Visual Scoping Study

for the Proposed BioTherm Solar Energy Projects near Aggeneys, Northern Cape

Enamandla PV 2

May 2016

Visual Scoping Study

for the Proposed BioTherm Solar Energy Projects near Aggeneys, Northern Cape

Enamandla PV 2

FINAL

May 2016

Report Prepared by:

Belinda Gebhardt

+27 84 3052119, belinda@gebhardt.co.za

PO Box 739, Rondebosch, 7701

Report Prepared For:

WSP / Parsons Brinckerhoff

1. INTRODUCTION

BioTherm Energy (Pty) Ltd. is proposing the development of two solar energy systems in the Northern Cape. The first, Letsoai, is a concentrated solar power (CSP) facility which will consist of two projects, each with a maximum generation capacity of 150MW. The second, Enamandla, is a photovoltaic (PV) facility which will consist of five projects, each with a maximum capacity of 75MW. This report only focuses on the Enamandla PV Site 2 (hereafter referred to as 'Enamandla PV 2').

The site is situated in the Northern Cape, in the Khâi-Ma Local Municipality, south of the N14 which runs between Springbok and Upington. The site is located approximately 13km south of the town of Aggeneys and approximately 50km south-west of the town of Pofadder and extends over an area of about 491ha (see Figure 1).

Enamandla PV 2 is situated within the Northern Electricity Grid Infrastructure (EGI) Corridor, one of 5 corridors earmarked for electricity infrastructure development. Although it is a solar project, it should be noted that the Enamandla PV 2 site is situated within the proposed Springbok Wind Renewable Energy Development Zone (REDZ), one of the eight areas that have been identified though 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 it includes listed activities in terms of these regulations. The environmental assessment is being conducted by WSP/ Parsons Brinckerhoff.

This Visual Scoping Study is one of many baseline investigations that have been undertaken by specialists as part of the Scoping Phase of the assessment. The scoping environmental and social studies will inform the proposed layout of the facility and specify requirements for future impact assessments. This Scoping Visual Study should be read in conjunction with the relevant Scoping Report and other specialist studies. The Scoping Phase study will be followed by a Visual Impact Assessment in the next phase of the project application.

1.1. SCOPE AND LIMITATIONS

SCOPE OF WORK

The principal objectives of the study were to establish a detailed visual baseline description of the project's zone of influence and to screen potential visual impacts to inform the impact assessment phase.

The scope of work included:

- Undertaking a field study to establish a baseline description of the visual characteristics of the landscape;
- Defining the visual resources and sense of place of the area;
- Identifying and mapping existing sensitive receptors, buffers, important viewpoints and view corridors;
- Identifying and screening potential visual concerns;
- Ensuring that the visual assessment will be in compliance with relevant standards, policies, laws and regulations; and
- Providing recommendations for the impact assessment phase.

LIMITATIONS AND ASSUMPTIONS

The following assumptions and limitations are relevant to the report:

1. The scoping report is based on background information supplied by WSP/Parsons Brinkerhoff regarding the proposed solar energy developments.

2. This report is confined to a baseline description and screening of potential visual sensitivities and does not include a full visual impact assessment. Impact ratings in the next project phase may differ from the screening rating presented in this report.

3. Preliminary determination of the Zone of Visual Influence (ZVI) has assumed a maximum receiver tower height of 250m, a maximum panel height of 7m.

4. Comments and concerns from interested and affected parties have not yet been tabulated and will be considered in the assessment phase.

5. 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.

6. Planning impacts are not considered within the scope of the visual study.

7. The following proposed projects, in close proximity to Enamandla PV 2, were considered when looking at cumulative impact, this list may not be complete: Aggeneys PV (Solar Capital), Aggeneys PV (Biotherm) Khai-Mai and Korana WEFs (Mainstream), Namies WEF (Juwi), Zuurwater Solar Facility (PV Africa) and Boesmanland Solar Farm.

2. APPROACH AND METHODOLOGY

2.1. APPROACH

The assessment was conducted in accordance with the Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (2005) and other relevant regulations and guidelines (see Section 3 below).

The focus of the scoping study was on establishing the character and sensitivity of the visual environment, identifying the visual catchment area and identifying visual resources in order to inform the next design phase as well as the impact assessment.

2.2. METHODOLOGY

In order to meet the terms of reference, 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 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 will be used in the assessment phase of the VIA to illustrate the likely zone of influence and visibility.

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

   - Slope and elevation;
   - Proximity of visual receptors (farmsteads and towns);
   - Proximity of major roads and scenic routes;
   - Nature reserves and National Parks; and
   - Other relevant features and buffer guidelines.

7. Visual **concerns and potential impacts** were identified; and

8. Potential visual impacts for each project phase were **screened** using WSP's screening methodology (see below).

IMPACT SCREENING TOOL

The screening methodology below was developed by WSP in order to give an indication of which impacts require detailed assessment and which impacts of very low significance can be excluded from the detailed studies in the impact assessment phase. The screening tool is based on two criteria, namely probability and severity.

It is important to note that given the nature of visual impacts, they are usually definite (i.e. a structure that will be built). Therefore for visual impacts, probability considers the probability of potential viewers being significantly affected rather than the probability of the structure being built. In addition, the efficacy of possible mitigation measures is also taken in consideration.

