual impact during construction due to dust, vehicles and equipment	**Nature of impact:**	direct							
	Without Mitigation	2	2	6	4	**40**	**Medium**	-	medium-high
	degree to which impact can be reversed:	The visual impact can be completely reversed if vehicles, equipment, rubble and any other construction materials are removed after construction.							
	degree of impact on irreplaceable resources:	Dust and equipment are not likely to impact on any irreplaceable visual resources.							
	Mitigation Measures	See Section 6							
	With Mitigation	2	2	4	3	**24**	**Low**	-	medium-high
Visual impact during construction due to vegetation clearing	**Nature of impact:**	direct							
	Without Mitigation	2	2	4	4	**32**	**Medium**	-	medium-high
	degree to which impact can be	The visual impact can be completely reversed after closure of facility, if vegetation is rehabilitated.							

	reversed:								
	degree of impact on irreplaceable resources:	Vegetation is classified as Least Threatened, and from a visual perspective can be re-established. The value of vegetation loss is considered in the ecological report.							
	Mitigation Measures	See Section 6							
	With Mitigation	2	2	2	4	**24**	**Low**	-	medium-high

Enamandla PV 3- No-Go

Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
No visual impacts are associated with the no-go alternative	**Nature of impact:**	no impact							
	Without Mitigation								
	degree to which impact can be reversed:	n/a							
	degree of impact on irreplaceable resources:	n/a							
	Mitigation Measures	n/a							
	With Mitigation								

Table 9: Impact Rating for Enamandla PV 3: Operational Phase

Operational Phase									
Enamandla PV 3 (Alternative 1 and 2)*									
Potential Impact		**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
Intrusion on sense of place and rural landscape	**Nature of impact:**	direct							
	Without Mitigation	2	4	4	4	**40**	**Medium**	-	medium-high
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if structures and buildings removed and vegetation rehabilitated.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if landforms remain unaffected as proposed.							
	Mitigation Measures	See Section 6							
	With Mitigation	2	4	2	4	**32**	**Medium**	-	medium-high
Visual impact of PV panels	**Nature of impact:**	direct							
	Without Mitigation	2	4	4	4	**40**	**Medium**	-	medium-high
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if tower removed.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if landforms remain unaffected as proposed.							

	Mitigation Measures	See Section 6							
	With Mitigation	2	4	2	4	**32**	**Medium**	-	medium-high
Visual impact of substation, inverters and other buildings and infrastructure	**Nature of impact:**	direct							
	Without Mitigation	2	4	6	4	**48**	**Medium**	-	medium-high
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if structures and buildings removed.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if landforms remain unaffected as proposed.							
	Mitigation Measures	See Section 6							
	With Mitigation	2	4	4	4	**40**	**Medium**	-	medium-high
Visual impact of reflection from facility	**Nature of impact:**	direct							
	Without Mitigation	3	4	4	3	**33**	**Medium**	-	medium
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if removed.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource.							
	Mitigation Measures	See Section 6							

	With Mitigation	3	4	2	3	**27**	**Low**	-	medium
Visual impact of lighting from facility	**Nature of impact:**	direct							
	Without Mitigation	2	4	4	3	**30**	**Low**	-	medium
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if lighting removed.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource.							
	Mitigation Measures	See Section 6							
	With Mitigation	2	4	2	3	**24**	**Low**	-	medium
Visual impact of additional roads and road widening	**Nature of impact:**	direct							
	Without Mitigation	2	4	4	3	**30**	**Low**	-	medium-high
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, but visible roads may remain.							
	Mitigation Measures	See Section 6							
	With Mitigation	2	4	2	3	**24**	**Low**	-	medium-high

Enamandla PV 3 - No-Go									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
No visual impacts are associated with the no-go alternative	**Nature of impact:**	no impact							
	Without Mitigation								
	degree to which impact can be reversed:	n/a							
	degree of impact on irreplaceable resources:	n/a							
	Mitigation Measures	n/a							
	With Mitigation								

* Alternative 2 is preferable as it is considerably smaller in size. However, the difference in visibility, particularly if all the sites are developed, is not significant enough to alter impact ratings.

Table 10: Impact Rating for Enamandla PV 3: Decommissioning Phase

Decommissioning Phase								
Enamandla PV 3 (Alternative 1 and 2)								
Potential Impact		**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**	**Status (+ve or -ve)**	**Confidence**
Visual impact	**Nature of impact:**	direct						

during decommissioning due to dust, vehicles and equipment	**Without Mitigation**	2	2	6	4	**40**	**Medium**	-	medium-low
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if structures and buildings removed and vegetation rehabilitated.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if landforms remain unaffected as proposed.							
	Mitigation Measures	See Section 6							
	With Mitigation	2	2	4	3	**24**	**Low**	-	medium-low
Enamandla PV 3 - No-Go									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
No visual impacts are associated with the no-go alternative	**Nature of impact:**	no impact							
	Without Mitigation								
	degree to which impact can be reversed:	n/a							
	degree of impact on irreplaceable resources:	n/a							
	Mitigation Measures	n/a							

	With Mitigation								

5.3 CUMULATIVE IMPACTS

Cumulative effects, relate to alterations to the perception of character arising from the visibility of the proposed development in conjunction with other solar and wind farms within the study area. Such cumulative effects would be expected to arise during the latter stages of the construction phase and throughout the operational phase.

The assessment considers two types of cumulative visual effects, namely effects arising from combined and sequential views. These comprise:

- combined views which "occur where the observer is able to see two or more developments from one viewpoint. Combined visibility may either be in combination (where several facilities are within the observer's arc of vision at the same time) or in succession (where the observer has to turn to see the various facilities)"

- sequential views which "occur when the observer has to move to another viewpoint to see different developments" (Vissering, 2011).

