MULILO
RENEWABLE PROJECT DEVELOPMENTS

Draft EIA Report for the proposed construction of
Boven PV1 75 MW Solar PV facility on the remaining extent of
the Farm Boven Rugzeer 169, Kenhardt, Northern Cape

chapter 14

conclusions and recommendations

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14 CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the key findings and recommendations based on the specialist studies and provides an integrated summary of impacts that will influence decision-making by the Competent Authority (i.e. the DEA) and the associated management actions (i.e. mitigation to avoid or reduce negative impacts or management actions to enhance positive benefits). All these mitigation and management measures are included in the draft EMPr (Section B of this Draft EIAr).

14.1 IMPACT SIGNIFICANCE OF THE MAIN IMPACTS IDENTIFIED AND KEY RECOMMENDATIONS

The conclusions on the impacts identified within each specialist study, together with the management actions required to avoid or mitigate the negative impacts (or to enhance the positive benefits) are presented in this section. Other possible impacts arising from the proposed project, including air quality, waste and noise that were identified during the Scoping Phase but that did not justify the need for a specialist study, have been addressed through suitable management measures also included in the Draft EMPr (Section B).

For the potential significant impacts of this project, specialist studies were conducted and included in Chapters 6 to 11 of the EIA Report, with specialist inputs on traffic and groundwater included in Chapters 12 and 13:

SPECIALIST	ORGANISATION	SPECIALIST STUDY / INPUT	SUMMARY CHAPTER
Dr. Jayson Orton	ASHA Consulting (Pty) Ltd	Heritage Impact Assessment	Chapter 6
Dr. Brian Colloty	Scherman Colloty & Associates cc	Aquatic and Terrestrial Ecological Impact Assessment	Chapter 7
Dr. John Almond	Natura Viva	Palaeontological Impact Assessment	Chapter 8
Rudolph du Toit	CSIR	Socio-economic Impact Assessment	Chapter 9
Johann Lanz	Private Consultant	Soil and Agricultural Potential Assessment	Chapter 10
Henry Holland	MapThis Trust	Visual Impact Assessment	Chapter 11
Surina Brink	CSIR	Traffic Statement	Chapter 12
Julian Conrad	GEOSS	Groundwater hydrocensus study	Chapter 13

14.1.1 Impacts on the heritage environment (excluding palaeontology)

It is recommended that construction of the proposed Boven Solar PV1 facility should be allowed to continue from a heritage perspective, since it is predicted that impacts to heritage resources are likely to be of **low** to **very low** significance following mitigation.

Key mitigation measures:

Design phase

- The facility should be placed in such a way as to be as near as possible to the other existing and proposed infrastructure in the area; and
- The overall disturbance footprint of the project should be kept as small as possible.

Construction phase

- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities (SAHRA and Ngwao-Boswa Ya Kapa Bokoni) and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

14.1.2 Impacts on palaeontology

The desktop palaeontological analysis identified the broader Nieuwehoop Solar Development study area as being of **low** palaeontological sensitivity. The impact of the proposed project on fossil heritage conservation is therefore predicted to be of **low** significance. No specialist palaeontological mitigation is recommended besides the need to monitor during construction for the potential exposure of any substantial fossil remains, as prescribed in the mitigation actions below:

Key mitigation measures:

Construction phase

- All substantial bedrock excavations should be monitored for fossil material by the responsible ECO. Should substantial fossil remains - such as vertebrate bones and teeth, plant-rich fossil lenses, petrified wood or dense fossil burrow assemblages - be exposed during construction, the responsible Environmental Control Officer should safeguard these, preferably in situ. SAHRA, i.e. The South African Heritage Resources Authority, should be alerted as soon as possible (Contact details: Mrs Colette Scheermeyer, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: cscheermeyer@sahra.org.za) so that appropriate action can be taken by a professional palaeontologist, at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a professional palaeontologist. The palaeontologist concerned with mitigation work will need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection). All palaeontological specialist work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies recently developed by SAHRA (2013).
- Monitoring of all deeper (> 1m) excavations into sedimentary rocks for fossil material by the ECO.