	Severity / Beneficial Scale				
Probability Scale		1	2	3	4
	1	Very Low	Very Low	Low	Medium
	2	Very Low	Low	Medium	Medium

	3	Low	Medium	Medium	High
	4	Medium	Medium	High	High

Probability Scale

4	**Definite**
	Where the impact will occur regardless of any prevention measures
3	**Highly Probable**
	Where it is most likely that the impact will occur
2	**Probable**
	Where there is a good possibility that the impact will occur
1	**Improbable**
	Where the possibility of the impact occurring is very low

Severity / Beneficial Scale

4	**Very severe**	**Very beneficial**
	An irreversible and permanent change to the affected system(s) or party (ies) which cannot be mitigated.	A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.
3	**Severe**	**Beneficial**
	A long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
2	**Moderately severe**	**Moderately beneficial**
	A medium to long term impacts on the affected system(s) or party (ies) that could be mitigated.	A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way.
1	**Negligible**	**Negligible**
	A short to medium term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.

3. LEGAL REVIEW

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 NEMA EIA Regulations contain broad guidelines for the preparation of specialist studies that are relevant to this study and particularly the assessment in the next phase of the project.

- **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. This has relevance to scenic routes and nature reserves in the area, which are referred to below. Heritage resources are also dealt with, in detail, in the Heritage Scoping Report undertaken by ACO Associates.

- **The NEMA Protected Areas Act (57 of 2003)** Section 17 of the Act is intended to protect natural landscapes.

- **D:EA&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. At the pre-application / planning phase the guidelines recommend visual input is used to identify scenic resources, visually sensitive areas and visual receptors. Additionally the visual input at this phase in the project cycle should identify fatal flaws, impacts requiring further assessment and provide input to design.

- **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. The Enamandla PV 2 site 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 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 2 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 facility 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 facility falls within the Northern Cape and is a solar facility, the report prepared by the Provincial Government may be helpful in providing some 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.

4. REGIONAL OVERVIEW

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.

4.1 GEOLOGY, CLIMATE AND TOPOGRAPHY

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 developments are 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, and perhaps also underlain, 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 sites 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.

4.2 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 and Bushmanland Sandy Grassland vegetation types, both classified as Least Threatened. 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 shrub and tufted grasses in colours of muted olive greens, browns and greys. 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 (see Plate ii). 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 i: Low growing tufted grasses

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

Plate iii: Occasional thorn tree

Plate iv: Low growing, fleshy-leafed succulents

4.3 LANDUSE

The predominant land use in the area is stock farming (including cattle, sheep, game or goat farming) and mining, with a small percentage reserved for 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.

The province has several National Parks and conservation areas including the Kgalagadi Transfrontier Park, which is Africa's first transfrontier game park, extending into both South Africa and

Botswana. However, there are no National Parks or conservation areas in close proximity to the proposed site.

The proposed site is currently used for cattle farming and are zoned for agricultural use. The carrying capacity of the arid, grassy, shrubland is very low (~10 ha per small stock unit) with vegetation cover varying with rainfall.

Most infrastructure present in the greater study area stems from mining activities and is concentrated around the town of Aggeneys. 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, power lines, cattle kraals and fences and occasional clusters of shade trees. Mining activities have a more pronounced impact on the natural character of the landscape.

It should also be noted that the area partially falls within the Springbok Wind REDZ and Northern EGI Corridor. These areas are targeted for renewable energy and electricity grid infrastructure development and so this future intended land use will alter the visual landscape. Although construction has not yet commenced, a concentration of Wind Energy Farms, in close proximity to the proposed sites, will significantly alter the vertical landscape and character of the area.

Plate v: Agriculture: cattle farming

Plate vi: Mining: Black Mountain tailings dam

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

4.4 VISUAL CHARACTER

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. It focuses on the inherent nature of the land. The basis for the visual character of the area is therefore provided by the underlying geology and climate.

The area 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 and serve as backdrops to the landscape, when viewed from a distance. 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. The study area is remote and sparsely populated, with less than 1 person per km^2. Patterns of the long straight roads, power lines 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 is likely to dominate the immediate visual landscape.

Plate viii: Visual Character, clear skies flat plains and koppies.

4.5 SENSE OF PLACE

An area will have a stronger sense of place if it can easily be identified, that is to say if it is unique and distinct from other places. Lynch defines 'sense of place' as "*the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid or unique, or at least a particular, character of its own*" (Lynch, 1992:131).

The visual character of the study area, while strikingly unique regionally, is typical of large areas of the Northern Cape and southern Namibia. The greater area is definable by its stark, dry landscape and feeling of remote stillness. The site is recognisable in the landscape by the two koppies which flank them, but are not strikingly different or recognisable from the vast areas of surrounding land. The Gamsberg inselberg to the north-west of the site is a unique landform, with a very distinct visual character, primarily due to its unusual topographical form.

4.6 VISUAL QUALITY

Aesthetic value is an emotional response derived from our experience and perceptions. As such, it is subjective and difficult to quantify in absolute terms. Studies in perceptual psychology have shown that humans prefer landscapes with higher complexity (Crawford, 1994). 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).

Visual quality therefore is an estimation of the composition of landscape and man-made elements and their resulting visual or scenic excellence.

The vast, arid plains of the Northern Cape and southern Namibia interspersed with rugged rocky, koppies contrast dramatically with the striking blue skies and create a landscape which is appealing in its expanse and remote, arid nature.