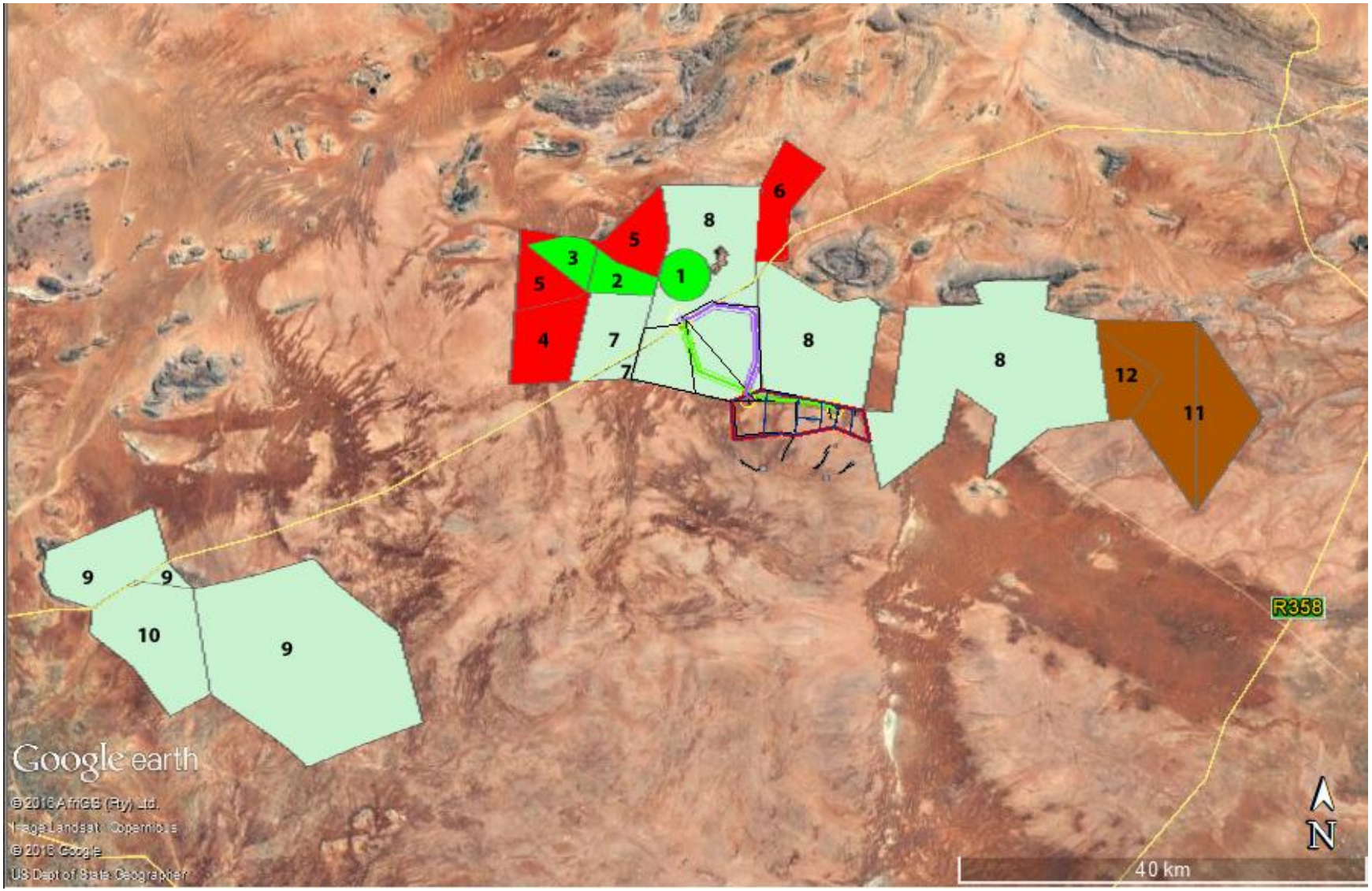
There are a number of Environmental Authorisations (EAs) (either issued or in progress) within a 70km radius of the proposed project site. These EAs are illustrated in **Figure 5** and detailed in **Table 11.** The site is located within the Springbok Wind REDZ and is therefore considered to be located within the renewable energy hub that is intended for the Aggeneys area.

Table 11: Other Proposed Renewable Energy Projects in the Area (WSP, 2016)

DEA REFERENCE NUMBER	EIA PROCESS	PROJECT TITLE	EAP	TECHNOLOGY	MEGA WATT	PROJECT STATUS
14/12/16/3/3/2/346/AM1	Amendment	Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the Construction of the Wind and PV Substations and Gridline Connections.	Aurecon South Africa (Pty) Ltd	Onshore Wind and Solar PV	75	In process
14/12/16/3/3/2/447	S&EIR	Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the Construction of the Wind and PV Substations and Gridline Connections.	Aurecon South Africa (Pty) Ltd	Onshore Wind and Solar PV	1000	In process
12/12/20/2334/7	S&EIR	Proposed Sato Energy Holdings Photovoltaic Project	SRK Consulting (Pty) Ltd	Solar PV	75	Withdrawn /Lapsed
12/12/20/2602	S&EIR	The Proposed Boesmanland Solar Farm Portion 6 (A Portion Of Portion 2), Farm 62 Zuurwater	SRK Consulting (Pty) Ltd	Solar PV	75	Approved
12/12/20/2334/6	S&EIR	Proposed Sato Energy Holdings Photovoltaic Project.	SRK Consulting (Pty) Ltd	Solar PV	75	Withdrawn /Lapsed
14/12/16/3/3/2/473	S&EIR	75MW PV plant on the Farm Zuurwater No 62, Phase 4.	SRK Consulting (Pty) Ltd	Solar PV	75	In process
14/12/16/3/3/2/222	S&EIR	Proposed Boesmanland Solar Farm Portion 6 (A portion of portion 2) Farm 62 Zuurwater.	SRK Consulting (Pty) Ltd	Solar PV	75	Approved