14.1.3 Impacts on the terrestrial and aquatic environment

The construction and operation of the proposed development on the Boven Solar PV1 site is predicted to result in a negative impact of **low** significance on the surrounding terrestrial and aquatic environments. This is assuming that the mitigation recommendations made within the specialist report are incorporated into the design and layout of the facility and that identified sensitive areas are excluded from the development footprint. Please refer to Section 14.2.4 for a detailed description of how this was adhered to by Mulilo.

Key mitigation measures:

Design phase

- Develop a plant rescue and protection plan which allows for the transplantation of conservation important species from areas to be transformed. Particular species include; *Boscia albitrunca, Boscia foetida, Acacia erioloba, Aloe dichotoma, Haworthia venosa and Hoodia officinalis.*
- Prepare a re-vegetation and habitat rehabilitation plan to be implemented during the construction and operational phases. This plan must include timeframes for restoration, promote rehabilitation within the shortest possible time after completion of construction (i.e. to reduce the amount of habitat converted at any one time) and to speed up the recovery of natural habitats.
- Avoid placing infrastructure within the identified watercourses and their buffers (i.e. 32 m). This would contribute to minimising the potential impacts on the aquatic environment and avoid the need for a Water Use License. Although the transmission lines would cross watercourses, it is advised that the towers suspending the overhead cables be placed outside the proposed 32 m buffer or the 1:100 year floodline, whichever is greater, to negate the need for a Water Use License for these structures.
- Although no alien plant species were observed in the proposed development sites, an alien invasive management plan must be compiled during the design phase and implemented during construction and operational phases as construction vehicles or machinery may contain residual seed or vegetative material collected during previous works. The plan must include mitigation measures to reduce the risk of potential invasion of alien species through measures such as the monitoring during the construction and operational phase and immediate removal of alien species is undertaken.
- The proposed water supply pipelines should buried below the bed of the streams and construction should take place during the dry season.

14.1.4 Impacts on the socio-economic environment

It is predicted that the overall significance rating of the negative socio-economic impacts associated with the proposed project is **medium** after mitigation; whereas the overall significance rating of the positive socio-economic impacts associated with the proposed development is **medium-high** when enhancement measures are implemented. This suggests that the prospective socio-economic benefits of the proposed project outweigh the socio-economic losses/impacts.

Key mitigation measures:

Construction and operational phases

- Develop and implement a Workforce Recruitment Plan which will reserve employment, where practically possible, for local residents (i.e. Kenhardt) (particularly for vulnerable groups such as women and previously disadvantaged individuals).
- Develop and implement a Stakeholder Engagement Plan to assist in a communication strategy for the proposed project to manage expectations.
- Delivery on the Economic Development Plan must be contractually binding on the proponent. This plan must engage with local NGOs, CBOs and local government structures to identify and agree upon relevant skills and competencies required in the Kenhardt community.
- Procure goods and services, where practical, within Kenhardt.

Decommissioning phase

- For the decommissioning phase, the project owner should provide appropriate succession training of locally employed staff earmarked for retrenchment during decommissioning; and all project infrastructures should be decommissioned appropriately and thoroughly to avoid misuse.

14.1.5 Impact on soils and agricultural potential

The proposed development is on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable and important for agricultural production. The proposed site is, however, on land which has very low agricultural potential and is only suitable for low intensity grazing. This reduces the significance of all agricultural impacts. The overall negative impact significance, following mitigation, to soil and agricultural potential is **very low** and there will be a **low** positive impact on agricultural activities as a result of additional land use income.

Key mitigation measures:

Design phase

- During construction phase, minimise the footprint of disturbance to 300 ha.

Construction and operational phases

- Confine vehicle access to roads only and control dust generation on site.
- During the construction phase, strip and stockpile topsoil from all areas where soil will be disturbed and after cessation of disturbance, re-spread topsoil over the surface and dispose of any sub-surface soils from excavations where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.
- For the operational phase, implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.