While not symbolic, the vastness of this desolate and remote landscape is evocative. These visual features create a landscape pattern that can be said to currently have a relatively high visual quality due to the high visual integrity, the general absence of intrusive, man-made features and the unusual visual character of the desolate arid plains interrupted by koppies. When the area is developed as a REDZ the concentration of turbines will alter the visual character, compromising the rural character and providing a cleaner, more futuristic or modern character. The aesthetic appeal of this altered landscape is subjective.

5. IMPACTS AND ISSUES IDENTIFICATION

The following section indicates the Zone of Visual Influence and visual sensitivity for the site. Potential visual issues are then identified and the impacts for each project phase broadly screened, using the methodology provided by WSP.

5.4. ENAMANDLA PV SITE 2

A solar PV plant is being proposed for Enamandla PV2 which will include either fixed axis systems or single axis tracking systems, and will use either crystalline silicon or thin film technology. The plant will have a maximum output capacity of 75MW and panels are likely to be 4m-7m high (WSP, 2016).

Enamandla PV2 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. Other associated facilities and infrastructure include:

- The 22 or 33kV cables which will be run underground, except where a technical assessment suggest that overhead lines are applicable;
- A laydown area for the temporary storage of materials during the construction activities;
- Construction of a car park and fencing;
- Administration, control and warehouse buildings; and
- Access roads and internal roads (see Section 5.10).

ZONE OF VISUAL INFLUENCE

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 Zone of Visual Influence (ZVI) is the maximum extent around an object, beyond which the visual impact will be insignificant, primarily due to distance.

Apparent size reduces linearly however, there is a large body of literature illustrating that visual *impact* reduces exponentially, rather than linearly. A recently published Scottish Guideline states; “It is important to emphasize, however, that visibility and distance do not follow a linear relationship.” (Scottish Government, 2011). According to Hull and Bishop (1988) the visual impact can be said to decrease at an exponential rate and so at 1000m would, nominally, be 25% of the impact as viewed from 500m. At 2000m it would be 10% of the impact at 500m (Hull and Bishop 1988). More recent studies on viewing distance have built on these early estimations and all emphasise the role that elevation, the angle of the sun and landscape characteristics play in determining visibility over distance.

There are very few available guidelines on the appropriate ZVI (or suggested limit of analysis) for solar facilities but studies indicate that glare can cause an impact up to 6km away (usually from troughs at this distance) (Sullivan, 2012). PV panels are generally lower in height and reflect less brightly than CSP systems. Visibility also depends on landscape characteristics and how elevated the viewpoint is in relation to the facility.

The Northern Cape has no specified ZVI or guidelines for solar energy but based on the above and given the flat character of the landscape and the clear air in the area, the suggested limit of assessment appropriate for this study area is defined, for the purposes of this VIA, as follows[1]:

[1] Once the height of the PV panels is established, these thresholds may change.

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

These distances are indicated on Figure 3.

VISUAL SENSITIVITY

Visual constraints or sensitive features have been mapped on Figure 3. The main scenic resources, ridgelines, steep slopes and key receptors are indicated.

TOPOGRAPHIC FEATURES

- Prominent ridgelines in the landscape are visually sensitive and should be avoided. The site is generally flat and the two ridgelines in close proximity to the site (indicated on Figure 3) are not currently included in 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.

SURROUNDING HOMESTEADS

- The area around the site is largely uninhabited; the only homesteads likely to be affected by the proposed development are indicated on the sensitivity map. The closest being Nombies, Struis-en-Bult, Brabees and Blomhoek.

TOWNS/URBAN AREAS

- The town of Aggeneys is situated ~15,5km from Enamandla PV 2 and may be affected by the proposed development, which may be visible from some locations on the outskirts of the town.
- The town of Pofadder is located approximately 56km from Enamandla PV 2 and will not be affected by the proposed development.

ROADS

- The N14 national road is approximately 11,5km from Enamandla PV 2 and may be affected by the PV solar facility along stretches of the road.
- Loop 10 Road and other farm roads are low traffic, gravel roads. Loop 10 Road is about 13,6km from the site at its closest point and the PV solar facility may be visible from portions of this road and from other farm roads in the area. The R358 is about 50km south-west of the site and not likely to be affected in any way.

POTENTIAL VISUAL ISSUES

Potential visual issues and impacts identified by the visual consultant are summarised in the table below. Not all of these can be classified as visual impacts, but are concerns and issues that should be considered.