12/12/20/2334/7	S&EIR	Proposed Sato Energy Holdings Photovoltaic Project.	SRK Consulting (Pty) Ltd	Solar PV	75	Withdrawn /Lapsed
14/12/16/3/3/2/550	S&EIR	Proposed Wind Energy Facility and Associated Infrastructure on Namies Wind Farm Pty Ltd.	Savannah Environmental Consultants (Pty) Ltd	Onshore Wind	220	In process
12/12/20/2151	BAR	The Proposed Construction of a Photovoltaic Power Generation Facility within the Black Mountain Mining Area.	SRK Consulting (Pty) Ltd	Solar PV	19	Approved
12/12/20/2605	BAR	Proposed Gamsberg Solar Energy Project on Portion 1 of Farm 57 Aroams.	Savannah Environmental Consultants (Pty) Ltd	Solar PV	unknown	Withdrawn /Lapsed
14/12/16/3/3/2/683	S&EIR	Proposed 75MW Korana Wind Energy Facility.	Savannah Environmental Consultants (Pty) Ltd	Onshore Wind	unknown	unknown
14/12/16/3/3/2/680	S&EIR	Proposed 140MW Khâi-Mai Wind Energy Facility.	Savannah Environmental Consultants (Pty) Ltd	Onshore Wind	unknown	unknown
12/12/20/2630[2]	S&EIR	Orlight SA Photovoltaic Solar Power Plant on portion 1 of the farm Aroams 57	Digby Wells Environmental	Solar PV	70	Approved

[2] This project is not indicated on the map.



Legend

- Unknown
- Approved
- Withdrawn/lapsed
- In process

ID	DEA NUMBER
1	12/12/20/2151
2	14/12/16/313/2/222
3	12/12/20/2602
4	12/12/20/2334/6
5	12/12/20/2334/7
6	12/12/20/2605
7	14/12/16/3/3/2/473
8	14/12/16/3/3/2/550
9	14/12/16/3/3/2/346/AM1
10	14/12/16/3/3/2/447
11	14/12/16/3/3/2/680
12	14/12/16/3/3/2/683

BIOTHERM ENERGY

Other Proposed Energy Projects in Area

Date: Dec 2016	Complied by: GEBH
Revision: 1	Fig No: 5

A summary of the status, extent, capacity and visual impact rating for each of these projects is summarised in **Table 12** below. An estimation of the total area is then ascribed to each significance rating. Please note that as stated in the limitations above, the ratings have been simplified, as rating methodologies and scoring methods differ from project to project. Where we were unable to source information this has been stated in the table. The table was compiled by WSP.

Table 12: Summary of Visual Impacts of Projects within a 70km Radius (WSP, 2016)

Proposed Development Name	DEA Reference	Current EA Status	Extent	Proposed Capacity	Impacts																	
					Construction						Operation					Decommissioning						
					Overall	Power line	Vehicle movement	Construction yard	Wind turbines	Lights at night	Overall	Power line	Vehicle movement	Wind turbines	Lights at night	Overall	Power line	Vehicle movement	Construction yard	Wind turbines	Lights at night	
Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the Construction of the Wind and PV Substations and Gridline Connections, near Springbok, within the Nama-Khoi Local Municipality, Northern Cape Province.	14/12/16/3/3/2/346/AM1	In Process	46 535	75	L						M											
Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the Construction of the Wind and PV Substations and Gridline Connections, Near Springbok, within the Nama-Khoi Local Municipality, Northern Cape Province.	14/12/16/3/3/2/447	In Process	46 535	1000	L						M											
The Proposed Boesmanland Solar Farm Portion 6 (A Portion Of Portion 2), Farm 62 Zuurwater, Aggeneys, Northern	12/12/20/2602	Approved	200	75	Could not be sourced																	

Proposed Development Name	DEA Reference	Current EA Status	Extent	Proposed Capacity	Impacts																	
Cape Province.																						
75MW PV plant on the Farm Zuurwater No 62 in the Namakwa District, Northern Cape Province, Phase 4.	14/12/16/3/3/2/473	In Process	222	75	L	L					M	M				L	L					
Proposed Boesmanland Solar Farm Portion 6 (A portion of portion 2) Farm 62 Zuurwater, Aggeneys, Northern Cape.	14/12/16/3/3/2/222	Approved	200	75	Could not be sourced																	
Proposed Wind Energy Facility and Associated Infrastructure on Namies Wind Farm Pty Ltd, near Aggeneys, Northern Cape Province.	14/12/16/3/3/2/550	In Process	15	220		L	L	L	H	M		L	L	H	M		L	L	L	L	L	
The Proposed Construction of a Photovoltaic Power Generation Facility within the Black Mountain Mining Area near Aggeneys in the Northern Cape Province.	12/12/20/2151	Approved	19.5	19	Could not be sourced																	
Proposed 75MW Korana Wind Energy Facility, near Poffader in the Northern Cape.	14/12/16/3/3/2/683	Unknown	3257 (all facilities)	Unknown		M	L		L	L	M	L		L	L	M	L			L	L	
Proposed 140MW Khâi-Mai Wind Energy Facility near Pofadder.	14/12/16/3/3/2/680	Unknown	3257 (all facilities)	Unknown		M				L	M				L	M					L	
Orlight SA Photovoltaic Solar Power Plant on portion 1 of the farm Aroams 57	12/12/20/2630	Approved	116	70	L						M					L						
			Total	**Total**																		
			50364.5	1608 MW																		

SIGNIFICANCE TOTALS PER IMPACT	SIGNIFICANCE RATING				**TOTAL HECTARES PER IMPACT**																	
	High Significance								15					15								
	Medium Significance					3257				15	50014	222			15	3257						
	Low Significance				46757	237	3272	15	3257	3257		3272	15	3257	3257	222	3494	15	15	3272	3272	
	Positive Impacts																					

The following EAs (as listed in **Table 13**) surrounding the solar developments have either been withdrawn or have lapsed and are therefore not been considered as part of the cumulative impact assessment:

Table 13: Lapsed or Withdrawn Projects not considered in Cumulative Assessment

PROPOSED DEVELOPMENT NAME	DEA REFERENCE	CURRENT EA STATUS	PROPOSED CAPACITY
Proposed Sato Energy Holdings Photovoltaic Project, Khai Ma Local Municipality, Northern Cape.	12/12/20/2334/7	Withdrawn / Lapsed	75
Proposed Sato Energy Holdings Photovoltaic Project, Khai Ma Local Municipality, Northern Cape.	12/12/20/2334/6	Withdrawn / Lapsed	75
Proposed Sato Energy Holdings Photovoltaic Project, Khai Ma Local municipality, Northern Cape.	12/12/20/2334/7	Withdrawn / Lapsed	75
Proposed Gamsberg Solar Energy Project on Portion 1 of Farm 57 Aroams near Upington, Khâi-Ma Municipality, Northern Cape.	12/12/20/2605	Withdrawn / Lapsed	Unknown

It is not possible to accurately estimate the significance of the cumulative impacts as not all facilities granted environmental approval will be constructed. Without knowing which combination of the 16 applications (10 listed above and 6 other potential BioTherm projects) will be built, there are 65 535 possible scenarios. However, what should be taken into consideration by the decision making authorities regarding cumulative visual impact is noted below:

- The total area affected by all 10 projects considered above is 50364.5 ha. If all the BioTherm Letsoai and Enamandla projects are approved that will result in a total area of 54 639.5 ha.
- A high concentration of solar and wind energy developments will have a greater impact on the visual landscape and will alter the visual character to a greater degree.
- If constructed, Namies Wind, Zuurwater PV, Boesmanland PV, Orlight PV and Springbok Solar and Wind facilities are likely to be sequentially visible from the N14, along this stretch of the road. The BioTherm Letsoai and Enamandla projects may contribute to this impact, but are unlikely to be highly visible from the N14, particularly if Namies is constructed, as they lie inland from the N14, behind the Namies Wind facility site.
- If constructed, Namies Wind, Korona Wind and Poortjies Wind facilities together with the BioTherm facilities are likely to be sequentially visible from the Loop 10 Road. Again the Biotherm projects are sited further away from the road than the other sites and are likely to be obscured from view by the other wind farms (assuming they are all constructed).
- Projects within a 6km radius of Enamandla PV 3 may have a combined visual impact from some viewpoints, these include both Letsoai CSP Sites, the 4 other Enamandla Projects and a three of the Namies Wind Facility sites.
- The impact of Enamandla PV 3 on the landscape is rated as medium impact in this VIA and it is reasonable to assume that the cumulative impact of any combination of the above projects will have a higher impact on the landscape. However, the BioTherm sites are *least likely* to contribute to the cumulative impact from the main roads and viewpoints.
- There are not many mitigation measures that can significantly reduce the cumulative visual impact, but screening along the N14 is possible and the consistent implementation of

mitigation measures across all projects can help to reduce visual impact to some extent. Additionally koppies and mountains in the area will partially obscure developments from some viewpoints along the N14. Mitigation measures are discussed in Chapter 6 below.

- In considering the bigger picture, having energy projects concentrated in indentified areas or zones can be preferable, but opinion regarding this differs and some literature indicates that from a visual perspective greater distance between projects is less visually intrusive.
- If the planning and environmental authorities have decided and approved the REDZ as a guiding tool/strategy, it follows that there will be higher cumulative visual impact within these zones. The other alternative is to ensure developments are specified distances away from any other development, which would result in lower cumulative visual impact but smaller visual impacts scattered across a greater area. Guidelines specific to this are not yet available and given the high number of approved applications that are never constructed, this could put potential renewable energy providers at a significant and unnecessary disadvantage. Guidelines and timeframes will therefore need to be carefully considered.

6. MITIGATION AND MANAGEMENT MEASURES

The visual impacts of the solar facility are difficult to mitigate in a flat, dry environment. The biggest visual mitigation is natural mitigation provided by the surrounding mountains and koppies. On a smaller scale there are some measures that can be implemented, particularly in the design and construction phase, to ensure the visual impacts are reduced as far as possible. These are listed in **Table 14** below.

Table 14: Mitigation and Management Measures for Enamandla PV 3:

ACTIVITY	MITIGATION AND MANAGEMENT MEASURE	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE	INCLUDE AS CONDITION OF AUTHORISATION	MONITORING REQUIREMENTS
Detailed design and specification	1. Design structures and buildings close together in clusters as far as possible. 2. Cables and pipelines should be located underground wherever possible. 3. When specifying lighting: • Use light fixtures that provide precisely directed illumination; • If possible, use lighting that is activated only on movement of illegal entry to the site; • Avoid high pole top security lighting if possible; 4. Specify wire mesh or Clear-Vu type fencing for perimeter fencing. 5. Signage related to the project must be discreet and confined to the entrances. 6. The colour of the structures, such as the supports and the rear of the panels, should be carefully selected, and be in the dark grey or green range, to minimise visibility and avoid reflectivity.	Design Team/ECO	Planning and Design	1. Yes 2. Yes 3. Yes 4. Yes 5. Yes 6. No a recommendation not a condition (there may be limitations in stock and choice - often colour treated structures have to be customised.)	Specifications to be incorporated by Design Team and verified by the ECO prior to construction.
Site clearing	1. The construction footprint must be kept as small as possible, to avoid unnecessary disruption to the existing vegetation. 2. No blanket clearing or removal of vegetation	Site Manager and ECO	Construction	1. Yes 2. Yes	To be specified in the EMPr

ACTIVITY	MITIGATION AND MANAGEMENT MEASURE	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE	INCLUDE AS CONDITION OF AUTHORISATION	MONITORING REQUIREMENTS
	outside of the building zone is allowed.				
Excavation and construction of facility	1. Site perimeter (building zone) must be clearly demarcated. 2. The handling and transportation of materials which may generate dust must be avoided during high wind conditions. 3. Ground level at site boundary should remain natural ground level. 4. The building site and construction facilities must be well maintained and strictly controlled. 5. Dust and litter control measures must be included in the Environmental Management Programme (EMPr) 6. No dumping in unauthorised and/or highly visible areas is permitted.	Site Manager and ECO	Construction	1. Yes 2. Yes 3. Yes 4. Yes 5. Yes 6. Yes	To be specified in the EMPr
Operations	1. Natural vegetation must be re-established on disturbed areas after construction; 2. Roads and drainage for runoff should be appropriately stabilised to avoid erosion and visual scars. 3. Ensure all colour treated surfaces are well maintained.	ECO	Operational	1. Yes 2. Yes 3. Yes	To be specified in the EMPr
Rehabilitation	1. A detailed rehabilitation plan must be prepared. 2. An ecologist must be appointed to assist with the plant selection and methods for vegetative rehabilitation. 3. Mitigation measures applicable to the construction phase are also applicable to decommissioning.	ECO	Decommissioning	1. Yes 2. Yes	To be specified in the Decommissioning and Rehabilitation Plan