14.1.6 Visual impacts and sense of place

Clustering on-site substations near the planned Nieuwehoop Substation will reduce the visual clutter of power lines and pylons. It will also improve the aesthetics to place energy storage facilities as close to each other as possible in order to have the solar fields as uncluttered as possible since these are the structures mostly associated with solar energy facilities. The landscape in the area chosen for the three solar projects is already impacted by the ore freight railway line and associated powerlines. The character of the area will take on additional industrial features when the planned Nieuwehoop Substation and additional high voltage transmission lines are constructed. Even though these 75 MW solar projects would cover an area of approximately 300 ha, the viewsheds cover a very similar area with that of the proposed Nieuwehoop Substation, which received Environmental Authorisation from DEA in 2011. In terms of receptors of visual impacts, the nearest public roads are the R 27 and R 383 which are located ~ 10 km from the edge of the PV site (at closest point). The visual specialist study did not identify any national or provincial parks or features of touristic value within 10 km of the proposed PV facility. Given this visual context for the proposed project, the visual impact of the proposed project is predicted to be of **medium** to **low** significance, with the implementation of mitigation measures.

Key mitigation measures:

Construction phase

- Prepare the solar field area (e.g. clearance of vegetation, grading, contouring and compacting) and solar field construction in a phased manner that makes practical sense in order to minimise the area of soil exposed and the shortest duration of exposure, to reduce the visual impact of dust generation.

Operational phase

- Prepare a lighting plan that will minimise light spill beyond project boundaries, avoid up-lighting and minimise lights in line with safety and security and working at night should be avoided.
- Painted features should be maintained and repainted when colour fades or paint flakes.

Decommissioning phase

- Disturbed and transformed areas should be contoured to approximate naturally occurring slopes to avoid lines and forms that will contrast with the existing landscapes.
- Re-apply stockpiled topsoil to disturbed areas and these areas to re-vegetate using a mix of native species in such a way that the areas will form as little contrast in form, line, colour and texture with the surrounding undisturbed landscape.
- Feather edges of re-vegetated areas to reduce form and line contrasts with surrounding undisturbed landscape.

14.1.7 Traffic impacts

Access to the site will be from the R27 and Transnet Service Road with the nearest town being Kenhardt (30 km) away. Based on the assessment of the potential impacts associated with the traffic to be generated during all phases of the project, the overall impact from traffic generation is predicted to be **low** when implementing suitable mitigation measures. The highest traffic will be generated during the

construction phase. The mitigation and management requirements outlined in the statement were included in the draft EMPr, with the main requirements outlined below:

Key mitigation measures:

Design and construction phases

- During the design phase, provide a Transport Traffic Plan to SANRAL (as per SANRAL's request) and a Road Maintenance Plan should be developed for the section of the Transnet Service Road and submitted to Transnet for approval.
- Should abnormal loads have to be transported by road to the site, a permit needs to be obtained from the Provincial Government Northern Cape (PGNC) Department of Public Works, Roads and Transport.

14.1.8 Geohydrological assessment and boreholes siting

The hydrocensus revealed that the potential for groundwater within the three areas designated for the solar PV projects is low in the western section and increases towards the east. The risk of drilling for groundwater is therefore quite high. The borehole yields sampled ranged from 0.04 – 1.2 L/s and of the thirteen sites, five boreholes were found to be dry. However, the water requirements for construction on the project are generally low (0.13 L/s assuming a 24 hour pumping cycle) and low yield boreholes found during the hydrocensus could meet the construction requirements.

Water quality of the area is classified as poor and saline according to DWAF 1998 drinking water assessment standards and is not fit for human consumption. The total dissolved solids within the study area range from 1 200 – 7 780 and salinity has a range of 840 – 4700. The water quality does not meet DWAF's requirements and may need additional treatments to improve the water quality for use.

The following recommendations are made with regards to the utilisation of boreholes that may yield groundwater:

- Utilise the boreholes as per the recommended sustainable yields and avoid over abstraction of any one borehole.
- Address the specific water quality problems at the various boreholes. This may require treatment or appropriate mixing.
- Where possible rotate abstraction and distribute evenly between the boreholes.
- Monitor the borehole water levels and abstraction volumes.
- Borehole monitoring will be essential at the boreholes, and this should include:
    - Abstraction monitoring. Each borehole should be equipped with a flow meter that is read at least once a month.
    - Automated water level monitoring. Each borehole should be equipped with an observation pipe and a logger to allow for water level monitoring.
    - Manual monitoring. Borehole water level, field chemistry (EC) and abstraction rate (L/s) should be measured at each borehole on at least a monthly basis.

