14 CUMULATIVE EFFECTS

14.1 INTRODUCTION

Cumulative effects are a result of effects that act together (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the project under consideration (e.g. the combined effect of other similar projects in the general area). An effect to a resource in itself may not be considered significant, but may become significant when added to the existing and potential effects eventuating from similar or diverse developments in the area.

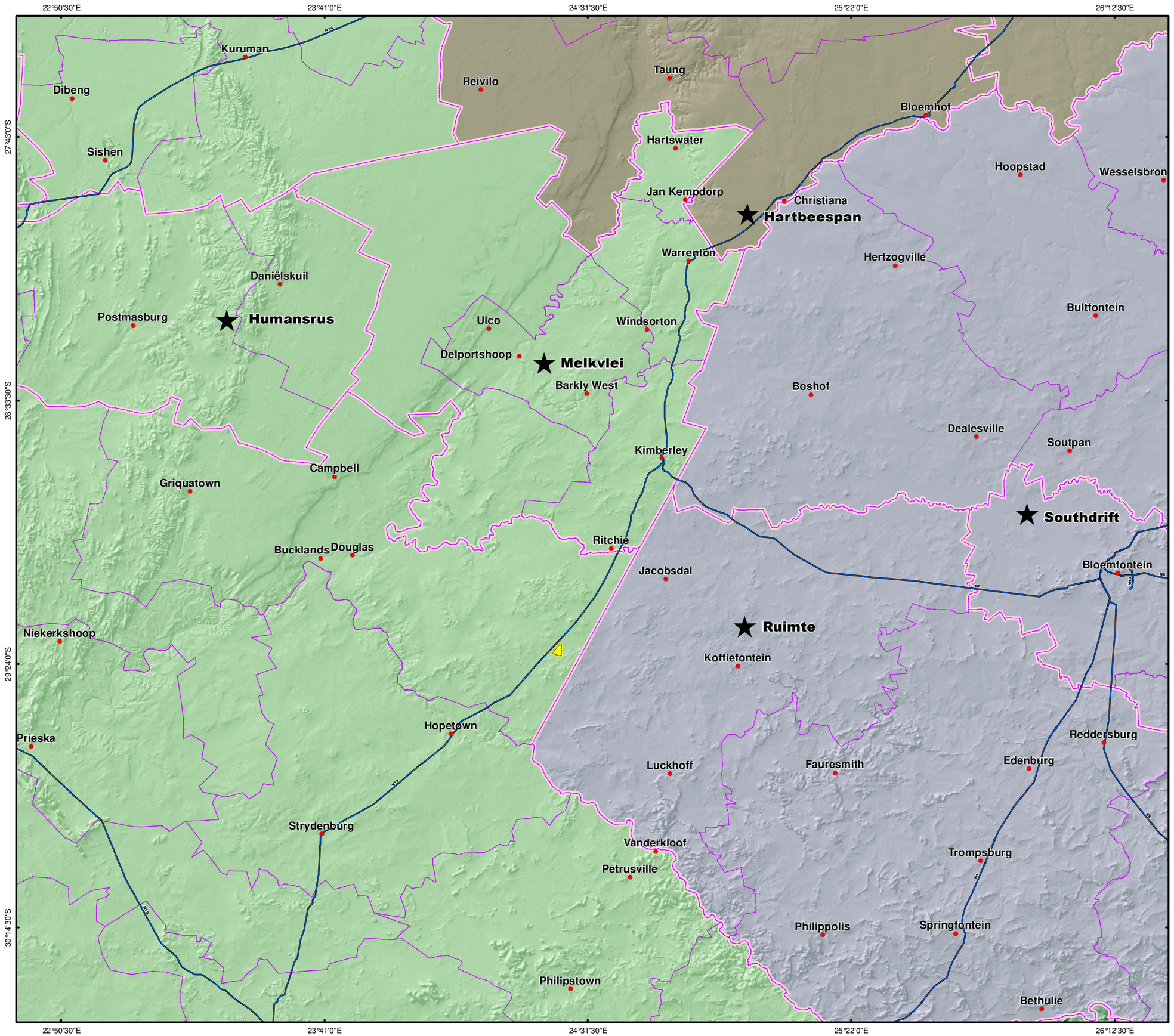
Cumulative effects have been defined as "*changes to the environment that are caused by an action in combination with other past, present and future human actions*" (Hegmann *et al* 1999).

There has been a substantial increase in renewable energy developments recently in South Africa, and legislation is evolving to facilitate the introduction of Independent Power Producers (IPPs) and renewable energy into South African electricity generation. The focus of the solar energy developments have largely been in the Northern Cape. It should, however, be noted that not all the solar power plants presently under consideration will become operational because of the following reasons:

- There are limitations to the capacity of the existing Eskom grid;
- Not all applications will receive positive environmental authorisation from the Department of Environmental Affairs (DEA);
- There are stringent requirements to be met by applicants in the competitive bidding process; and
- Not all solar power plants will be successful in securing financial support.