7. STAKEHOLDER CONSULTATION

7.1. STAKEHOLDER CONSULTATION PROCESS

A detailed description of the public participation process is contained in Comments and Responses Document for Enamandla PV 3 (WSP, 2016). The objectives of the public participation process included:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the Proposed Project;
- Clearly outline the scope of the Proposed Project, including the scale and nature of the existing and proposed activities;
- Identify viable Proposed Project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the subsequent specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the Proposed Project, issues and solutions.

A list of notices send to registered stakeholders and a complete set of comments received to date are included in the Comments and Responses Document (WSP, 2016). A summary of the issues raised pertaining to visual concerns and impacts is summarised in Table 15 below.

7.2. STAKEHOLDER COMMENTS AND RESPONSE

Table 15: Stakeholder Comments

STAKEHOLDER DETAILS	COMMENT	SPECIALIST RESPONSE
Department of Environmental Affairs: Ms Nonhlahla Mkhwanazi	Scoping specialist studies, if applicable, must be submitted to the Department with the final SR.	A Visual Scoping Report was submitted with the final SR by WSP.
Department of Environmental Affairs: Ms Nonhlahla Mkhwanazi	The specialist studies conducted must be specific to each of the sites applied for. The specialist must provide recommendations and mitigation measures specific to each site and the EAP must provide mitigation measures; an assessment and recommendations for each site as well as the cumulative impacts for each of the facilities.	A Visual Impact Assessment has been completed for each site. Mitigation measures are proposed in Chaper 6 of the report. Cumulative impacts are assessed in Chapter 5.
Department of Environmental Affairs: Ms Nonhlahla Mkhwanazi	Should there be similar applications in the area, all the specialist assessments must include a cumulative environmental impact assessment for all identified and assessed impacts. The cumulative impact assessment must indicate the following: - Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land. - Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the	From a visual perspective it is difficult to provide an accurate cumulative impact environmental statement as it is not possible to assume which projects will be developed and which not. Many applications receiving approval do not get built. Of the 16 potential projects considered in the cumulative assessment, there are 65 535 possible scenarios or different combinations of projects that could be built. However, an overview of the cumulative impact and assessment is included in Chapter 5 of the VIA, with key factors relevant to decision making authorities highlighted.

STAKEHOLDER DETAILS	COMMENT	SPECIALIST RESPONSE
	conclusion and mitigation measures were drafted for this project. - The cumulative impacts significance rating must also inform the need and desirability of the proposed development. - A cumulative impact environmental statement on whether the proposed development must proceed.	
South African Heritage Resources Agency: Natasha Higgitt	SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit accepts and promotes the recommendations of the AIA and PIA. No further Palaeontological Specialist studies are required for the proposed development. The pending HIA must take the following aspects (but not limited to) into consideration when assessing impacts: • Archaeological and Historical heritage resources; • Burial grounds and graves; • ***Visual Impact of the proposed development on heritage resources; and*** • Any comments provided by the public regarding heritage resources. The EIA with all appendices must be submitted along with the heritage reports in order for further comments to be issued.	Visual impacts on heritage resources (namely landscape value) is considered and assessed in this report.
Department of Environmental Affairs: Nonhlahla Mkhwanazi	The final SR must provide evidence that all identified and relevant competent authorities have been given an opportunity to comment on the proposed development; particularly the Square Kilometre Array South Africa, and the South African Astronomical Observatory	Proof of correspondence with stakeholders has been included in the comment and response report. The project database included the Square Kilometre Array from the inception of the project. The database has been updated to include the South African Astronomical Observatory.

8. CONCLUSION

The following findings and recommendations are pertinent:

- The proposed facility is situated in a remote, arid landscape of relatively high visual value. The visual absorption capacity is moderately good primarily due to the mountains and koppies.

- The area is remote and viewer numbers are low but inhabitants generally have a great affinity for the land and landscape.

- The geometric patterns and refection from the PV panels and the other installations are of a scale and size that is not highly congruent with the natural environment and agricultural activities, but slightly more congruent with mining and existing power facilities in the area.

- The viewshed is limited primarily to a 3km radius, extending beyond this to the north-east. Portions of the N14 and Loop 10 Road which fall within the viewshed are more than 9km away, beyond the 6km ZVI radius.

- Other buildings and infrastructure associated with the facility will result in a number of lesser visual impacts and can be mitigated.

- The greatest visual concern is the cumulative impact on the landscape. If REDZ and ECI are established, containing the visual impacts within these zones has merit, but will increase the cumulative visual impact on the landscape within these zones. If the 16 potential projects within a 70 km radius of the site are considered, there are 65 535 possible scenarios or combinations of renewable energy projects that may be built. It is therefore not possible to accurately estimate the significance of the cumulative impact.

- However given the height of the proposed panels and the location of the Enamandla sites, they are not likely to significantly increase the cumulative impact as visibility is so low and they are situated further away from the main viewing corridors, behind other proposed development sites.

- The visual impacts can be completely reversed after decommissioning, if all the structures are removed and the land suitably rehabilitated. No landscape forms or features will be permanently affected. It is critical that decommissioning and rehabilitation are well controlled and enforced after the life of the facility.

- Alternative 2 is preferable as it is considerably smaller in size. However, the difference in visibility, particularly if all the sites are developed, is not significant enough to alter impact ratings.

- Although the no-go option is preferred from a visual perspective, the visual impacts can be mitigated to an acceptable degree.