14.1.9 Summary of the comparative assessment of the positive and negative implications of the proposed activity

Sections 14.1.1 to 14.1.7 provide a summary of the findings of the specialist studies (or inputs) that were sourced as part of this EIA process. Table 14.1 summarises the overall significance of these impacts following the implementation of the recommended mitigation and management measures. From this table it can be seen that no negative impacts of high significance are predicted to occur as a result of this project provided the stipulated management actions are implemented effectively. The positive impacts generated by the project are associated with the economic benefits from employment opportunities, knowledge gained from conservation of potential fossil finds and the additional source of income from the PV facility. Considering that all the negative impact would be appropriately managed and the positive impacts enhanced through mitigation measures and management actions included in the draft EMPr (Section B), the potential negative impacts associated with the proposed project are not anticipated to be significant.

Table 14.1: Comparative assessment of main impacts

MAIN IMPACTS	OVERALL IMPACT SIGNIFICANCE PRE-MITIGATION	OVERALL IMPACT SIGNIFICANCE FOLLOWING MITIGATION
Heritage Impact	Very low - negative	Very low - negative
Aquatic and Terrestrial Ecology	Medium- High - negative	Low - negative
Palaeontological Impact	Low- negative	High- positive
Socio-economic Impact	Medium- High - negative	Medium - negative
	Medium- High - positive	Medium - High - positive
Soil and Agricultural Potential	Very low – Low - negative	Very low – negative
	Low - positive	Low - positive
Visual Impact	Medium - negative	Medium to Low - negative
Traffic	Medium- High - negative	Low - negative

14.2 CONSIDERATION OF ALTERNATIVES

14.2.1 No-go alternative

The no-go alternative assumes that the proposed project does not go ahead i.e. it is the option of not constructing the proposed 75 MW Boven Solar PV1 facility. This alternative would result in no negative environmental impacts on the site or surrounding local area or positive economic benefits that could stem from this PV project. It therefore provided the baseline against which other alternatives were compared. As discussed in Section 3.1 of Chapter 3, the following advantages (i.e. benefits) are associated with the “no-go” alternative:

- There is no development of solar energy facilities at the proposed location;
- The land-use remains only agricultural and the entire farm area of approx. 6510.32 ha could continue to provide grazing to support approx. 108 to 158 large stock units (e.g. cattle). The PV facility would have a maximum total footprint of 300 ha and therefore, should this project proceed, 300 ha of land would be 'lost' for grazing, which would mean that the site would have a capacity of 103-151 large stock unit on the farm;
- There is no change to the current landscape. The existing landscape will remain as is, without the visual impact of the PV facility, but noting that the existing landscape would still change as Eskom plan to construct the Nieuwehoop substation and high voltage transmission lines for which they have an existing Environmental Authorisations;
- No additional transmission lines will be constructed, as a result of the Boven Solar PV1 facility, which may cause bird collisions or fences/infrastructure that may restrict animal movement and create habitat fragmentation, but noting that Eskom will construct high voltage lines over this farm;
- No additional traffic would be generated from this project in this area;
- No increase in social deviance and influx of job seekers into the Kenhardt area; and
- Water use of approx. 700 kilolitres per year for operations, associated with cleaning of panels would be avoided and this water could be used for other purposes.