The preceding impact assessment chapters have assessed the impacts associated with the Graspan PV Power Facility largely in isolation. It is important, and there is a legislated requirement, to assess cumulative effects associated with a proposed development. This chapter examines whether the proposed project's potential impacts become more significant when considered in combination with the other existing and proposed infrastructure, including solar power projects, within the area.

Figure 14.1 shows the proposed location of the Graspan PV Power Facility in relation to all other known commercial-sized solar developments. It is important to note that the location and information available for each proposed development has been found in the public domain and from other developers.



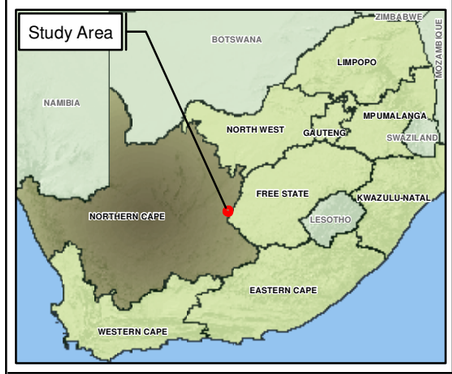
Legend

- Main Town
- National Roads

Provincial Boundaries

- Free State
- North West
- Northern Cape

- District Municipalities
- Local Municipalities
- Graspan Photovoltaic (PV) Power Facility
- ★ Planned Solar Power Plants



SCALE:

0 1 2 3 4 5 Kilometres

N

TITLE:

Figure 14.1: Planned Solar Power Plants in the vicinity of the Graspan PV Power Facility

CLIENT:

solairedirect Southern Africa The solar MWh company

DATE: Oct 2012	CHECKED: DA	PROJECT: 0156408
DRAWN: AB	APPROVED: SHC	SCALE: 1 : 1 300 000

DRAWING: Graspan Planned Solar Power Plants.mxd — REV: 0

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Projection: Geographic: WGS84
Source: Chief Directorate National Geo-Spatial Information - Base data, Demarcation Board - Municipality data. Inset Map: Esri Data & Maps

SIZE: A3

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All reasonable effort has been made to review the currently proposed position of the Graspan PV Power Facility, in relation to other existing or proposed solar power plants and major infrastructure within a 15 km radius thereof. There are currently no existing commercial solar power plants in operation within the Northern Cape and therefore this chapter focuses on any known proposed solar development projects. These developments are listed in *Table 14.1* and the known status within each of their development cycles at the time of this assessment is also reflected.

Table 14.1 Planned Solar Power Plants in the vicinity of the Graspan PV Power Facility

Solar Power Plant	**Approximate Distance (km)**
Ruimte PV Solar Energy Facility	5
Melkvlei PV Solar Energy Facility	9
Hartbeespan PV Solar Power Plant	15
Humansrus	15
Southdrift	14

It is evident from *Table 14.1* that there are five known proposed solar power plants in addition to the Graspan PV Power Facility in a radius of 15 km from the study area.

As there is uncertainty as to whether all the above-mentioned developments will be implemented, it is difficult to quantitatively assess the potential cumulative effects. It is, however, important to explore the potential cumulative effects qualitatively to meet legislative requirements as well as to provide a better understanding of these effects and the possible mitigation that may be required. The assessment and implementation of mitigation measures should be lead by Government in collaboration with the renewable energy sector and relevant NGOs. As these cumulative effects are explored in more detail, the trade-offs between promoting renewable energy (and the associated benefits in terms of reduction in CO_2 emissions) versus the local and regional environmental and social impacts and benefits (i.e. impacts on bird populations, landscape, tourism, flora, employment, etc.) will become evident. It is only when these trade-offs are fully understood, that the true benefits of renewable energy can be assessed.

In the sections below the potential cumulative effects of several developments within a 15 km radius of the Graspan PV Power Facility are explored. The discussion and associated conclusions must be understood in the context of the uncertainty associated with the proposed and known developments and the qualitative nature of the assessment.

14.2 SOILS AND SURFACE AND GROUNDWATER

When preparing sites for PV panels, some developers clear the entire site of vegetation, often leveling and grading the whole extent of the site. This may

result in soil compaction, soil disturbance and erosion. As the proposed PV solar plants occupy large areas, potential cumulative effects could be significant if not managed properly. However, the proposed Graspan PV Power Facility is located on a flat site with no identified drainage channels. Should the stipulated mitigation measures to avoid disturbance to the soils and surface and groundwater be implemented, the cumulative effects associated with the proposed PV power facility are expected to be minimal.