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ANNEXURE A

VISUAL ASSESSMENT RATING CRITERIA

Quality

Criteria
Visual quality is high when: • The landscape offers dramatic, rugged topography and /or visually appealing water forms are present; • Pleasing, dramatic or vivid patterns and combinations of landscape features and vegetation are found; • The landscape is without visually intrusive or polluting urban, agriculture or industrial development (i.e.it reveals a high degree of integrity); and/or • Outstanding or evocative features and landmarks are present; and • The landscape/townscape is able to convey meaning.

VAC

High	Moderate	Low
The area is effectively able to screen visual impacts: • Undulating or mountainous topography and relief; • Good screening vegetation (high and dense); • Is highly urbanised in character; and • Existing development is of a scale and density to absorb the visual impact.	The area is partially able to screen visual impacts: • Moderately undulating topography and relief; • Some or partial screening vegetation; • A relatively urbanised character; and • Existing development is of a scale and density to absorb the visual impact to some extent.	The area is not able to screen the visual impacts: • A flat topography; • Low growing or sparse vegetation; • Is not urbanised; and • Existing development is not of a scale and density to absorb the visual impact to some extent.

Visibility

Not Visible	Marginally Visible	Visible	Highly visible
Proposed activities cannot be seen	Proposed activities are only just visible / partially visible	Proposed activities are visible although parts may be partially obscured	Proposed activities are clearly visible (usually in foreground)

Integrity

High	Moderate	Low
The development/activity results in a noticeable change or is discordant with the surroundings: • Is not consistent with the existing land use of the area; • Is not sensitive to the natural environment; • Is very different to the urban texture and layout; • The buildings and structures are not congruent / sensitive to the existing architecture / buildings; and	The development/activity partially fits into the surroundings but is clearly noticeable : • Is moderately consistent with the existing land use of the area; • Is moderately sensitive to the natural environment; • Is moderately consistent with the urban texture and layout; • The buildings and structures are moderately congruent / sensitive to the existing	The development/activity results in a minimal change to the surroundings and blends in well: • Is consistent with the existing land use of the area; • Is highly sensitive to the natural environment; • Is consistent with the urban texture and layout; • The buildings and structures are congruent / sensitive to the existing architecture / buildings; and

• The scale and size of the activities are different to nearby existing activities.	architecture / buildings; and • The scale and size of the activities are moderately similar to nearby existing activities.	• The scale and size of the activities are similar to nearby existing activities.

Viewer Sensitivity

High	Moderate	Low
• Residential areas • Nature reserves • Scenic routes / trails	• Sporting and recreational areas • Places of work	• Industrial areas • Active mining areas • Visually severely degraded areas

ANNEXURE B

IMPACT RATING METHODOLOGY

IMPACT ASSESSMENT METHODOLOGY

The EIA uses a methodological framework developed by WSP | Parsons Brinckerhoff to meet the combined requirements of international best practice and NEMA, Environmental Impact Assessment Regulations, 2014 (GN No. 982) (the "EIA Regulations").

As required by the EIA Regulations (2014), the determination and assessment of impacts will be based on the following criteria:

- Nature of the Impact
- Significance of the Impact
- Consequence of the Impact
- Extent of the impact
- Duration of the Impact
- Probability if the impact
- Degree to which the impact:
  - can be reversed;
  - may cause irreplaceable loss of resources; and
  - can be avoided, managed or mitigated.

Following international best practice, additional criteria have been included to determine the significant effects. These include the consideration of the following:

- Magnitude: to what extent environmental resources are going to be affected;
- Sensitivity of the resource or receptor (rated as high, medium and low) by considering the importance of the receiving environment (international, national, regional, district and local), rarity of the receiving environment, benefits or services provided by the environmental resources and perception of the resource or receptor); and
- Severity of the impact, measured by the importance of the consequences of change (high, medium, low, negligible) by considering inter alia magnitude, duration, intensity, likelihood, frequency and reversibility of the change.

It should be noted that the definitions given are for guidance only, and not all the definitions will apply to all of the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

METHODOLOGY

Impacts are assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected and how it will be affected

NATURE OR TYPE OF IMPACT	DEFINITION
Beneficial / Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.

NATURE OR TYPE OF IMPACT	DEFINITION
Adverse / Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that arise directly from activities that form an integral part of the Project (e.g. new infrastructure).
Indirect	Impacts that arise indirectly from activities not explicitly forming part of the Project (e.g. noise changes due to changes in road or rail traffic resulting from the operation of Project).
Secondary	Secondary or induced impacts caused by a change in the Project environment (e.g. employment opportunities created by the supply chain requirements).
Cumulative	Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

→ The physical **extent**, wherein it is indicated whether:

SCORE	DESCRIPTION
1	the impact will be limited to the site;
2	the impact will be limited to the local area;
3	the impact will be limited to the region;
4	the impact will be national; or
5	the impact will be international;

→ The **duration**, wherein it is indicated whether the lifetime of the impact will be:

SCORE	DESCRIPTION
1	of a very short duration (0 to 1 years)
2	of a short duration (2 to 5 years)

SCORE	DESCRIPTION
3	medium term (5–15 years)
4	long term (> 15 years)
5	permanent

→ The **magnitude of impact on ecological processes**, quantified on a scale from 0-10, where a score is assigned:

SCORE	DESCRIPTION
0	small and will have no effect on the environment.
2	minor and will not result in an impact on processes.
4	low and will cause a slight impact on processes.
6	moderate and will result in processes continuing but in a modified way.
8	high (processes are altered to the extent that they temporarily cease).
10	very high and results in complete destruction of patterns and permanent cessation of processes.

→ The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where:

SCORE	DESCRIPTION
1	very improbable (probably will not happen.
2	improbable (some possibility, but low likelihood).
3	probable (distinct possibility).
4	highly probable (most likely).

SCORE	DESCRIPTION
5	definite (impact will occur regardless of any prevention measures).