Table 1: Potential Visual Impacts for Enamandla PV 2

Visual Issue	Comment
Visual intrusion on the sense of place, including scenic landscapes.	The remote and rural character of the area, typical of the Northern Cape Karoo is flat with low vegetation and clear air, providing very little visual absorption. The strongly regular geometric patterns and reflective surfaces of the panels and the power conversion units will differ from the current visual landscape and may impact the sense of place and scenic landscape.
Visual impacts of PV panels and the power conversion units on inhabitants and motorists.	The low profile of the PV panels will reduce their impact when viewed at low elevations but glare and power conversion units may impact inhabitants and motorists. The area is however, sparsely populated, with few scattered homesteads (Figure 3). Nombies, Brabees, Struis-en-Bult and Blomhoek are situated with 20km radius and the town of Aggeneys is located approximately 15,5km away. Motorists/tourists on the N14 and Loop 10 Road may also be affected by the proposed development along stretches of these roads.
Visual impacts of substation and O&M building on inhabitants and motorists.	The proposed substation has a maximum height of 35m-40m and together with other O&M facility may have visual impacts on inhabitants and motorists.
Visual impact of security lighting.	Any lighting for security at the site may have a visual impact on the clear, dark skies of the area. Detailed information regarding lighting has not yet been specified and will be considered in the EIA phase.
Visual impact during construction.	There will be some visual impacts on motorists and inhabitants during the construction period resulting from laydown areas, construction vehicles, dust and equipment. These will be a temporary impact.
Cumulative visual impacts.	Many solar and wind energy projects are being proposed in the area, and include: Aggeneys PV (Solar Capital), Aggeneys PV (Biotherm) Khai-Mai and Korana WEFs (Mainstream), Namies WEF(Juwi), Zuurwater Solar Facility (PV Africa) and Boesmanland Solar Farm. If these are all to be built the developments would significantly alter the visual landscape of this part of the Northern Cape.

The above potential impacts have been broadly rated for each project phase using the screening methodology provided by WSP and explained in Section 2.2 above. It should be noted, that due to their nature, visual impacts are usually definite (i.e. structures that will be built). So probability also considers how easily the impact can be mitigated and how likely it will be to affect many visual receptors.

Table 2: Visual Screening of Impacts of Enamandla PV 2

	ALTERNATIVE ONE (fixed axis)			ALTERNATIVE TWO (tracking)		
IMPACT	SEVERITY	PROBABILITY	IMPACT RATING FOR SCREENING	SEVERITY	PROBABILITY	IMPACT RATING FOR SCREENING
Visual impact on sense of place and scenic resources.	2	2	(-ve) Low	2	2	(-ve) Low
Visual impacts during construction	2	2	(-ve) Low	2	2	(-ve) Low
Visual impact during operation (PV panels /power conversion unit)	2	2	(-ve) Low	2	2	(-ve) Low

Visual impact during operation (substation and other buildings)	2	2	(-ve) Low	2	2	(-ve) Low
Visual impact during operation (lighting)	1	2	(-ve) Very Low	1	2	(-ve) Very Low
Visual impact during decommission	1	2	(-ve) Very Low	1	2	(-ve) Very Low
Cumulative visual impacts	3	2	(-ve) Medium	3	2	(-ve) Medium

5.10. ACCESS ROAD

Access roads have not yet been finalised. Where possible existing roads will be used to access sites, but may need to be upgraded. Additionally a number of internal roads will be constructed. These will be between 4-6m excluding any V-drains (WSP, 2015).

ZONE OF VISUAL INFLUENCE

Due to their nature, the visibility of the access roads will be dependent on the elevation and steepness of the landscape they transverse rather than height of the roads themselves. Guidelines relating to renewable facility's zones of visual influence are therefore not applicable.

For the purposes of this VIA the following thresholds are relevant:

- less than 1km – roads may be a prominent feature, dominating perception;
- between 1km and 3km – roads may be relatively prominent and dominate perception to some extent; and
- more than 3km – roads may be visible but not dominant.

These distances are indicated on Figure 2.

VISUAL SENSITITY

Visual constraints or sensitive features have been mapped on Figure 3. The main scenic resources, ridgelines, steep slopes and key receptors are indicated.

TOPOGRAPHIC FEATURES

- Prominent ridgelines and topographical features in the landscape are visually sensitive and should be avoided, if possible, when planning road routes. The highest ridgelines on the site are indicated on Figure 3.

SURROUNDING HOMESTEADS AND TOWNS

- Homesteads within approximately 3km of the access roads may be affected by the proposed roads.
- There are no towns likely to be affected by the proposed access roads.

POTENTIAL VISUAL ISSUES

Potential visual issues and impacts identified by the visual consultant are summarised in the table below. Not all of these can be classified as visual impacts, but are concerns and issues that should be considered.

Table 3: Potential Visual Impacts for Access Roads

Visual Issue	Comment
Visual impact on the physical landscape.	Given the topography of the landscape, cut and fill and other earthworks will be minimal and the impact on the physical landscape form when constructing roads is not likely to be significant.
Visual intrusion on the sense of place and scenic landscapes.	Given that the area already contains a number of gravel farm roads criss-crossing the landscape, the additional internal roads are not expected to impact significantly on the sense of place.
Visual impacts of roads on inhabitants.	Population density is low and the proposed roads are not expected to have a significant impact on many inhabitants.
Visual impact during construction	There will be some visual impacts on motorists and inhabitants during the construction period resulting from the construction vehicles, dust and equipment. These will be a temporary impact.
Cumulative visual impacts	M Many solar and wind energy projects are being proposed in the area, and include: Aggeneys PV (Solar Capital), Aggeneys PV (Biotherm) Khai-Mai and Korana WEFs (Mainstream), Namies WEF (Juwi), Zuurwater Solar Facility (PV Africa) and Boesmanland Solar Farm, each with their own system of roads. If all these developments build roads it may contribute to the cumulative impact.

The above potential impacts have been broadly rated for each project phase using the screening methodology provided by WSP and explained in Section 2.2 above. It should be noted, that due to their nature, visual impacts are usually definite (i.e. structures that will be built). So probability also considers how easily the impact can be mitigated and how likely it will be to affect many visual receptors.