If the "no-go" alternative results, the following <u>disadvantages</u> (i.e. negative impacts) could occur:

- No additional power will be generated or supplied through means of renewable energy resources by this project at this location. The 75 MW facility is predicted to generate approximately 200 GW/h per year which could power 20 000 households.
- The "no project" alternative will have implications on assisting the South African government achieve its proposed renewable energy target 17 800 MW of renewable energy capacity by 2030;
- Additional power to the local grid will need to be provided via the Eskom grid, with approximately 90% coal-based power generation with associated high levels of CO_2 emissions and water consumption, as well power losses as a result of having to transmit the power from the generation sources (i.e. mostly coal power stations in Limpopo and Mpumalanga provinces) to the Kenhardt area;
- No additional renewable energy generation in the Kenhardt area, which can assist in stabilising the grid in this area;
- Local communities will continue their dependence on agriculture production, government subsidies and the local municipality's vulnerability to economic downturns increases because of limited access to natural and financial capital (see Chapter 9);
- There is no opportunity for additional employment as a result of diversification of the local economy to include renewable energy. Employment opportunities created during the construction phase equates to approximately 5 000 man months of which 80 % would be allocated to South African citizens;
- Project capital investment of approx. R 2 billion of which 60% will be local spend.

- The positive socio-economic impacts likely to result from the project such as increased local spending, the creation of local employment opportunities and the proposed implementation of an Economic Development Plan will not be realised; and
- The local economic benefits associated with the REIPPPP will not be realised, and socio-economic contribution payments (~ R250 million) into the local community trust will not be realised.

At present the proposed site is zoned for agricultural land-use, and is mainly used for livestock grazing and based on a 2007 assessment (AGIS), the natural grazing is low at 41-60 hectares per large stock unit. A Soil and Agriculture Potential Study was undertaken by Johann Lanz as part of this EIA (Chapter 10). Due to the fact that the impact on the agricultural land-use will have a very low to low significance, the low grazing capacity of the land and the fact that only 5 % of the available farmland will be developed on, the current land-use alternative (i.e. agricultural use) is not deemed as the preferred alternative and can still continue on the farm during the lifetime of the project. Hence, while the 'do nothing' alternative will not result in any significant ("High") negative environmental or other impacts; it will not result in any positive community development, nor will it generate an alternative land-use income from the solar energy facility or result in socio-economic benefits. Hence the "no-go" alternative is not a preferred alternative.

14.2.2 Site alternatives

As discussed in Chapter 3 of this report and shown in Figure 14.1, the EIA considered four sites as potential sites for the proposed development. The sites and their respective site sized that were assessed were:

- The preferred site (Boven Solar PV1) is 600 ha;
- Alternative PV2 consisting of:
    - Alternative PV2 is 680 ha;
    - Alternative PV2a is 341 ha; and
    - Alternative PV2b is 495 ha.