- the **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- the **status**, which is 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; and
- the *degree* to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

$$S = (E+D+M)*P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

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

OVERALL SCORE	SIGNIFICANCE RATING	DESCRIPTION
< 30 points	**Low**	where this impact would not have a direct influence on the decision to develop in the area
31-60 points	**Medium**	where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	**High**	where the impact must have an influence on the decision process to develop in the area

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the Project's actual extent of impact, and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures, and is thus the final level of impact associated with the development of the Project. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this EIA Report.

ANNEXURE C

CV AND PROJECT EXPERIENCE

Belinda Gebhardt

Curriculum Vitae

I have over 15 years working experience in the environmental and development sectors. During this time I have had extensive experience in conducting and managing a broad range of environmental projects. I have particularly focussed on Visual Impact Assessment (VIA), Environmental Impact Assessment (EIA), State of the Environment Reporting and Environmental Management Frameworks. I also have experience in environmental training, capacity building and materials development, including experience with illiterate and semi-literate communities. For the past three years I have also been involved with voluntary work for the Botanical Society of South Africa.

Personal Details:

Physical Address:	15 Rover Road, Rondebosch, 7700
Postal Address:	PO Box 749 Rondebosch, 7701
Tel:	021 6863750 / 084 3052119
Email:	belinda@gebhardt.co.za
Nationality:	South African (ID No: 7406270049085)
Marital Status:	Married

Qualifications and Professional Affiliation:

- BL Hons (Landscape Architecture): University of Pretoria, 1996.
- MPhil in Environmental Management: University of Cape Town, 2003.
- SACLAP (South African Council for Landscape Architecture Professionals) Reg. No.: 99098.
- CEAPSA (Certified with the Board of Environmental Assessment Practitioners, South Africa).

Employment History:

• 2015 - current	**Independent Consultant**, Visual Impact Assessment.
• 2009 – 2011	**Independent Consultant**, Visual & Environmental Impact Assessment.
• 2003 - 2009	**SRK Consulting** Environmental Department Cape Town: Environmental Scientist. Environmental Planning and Monitoring, Environmental Impact Assessment, Visual Impact Assessment, State of the Environment Reporting. Primary duties included project management, management of specialist teams, conducting public participation processes, report writing and compilation, basic GIS, onsite inspections, assessment and analysis of environmental and social factors, budget management and client liaison.
• 2002 - 2003	**University of Cape Town:** Full-time student (MPhil).
• 1998 - 2002	**Abalimi Bezekhaya**, Khayelitsha Office, Cape Town: Greening Co-ordinator. Co-ordination and implementation of school and community greening projects and events, training and

	material development. Primary duties included management of the School and Community Greening Programme, facilitating workshops and training courses for children, teachers, caretakers and other community members. Planning and implementation of greening projects and community events such as Arbour Day and assistance with the running of the garden centre and urban agriculture programmes.
• 1997 - 1998	**South African Environmental Project**, Cape Town: Assisted in the Development of the draft EIA Guidelines for the Kingdom of Lesotho, assisted with the running of the volunteer programme and compilation of articles for the website and newsletter.

Summary of Expertise:

- Visual Impact Assessment;
- Project Management;
- Report Writing;
- Editing and Proof Reading;
- Public Consultation;
- Environmental Impact Assessment;
- Environmental Management Frameworks and State of the Environment Reporting; and
- Environmental Management and Monitoring Plans and Guidelines.
- Material Development and Training;

Key Skills:

- Excellent communication skills, verbal and written;
- Computer skills including working knowledge of MSWord, Excel, Photoshop Elements 9, PowerPoint;
- Outstanding organisational and administrative skills;
- Ability to work well in a team, as team leader or in support role; and
- Ability to take initiative.

Hobbies and Interests:

Gardening, reading and creative writing.

Key Projects :

A list of key project experience available on request.

References:

1. **Chris Dalgliesh:** SRK Consulting. CDalgliesh@srk.co.za 021 6593060
2. **Kate Steyn:** Independent Consultant. Katesteyn24@gmail.com 084 5730723
3. **Richard Hill:** UCT, EGS Dept. richard.hill@uct.ac.za 021 6502786

Belinda Gebhardt: Key Project Experience

Key Experience:	
Visual Impact Assessment	
Name of Project:	Visual Impact Assessment for Re-Development of Site 460 (St Helena Bay, Western Cape)
Client:	ACO Associates
Project Description:	Visual Impact Assessment
Project duration/date:	2016
Name of Project:	Visual Impact Assessment for the Robben Island Photovoltaic Plant (Cape Town)
Client:	WSP, Parsons Brinckerhoff
Project Description:	Visual Impact Assessment
Project duration/date:	2016
Name of Project:	Visual Impact Assessment for the Portion 15 of Farm 281, Suidestrand (Agalhas, Overberg)
Client:	Luchrist Eiendomsbeleggings
Project Description:	Visual Impact Assessment
Project duration/date:	2015
Name of Project:	Visual Impact Assessment for the Exxaro Eerstelingsfontein Coal Mine
Client:	WSP, Parsons Brinckerhoff
Project Description:	Visual Impact Assessment
Project duration/date:	2011
Name of Project:	Proposed Upgrade of R310 Corridor between the N2 and Polkadraai Road (Stellenbosch)
Client:	SRK Consulting
Project Description:	Visual Impact Assessment
Project duration/date:	2011
Name of Project:	Stellenbosch Landfill (Stellenbosch, Western Cape)
Client:	Stellenbosch Municipality
Project Description:	Visual Impact Assessment
Project duration/date:	2010
Name of Project:	Gamsberg Zinc Project (Aggeneys, Northern Cape)
Client:	Black Mountain Mining (Pty) Ltd
Project Description:	Visual Baseline
Project duration/date:	2009
Name of Project:	Worcester Hills Development (Worcester, Western Cape)
Client:	Worcester Land Trust
Project Description:	Visual Impact Assessment
Project duration/date:	2008
Name of Project:	Levendal (Suider-Paarl, Western Cape)
Client:	Levendal Developments
Project Description:	Visual Impact Assessment
Project duration/date:	2007
Name of Project:	Ben Schoeman Dock: Berth Deepening EIA (Cape Town)
Client:	Transnet Projects