14.3 ECOLOGY

The national vegetation map for the site indicates a dominance of the Northern Upper Karoo vegetation type and a small section of Kimberley Thornveld located in the south eastern section of the site (Mucina and Rutherford, 2006). Field surveys undertaken, however, identified several small pans on the site corresponding to the Highveld Salt Pans vegetation types and an area of rock outcrop which corresponds to the Vaalbos Rocky Shrubland vegetation type. The field survey further identified the Kimberley Thornveld to be of greater extent on the site than as depicted by the national vegetation map. These vegetation types are all classified as Least Threatened. Of the vegetation types present on site, the Vaalbos Rocky Shrubland found in the vicinity of the rocky outcrop is considered the most ecologically sensitive, and as a habitat type is not found anywhere else on the site. On a broad scale, the Kimberley Thornveld vegetation type is considered to be more ecologically sensitive than the northern Upper Karoo vegetation type. This is due to the Kimberley Thornveld containing numerous large trees, while the Northern Upper Karoo vegetation type is dominated by low bushes and grasses.

In addition to the number of proposed solar power plants found within 15 km of the proposed Graspan PV Power Facility, there are numerous solar energy projects of a commercial scale planned across the Northern Cape, some of which may also fall within the above-mentioned vegetation types, thereby contributing towards cumulative effects within the vegetation types. There is high uncertainty as to how many of these developments will go ahead. Considering the vegetation types found on the site are all classified as Least Threatened, and the number and size of known proposed solar power plants, the cumulative effects of solar power plants on these vegetation types is considered to be low.

Furthermore, the broad area has a low topographic diversity and as a result, broad-scale ecological processes are likely to operate in a diffuse manner and the site is therefore not likely to function as part of a movement or migration corridor for fauna and flora. The larger fauna which occurs in the area is typical of arid and semi-arid areas and constitutes species which are able to avoid human contact through mobility or their unobtrusive behaviour. Such species will be able to persist within the developed areas, or will be able to avoid them. In addition, the area is already relatively impacted due to the presence of the existing railway line as well as Eskom's Graspan Traction

Substation and associated transmission lines. The overall impact on the connectivity of the landscape and the further disruption of ecosystem processes is reduced by the proximity to these other instances of existing development.

14.4 BIRDS

The most significant potential impact on birds of any solar power plant is the displacement or exclusion of threatened, rare, endemic or range-restricted species from critical areas of habitat. Given the considerable space requirements of commercially viable PV facilities (>50-100 ha), this effect could be regarded as significant in some instances when taking into consideration the various proposed solar power plants planned around the Graspan PV Power Facility and elsewhere in the Northern Cape. However, it is understood that it is unlikely that all the proposed solar power plants will become operational (see *Section 14.1*).

There are 13 IUCN (1) listed bird species (see *Section 5.2.2*) known to occur in the affected project area. All of the listed species are susceptible to some degree to both electrocution by, or collision with, power line infrastructure. Larger raptors are susceptible to both collision and electrocution, while storks, bustards and flamingos are all vulnerable to collision with power lines. The additional proposed developments within close proximity to the site may cause increased pressure on these species unless appropriate mitigation and monitoring is undertaken.

14.5 LANDSCAPE AND VISUAL IMPACT

Should many more of these types of solar energy developments be installed in close proximity to each other in the affected project area, there is a possibility that the agricultural sense of place of the area will be undermined. The resulting landscape characteristic will be defined by the solar energy facilities. However, due to the limited visual resources in the area and the limited number of receptors, any potential cumulative impact would be contained to the area and would not negatively impact on the tourism.

14.6 SOCIO-ECONOMIC IMPACTS

Benefits to the local, regional and national economy through employment and procurement of services could be substantial should all the renewable energy facilities proceed. This benefit will increase significantly should critical mass be reached that allows local companies to develop the necessary skills to support construction and maintenance activities and that allows for components of the solar energy facilities to be manufactured in South Africa.

(1) International Union for the Conservation of Nature.

Over time, as businesses develop locally to meet the needs of the solar energy sector, levels of procurement may increase.

The potential for the proposed Graspan PV Power Facility and other future projects to result in greater impacts on the local and national economy as a whole is primarily dependent on economies of scale. Initially, import content will be high. However, if the sector grows in size it should provide opportunities for growth of the local supply chain and the additional benefits that would flow from this. The introduction of large numbers of PV plants could provide local economic opportunities for component manufacture, and with an appropriate industrial policy it would be possible to leverage South Africa's relatively cheap steel resources. The distance from other international manufacturers will also present a competitive advantage, especially for less-specialised large-scale components such as PV array support structures.

The cumulative impact in terms of loss of agricultural land could potentially be extensive due to the large land take required for PV solar plants and considering the number of plants planned in the Northern Cape. However, the agricultural potential of the land is classified as low (see *Chapter 8*) and therefore these impacts are not considered to be significant.

14.7 CONCLUSIONS

Cumulative effects and benefits on various environmental and social receptors will occur to varying degrees with the development of solar power plants in the Northern Cape. The alignment of renewable energy developments with South Africa's National Energy Response Plan and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions, is undoubtedly positive. The economic benefits of renewable energy developments at a local, regional and national level have the potential to be significant. Should impacts be managed and appropriate monitoring implemented, cumulative effects to environmental receptors as a result of the proposed Graspan PV Power Facility are not considered to be significant.