Table 4: Visual Screening of Impacts of Access Roads

IMPACT	SEVERITY	PROBABILITY	IMPACT RATING FOR SCREENING
Visual impact on the physical landscape	1	2	(-ve) Very Low
Visual impact on sense of place and scenic landscapes	*Currently not enough detail to assess, will be addressed in EIA.*		
Visual impacts during construction	2	3	(-ve) Medium
Visual impact during operation	*Currently not enough detail to assess, will be addressed in EIA.*		
Cumulative visual impacts	2	2	(-ve) Low

6. TERMS OF REFERENCE FOR THE IMPACT ASSESSMENT PHASE

The goal of visual impact assessment is not to predict whether specific individuals 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 a particular project will affect those scenic values (Vissering, 2011).

Thus the primary aim of the visual 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. The study will use the above analysis of the visual characteristics, value and sense of place of the receiving environment as a baseline. Emphasis will be placed on sensitive visual resources and community concerns.

Qualitative as well as quantitative techniques and criteria will be used in the evaluation and clearly documented to ensure the reliability and credibility of conclusions and recommendations. The VIA will comply with the Department of Environmental Affairs and Development Planning's Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (2005).

The study will include the following:

1. Refining of the baseline study, description of the visual character of the site and zone of visual influence, if required.

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

3. Assessment of 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;
    - Viewshed analysis (visibility) – the geographic area from which the project may be visible (view catchment);
    - Visual intrusion (or integrity) – the level of congruence or integration with existing landscape; and
    - Viewer numbers and sensitivity – the level of acceptable visual impact is influenced by the type of visual receptors.

4. Assessment of the significance of the visual impacts, rated according to the Hacking methodology (provided by 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. Impacts will be rated before mitigation and after (assuming) mitigation if applicable.

6. Development of mitigation measures to reduce visual impacts and enhance any positive visual benefits.

7. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The following findings are pertinent and applicable to all the above projects:

- The project area has a high visual quality, characterised by the expansive plains, interrupted by koppies and the desolate and arid nature of the landscape.
- The greater area has a strongly defined sense of place but the study area itself is not easily distinguishable from the area in general.
- There are few visual intrusions in the natural landscaping, but it is visually compromised in sections by existing transmission lines, telephone lines, mining activities and windmills.
- The site falls within the Northern EGI Corridor and the Springbok Wind REDZ. These areas are earmarked for electricity grid infrastructure and renewable energy projects. A concentration of these developments in the area will significantly alter the visual landscape.
- The area is not densely populated and homesteads (some of which are uninhabited) are sparsely situated in the landscape, sometimes over 50km apart.
- The Zone of Visual Influence for PV facility and transmission lines was defined as a 6km radius, with 20km being the outer limit of analysis.
- Sensitive visual features include the Gamsberg Inselberg, prominent koppies, the N14 as well as some homesteads.
- Only a preliminary 'screening' assessment has been made of the proposed 2 the Enamandla PV 2 site in this study. A more detailed visual assessment of the solar power facility and related infrastructure will be made in the EIA Phase of the project. Ratings may differ from those contained in this report.
- Impacts likely to have the highest visual impact include the receiver tower, plumes from cooling plants, PV solar facility (including power conversion unit), heliostat field, transmission lines and cumulative impacts.
- Comment on possible visual impacts for aircraft must be obtained from the Civil Aviation authorities.

RECOMMENDATIONS

- Detailed viewsheds and analysis of visual impacts is required in the EIA Phase of the project, for the solar energy facility Enamandla PV 2.
- Given their height, and the general elevation of the landscape, effective mitigation for the receiver tower and power towers is not possible. However other impacts can be minimised to some extent and must be developed in the next phase of the EIA process.
- Any ridgelines and high points in the landscape are visually sensitive and should be avoided (currently not within footprint area).

- The recommended buffers provided by PGWC's 2006 Guidelines and some of those being developed in the National Wind and Solar PV Strategic Environmental Assessment being compiled by the Bernard Oberholzer with the CSIR (still in process) are provided in Annexure B. These are not all directly applicable to solar energy but help to provide some guidelines.

8. REFERENCES

- Almond, J. E. (2011). Paleontological Studies: Proposed Sato Energy Holdings (Pty) Ltd photovoltaic project on Portion 3 of Farm Zuurwater 62 near Aggeneys, Northern Cape Province.

- Arriaza, M (2004) Assessing Visual Quality in Rural Landscapes. Landscape and Urban Planning, Vol. 69, Issue 1 pg 115-125, 15 July 2004.

- Cornell, D.H., Thomas, R.J., Moen, H.F.G, Reid, D.L., Moore J.M. and Gibson, R.L. (2006). The Namaqua-Natal Province. In: Johnson, M.R., Anhaeusser, C.R.and Thomas, R.J. (Eds.), The Geology of South Africa. Geological Society of South Africa, Council for Geoscience, Pretoria, 325-380.

- Crawford, D. (1994) Using remotely sensed data in landscape visual quality assessment, Landscape and Urban Planning. 30: 17-81

- Geological Survey, Dept. Mineral and Energy Affairs, 1984. Geological Map of South Africa, 1:1 000 000 scale.

- Hull, RB and Bishop, I.E. (1988) Scenic Impacts of Electricity Transmission Towers: the Influence of Landscape Types and Observer Distance. Journal of Environmental Management: 27, 99-108.