Project Description:	Visual Impact Assessment
Project duration/date:	2007
Name of Project:	BRWM Municipal Landfill (Western Cape)
Client:	BRWM Municipality
Project Description:	Visual Impact Assessment
Project duration/date:	2006
Name of Project:	Anura Winelands Estate (Klapmuts, Western Cape)
Client:	Thymen Bothma
Project Description:	Visual Impact Assessment
Project duration/date:	2005
Name of Project:	Pulp United Paper Mill (Richards Bay, KZN)
Client:	Pulp United
Project Description:	Visual Impact Assessment
Project duration/date:	2005
Name of Project:	Redevelopment of several municipally owned precincts near the Mossel Bay Beachfront (Mossel Bay, Western Cape)
Client:	AttPower Developments
Project Description:	Visual Sensitivity
Project duration/date:	2005
Name of Project:	Pearly Beach Waste Water Treatment Works (Pearly Beach, Western Cape)
Client:	Overstrand Municipality
Project Description:	Visual Impact Assessment
Project duration/date:	2003 – 2004
Name of Project:	Erf 324 (Rooi Els, Western Cape)
Project Description:	Visual Impact Assessment
Project duration/date:	2003
Name of Project:	NDC Mining EIA (West Coast, Western Cape)
Client:	NDC Mining Company
Project Description:	Visual Impact Assessment
Project duration/date:	2003
Name of Project:	St Francis Bay Golf Estate (St Francis Bay, Eastern Cape)
Project Description:	Visual Impact Assessment
Project duration/date:	2003

Environmental Impact Assessment

Name of Project:	Klue Street Link Road (Worcester, Western Cape)
Client:	Worcester Land Trust
Project Description:	Basic Assessment
Project duration/date:	2008 – 2009
Name of Project:	Rochester Road (Philippi, Cape Town)
Client:	Rochester Park Pty. Ltd
Project Description:	Basic Assessment
Project duration/date:	2007 – 2009
Name of Project:	Altona Developments (Worcester, Western Cape)

Client:	Altona Developments Pty Ltd.
Project Description:	Environmental Impact Assessment
Project duration/date:	2006 – 2009
Name of Project:	Levendal Developments (Suider Paarl, Western Cape)
Client:	Levendal Developments Pty Ltd.
Project Description:	Environmental Impact Assessment
Project duration/date:	2006 – 2009
Name of Project:	Bakhuis Bauxite Mining ESIA (Suriname, South America)
Client:	BHP Billiton
Project Description:	Environmental and social impact assessment
Project duration/date:	2005 – 2009
Name of Project:	BHP Billiton Coermotibo Three Hills Bauxite Deposits (Coermotibo, Suriname, South America)
Client:	BHP Billiton
Project Description:	Environmental and Social Impact Assessment
Project duration/date:	2005
Name of Project:	Bordjiesrif Environmental Experiential Centre (Cape Point, Table Mountain National Park)
Client:	South African National Parks
Project Description:	Environmental Impact Assessment
Project duration/date:	2003-2005
Name of Project:	Buffels Bay Recreational Area Upgrade (Cape Point, Table Mountain National Park)
Client:	South African National Parks
Project Description:	Environmental Impact Assessment
Project duration/date:	2003-2004
Name of Project:	Vodacom Base Station Installations (Cape Town and surrounds)
Client:	Vodacom
Project Description:	Environmental Impact Assessments
Project duration/date:	2003 – 2006
Name of Project:	NDC Mining EIA (West Coast, Western Cape)
Client:	NDC Mining Company
Project Description:	EIA for the proposed diamond mining on the West Coast
Project duration/date:	2003
Name of Project:	Vissershok Landfill Extension (Cape Town)
Client:	City of Cape Town
Project Description:	EIA for the proposed landfill extension
Project duration/date:	2003 – 2004
Name of Project:	Worcester Effluent Disposal Site and Pipeline (Worcester, Western Cape)
Client:	KWV, Distell and Brenn-O-Kem
Project Description:	EIA for the proposed effluent disposal site and pipeline in Worcester
Project duration/date:	2004

State of the Environment Reporting and Environmental Management Frameworks

Name of Project:	City of Cape Town Environmental Management Frameworks (Districts A,D,G,H)
Client:	City of Cape Town
Project Description:	Environmental Management Frameworks
Project duration/date:	2009

Name of Project:	City of Cape Town Environmental Management Frameworks (Districts B, C , E)
Client:	City of Cape Town
Project Description:	Environmental Management Frameworks
Project duration/date:	2008 – 2009
Name of Project:	Western Cape State of the Environment Report (Western Cape)
Client:	Dept. Of Environmental Affairs and Development Planning
Project Description:	Management and compilation of Western Cape State of the Environment Report
Project duration/date:	2004 – 2005
Name of Project:	Knysna State of the Environment Report Framework (Knysna, Western Cape)
Project Description:	State of the Environment Report Framework and Guideline Document
Project duration/date:	2004 – 2005

Environmental Management and Monitoring Plans, Guidelines and Auditing

Name of Project:	Hopewell Conservation Project (Nelson Mandela Bay Municipality, Eastern Cape)
Client:	Hopewell Conservation Project Pty Ltd.
Project Description:	Landscaping Guidelines
Project duration/date:	2010
Name of Project:	Rochester Road EMP (Philippi, Cape Town)
Client:	Rochester Park Pty Ltd.
Project Description:	Environmental Management Plan
Project duration/date:	2008
Name of Project:	Kristensen Oceanfront Restaurants Environmental Audits (Cape Town)
Client:	Kristensen Oceanfront Restaurants
Project Description:	Environmental Audit
Project duration/date:	2004 / 2005 / 2006
Name of Project:	Kwanonquaba EMP (Mossel Bay, Western Cape)
Project Description:	Environmental Management Plan
Project duration/date:	2007
Name of Project:	Coermotibo Three Hills Bauxite Deposits EMP (Coermotibo, Suriname, South America)
Client:	BHP Billiton
Project Description:	Environmental Management Plan
Project duration/date:	2006