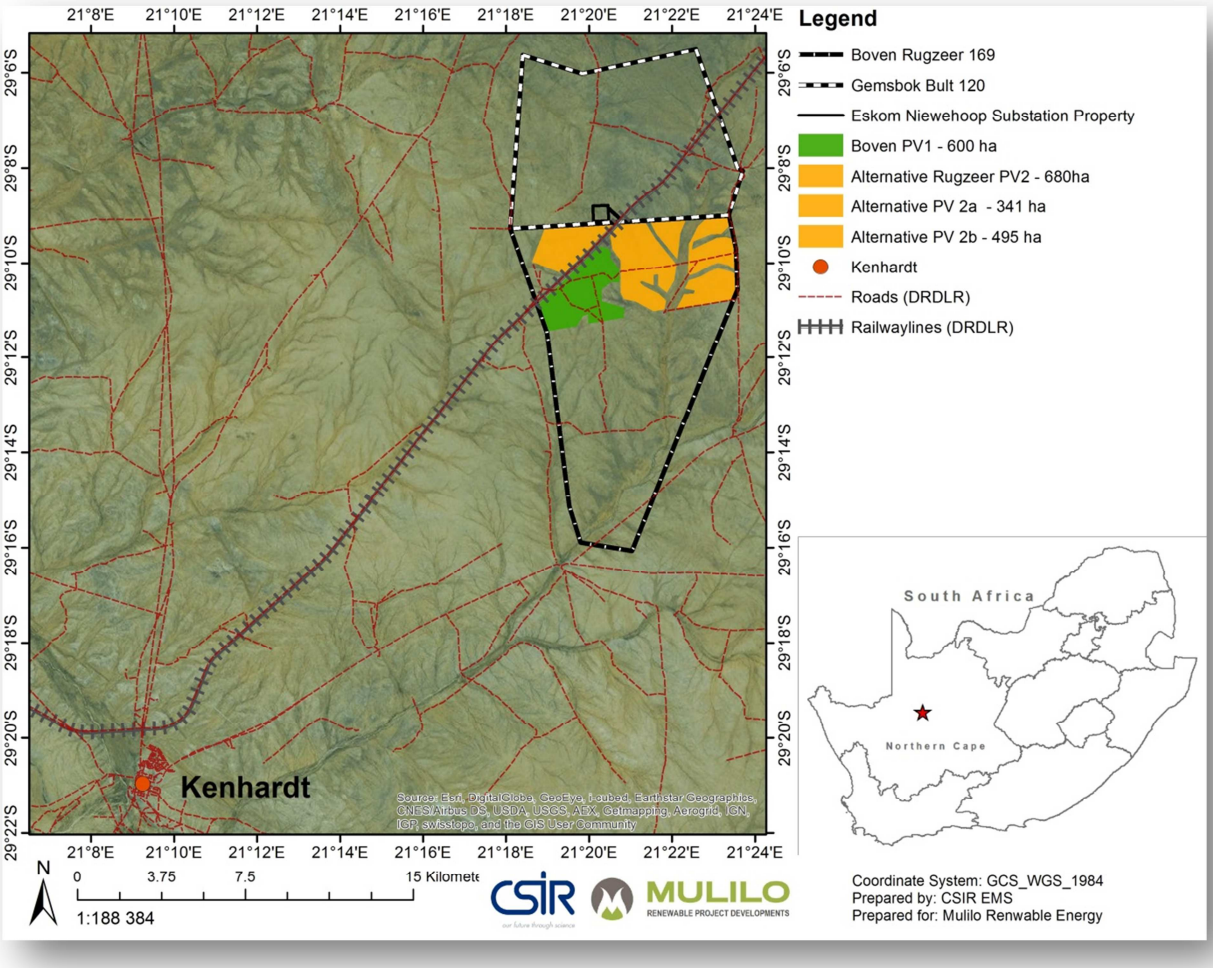

Figure 14.1: Site alternatives on the Boven Rugzeer (Remaining Extent of Farm No. 169) that were considered during the EIA phase.

The specialist studies assessed all four sites and determined the significance of the impacts, should the proposed solar facility be constructed on the specific site. Most of the studies undertaken, including the Socio-Economic, Soil and Agricultural Potential, Palaeontological, Traffic and the Visual Impact Assessment, did not provide a preference for a specific site since the impacts would be the same for all the sites. The Visual Impact Assessment did recommend that the proposed development be clustered together i.e. the three 75 MW be located together and close to the proposed Nieuwehoop Substation to reduce the cumulative visual impact (the cumulative impact is further discussed in Section 14.4 of this Chapter).

The Ecological Impact Assessment, which assessed the terrestrial and aquatic features present on site, indicated that from an ecological perspective, the Boven Solar PV1 site is the favoured option. The alternative site was not considered suitable since several intact drainage lines that could be impacted upon by the stormwater management systems that would be required for the PV plant. A map showing the sensitive ecological features is provided in Figure 14.2 (this map is also attached in Appendix B.1). The figure shows that the alluvial watercourse present has a “High” sensitivity and the drainage lines a

"Moderate" sensitivity. Based on the high sensitivity of these features and the need for a WULA, should these features be physically affected, these alluvial watercoures should be avoided.

The Heritage Impact Assessment found that no highly significant heritage resources exist on any of the sites assessed. In terms of protecting landscape character, the Boven Solar PV1 site is favoured, as keeping the facility close to the existing railway and electrical infrastructure would be most desirable. The heritage resources that were found on site and that were indicated to have a heritage resource sensitivity, are also shown in Figure 14.2.

The environmental sensitivity map and an overlay of site alternatives that were considered are shown in Figure 14.3. Based on the environmental and heritage specialist studies and the sensitivities shown on the map, the **Boven Solar PV1** site is identified as the preferred site.

Figure 14.2/...