- Joubert P (1986). Namaqualand Metamorphic Complex – A summary. In: Anhaeusser C.R. and Maske S. (Eds.), Mineral Deposits of Southern Africa Volume II, Geological Society of South Africa, Johannesburg, 1395-1420.

- Landscape Institute and the Institute of Environmental Assessment and Management (2002) Guidelines for Landscape and Visual Impact Assessment, Second Edition, E&FN Spon Press.

- Lynch, K. (1992) Good City Form, The MIT Press, London.

- Mucina L. & Rutherford M.C. (2006). The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

- Oberholzer, B (2005) Guideline for Involving Visual and Aesthetic Specialists in EIA Processes: Edition 1. CSIR Report No.: ENV-S-C 2005 053 F. RSA, Provincial Government of the Western Cape, DEA&DP, Cape Town.

- Oberholzer, B and CSIR (2016) Unpublished selected extract from the National Wind and Solar PV Strategic Environmental Assessment.

- Provincial Government of the Western Cape / CNdV Africa (2006). Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape.

- Ramsay (1993) in Martin, Y (2012), Visual Impact Assessment for the Proposed Solar Photovoltaic Installation at Grootvlei Power Station, Report 1600/V12 MP.

- Scottish Government. 2011. Onshore Wind Turbines. Specific Advice Sheet. http://www.scotland.gov.uk/Resource/Doc/212607/0120077.pdf

- South African National Biodiversity Institute (2012) National Vegetation Map http://bgisviewer.sanbi.org/BGISLUDS-SL-viewer/Viewer.html?Viewer=National%20vegetation%20map%202009&layerTheme=National%20Vegetation%20Map%202009

- Sullivan, R,G. (2012). Visual Impacts of Utility-scale Solar Energy Facilities on Southwestern Desert Landscapes. http://visualimpact.anl.gov/solarvis/docs/Solar_Visual_Impacts.pdf

- Sullivan, R.G. (2013). Notes from Solar Energy Workshop. http://www.bia.gov/cs/groups/xieed/documents/document/idc1-021617.pdf

- Vissering, Jean. 2011. A Visual Impact Assessment Process for Wind Energy Projects. Clean Energy States Alliance. http://www.cleanenergystates.org/assets/2011-Files/States-AdvancingWind-2/CESA-Visual-Impacts-Methodology-May2011.pdf.

- WSP | Parsons Brinckerhoff, Environment & Energy, Africa (2015 update 2016). Technical Information for Specialists Spreadsheet.

- Young (2000) First Draft Gamsberg Zinc Project: Specialist Study Report: Visual Environment. Newtown Landscape Architects, 10 March 2000.

ANNEXURE A:

LOCATION MAPS

ZONE OF VISUAL INFLUENCE MAPS

AND VISUAL SENSITIVITY MAPS

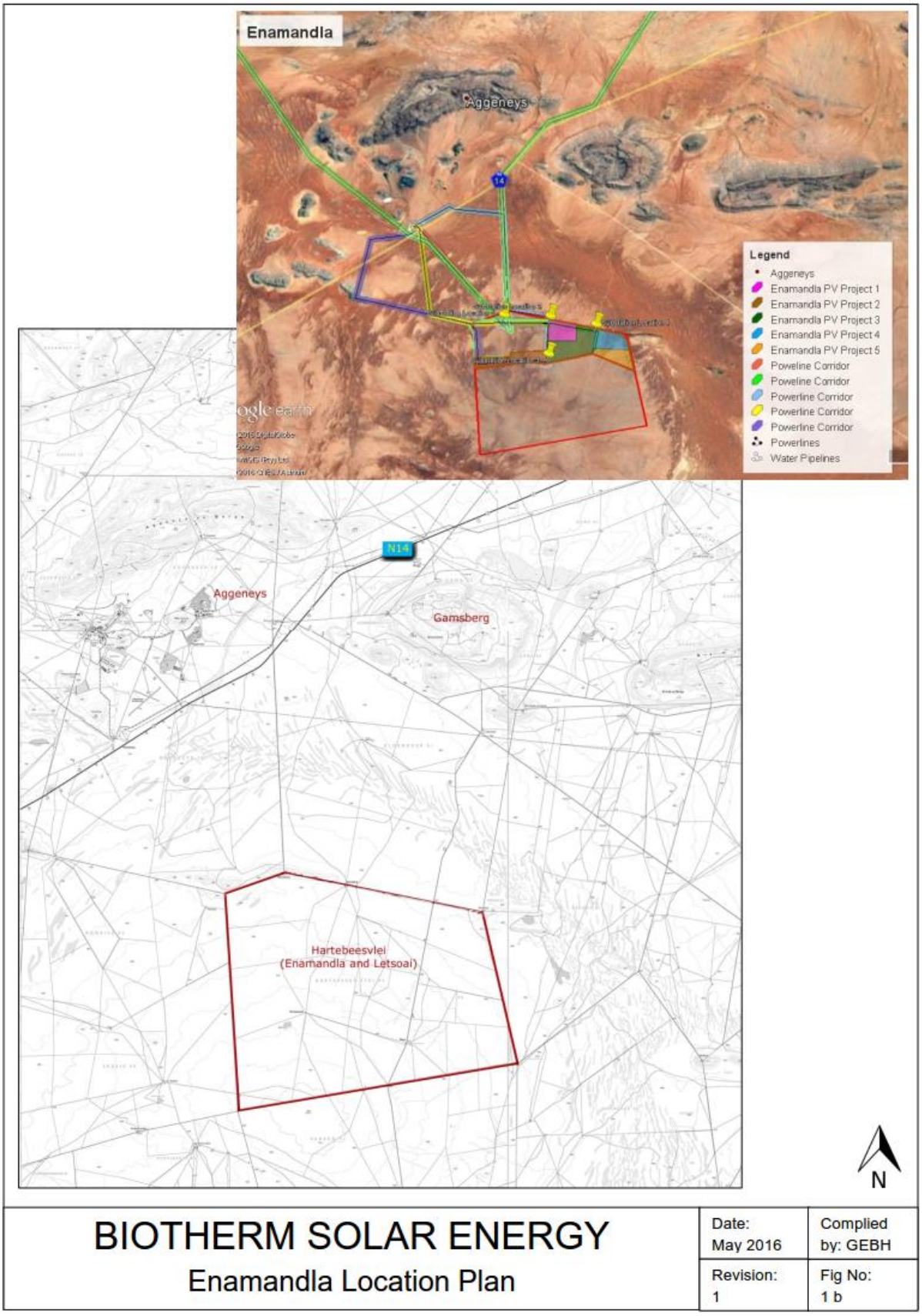

Figure 1: Location Enamandla

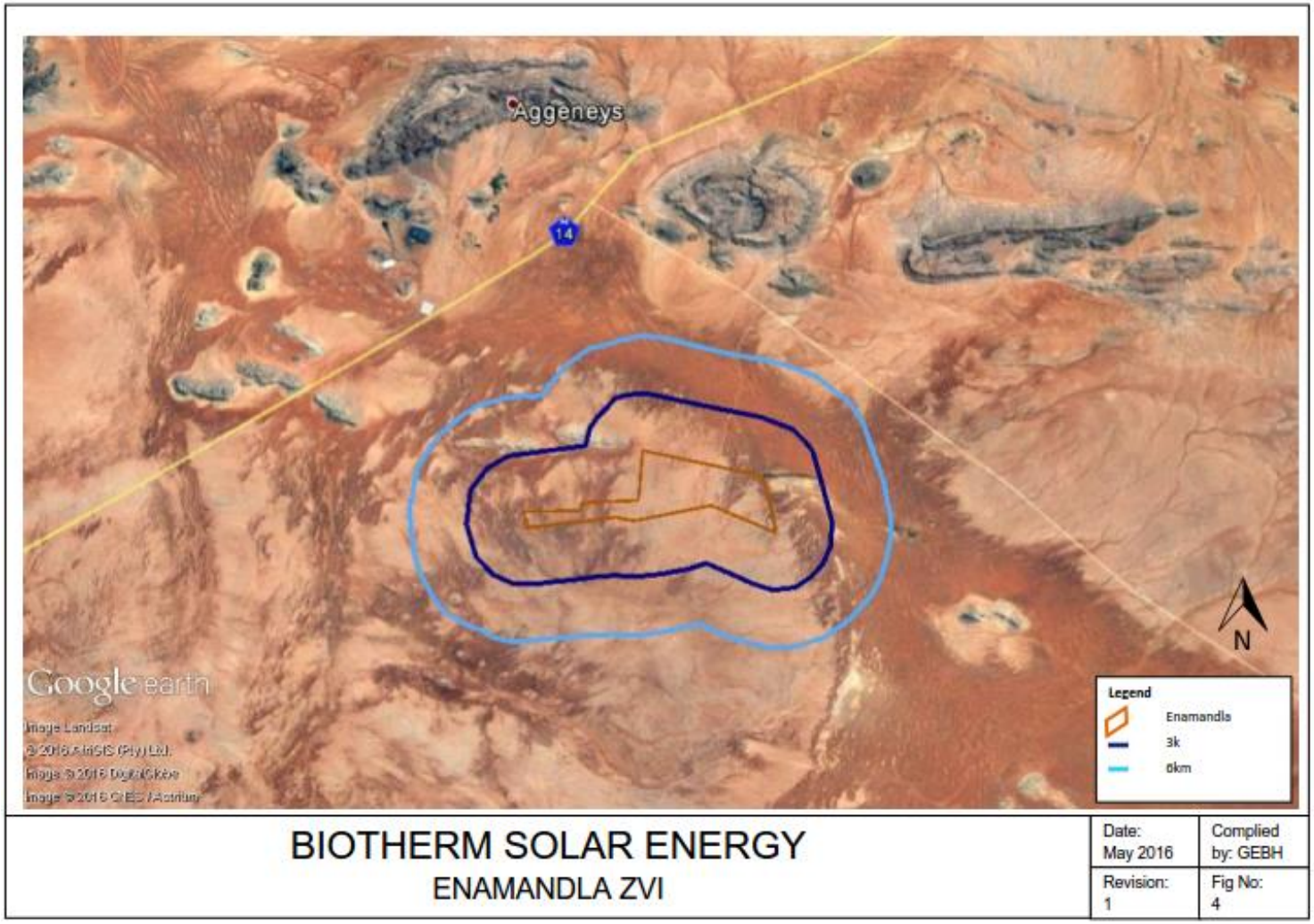

Figure 2: Zone of Visual Influence, Enamandla

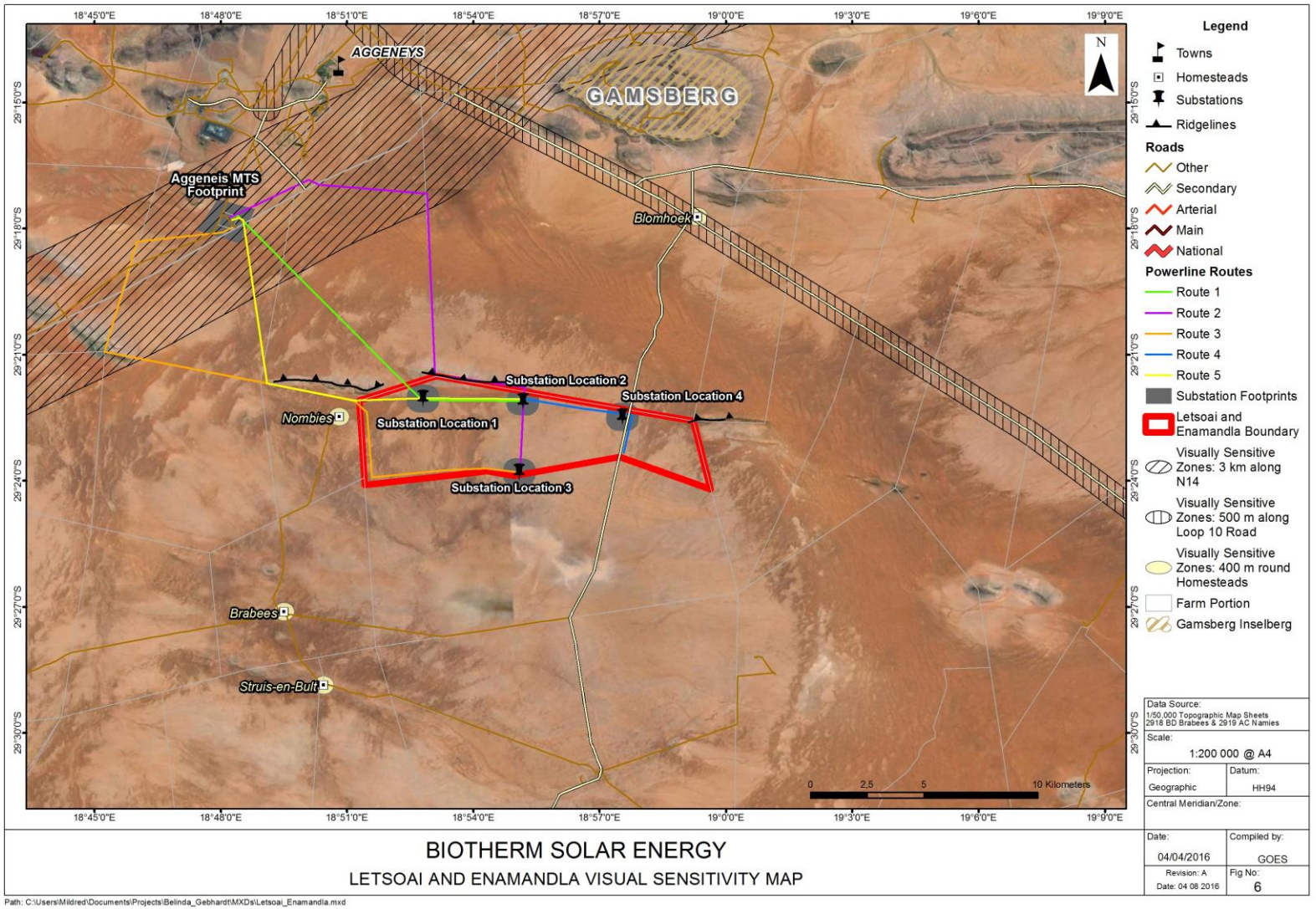

Figure 3: Visual Sensitivity Map: Letsoai and Enamandla

ANNEXURE B:

BUFFER GUIDELINES

Table 5: Buffer Guidelines

	PGWC 2006 Guidelines	Draft Recommended Guidelines	Comment
Urban Areas	800m	-	Urban edge lines assumed where necessary for rural towns with no formal urban edge.
Residential Areas, including rural dwellings (outside the project site)	400m	2 to 4km (can be less if outside the viewshed).	-
Residential Areas, including rural dwellings (inside the project site)	400m	800m	
National Roads	3km	3km	Should depend on scenic value of route. Can be reduced.
Local district roads/gravel roads	500m	500m	Review if high scenic value.
Provincial tourism routes	4km		Statutory scenic drives.
Local tourism routes	2,5km	1 to 3km (can be less if outside the viewshed).	Assumption made for local importance. Could be reduced.
Major power lines	250m	-	-
Local airfields	2,5km	-	To be confirmed with appropriate agency at local level.
Private nature reserves/ guest farms/ resorts	500m	2 to 5km (can be less if outside the viewshed).	Or as per statutory protection.
Heritage and Cultural Sites	500m	-	Includes fossil sites, nation (+ provincial) monument sites, graves and memorial sites.
Elevation and slopes	Map at local level		Map at local level
Major ridgelines, peaks and scarps	500m	500m.	Required and local scale.
South African Large Telescope (SALT)	-	25km.	-