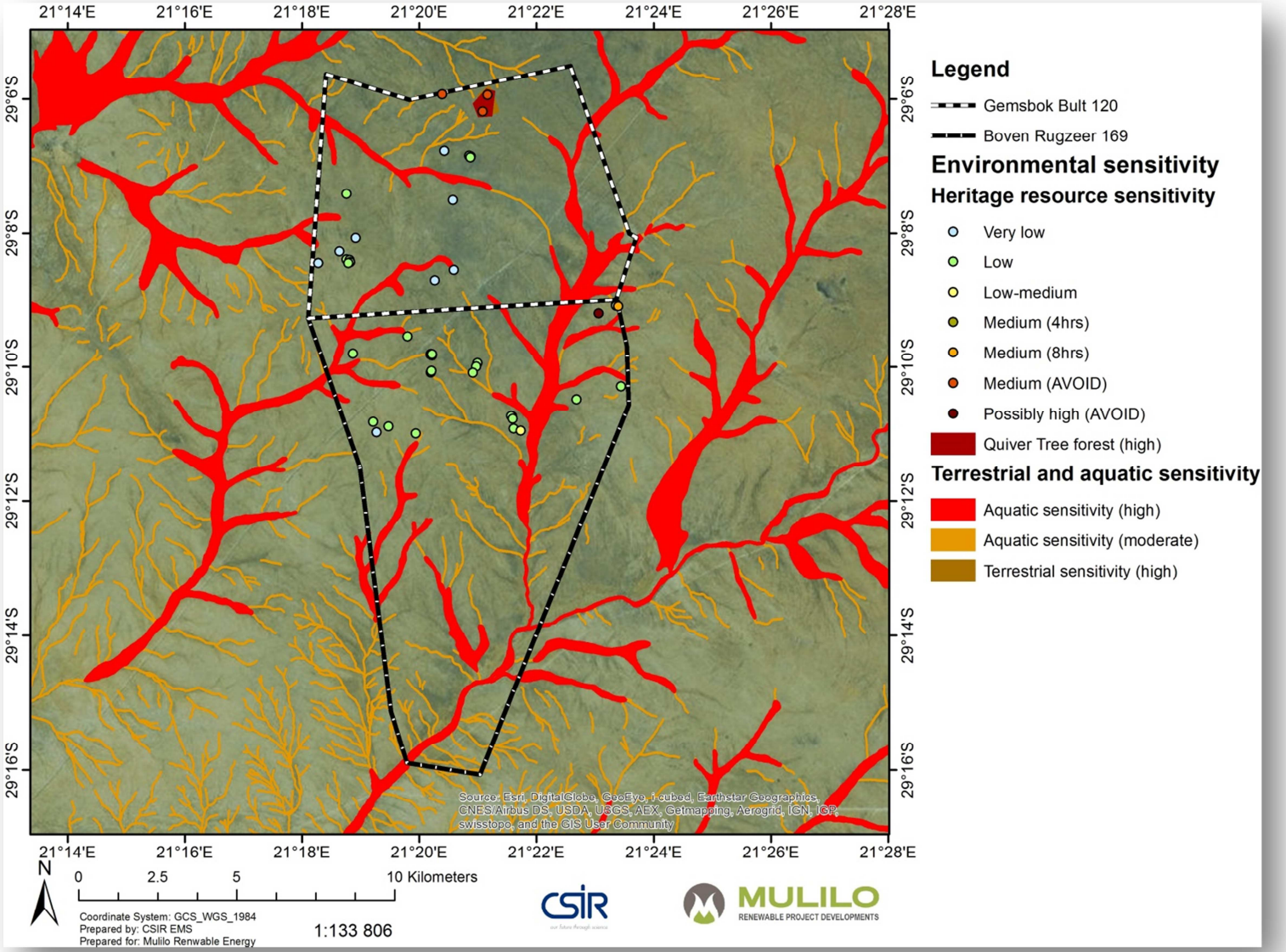

Figure 14.2: Environmental sensitivity map for the farms Gemsbok Bult (Remaining Extent of Portion 3 of 120) and Boven Rugzeer (Remaining Extent of farm 169)

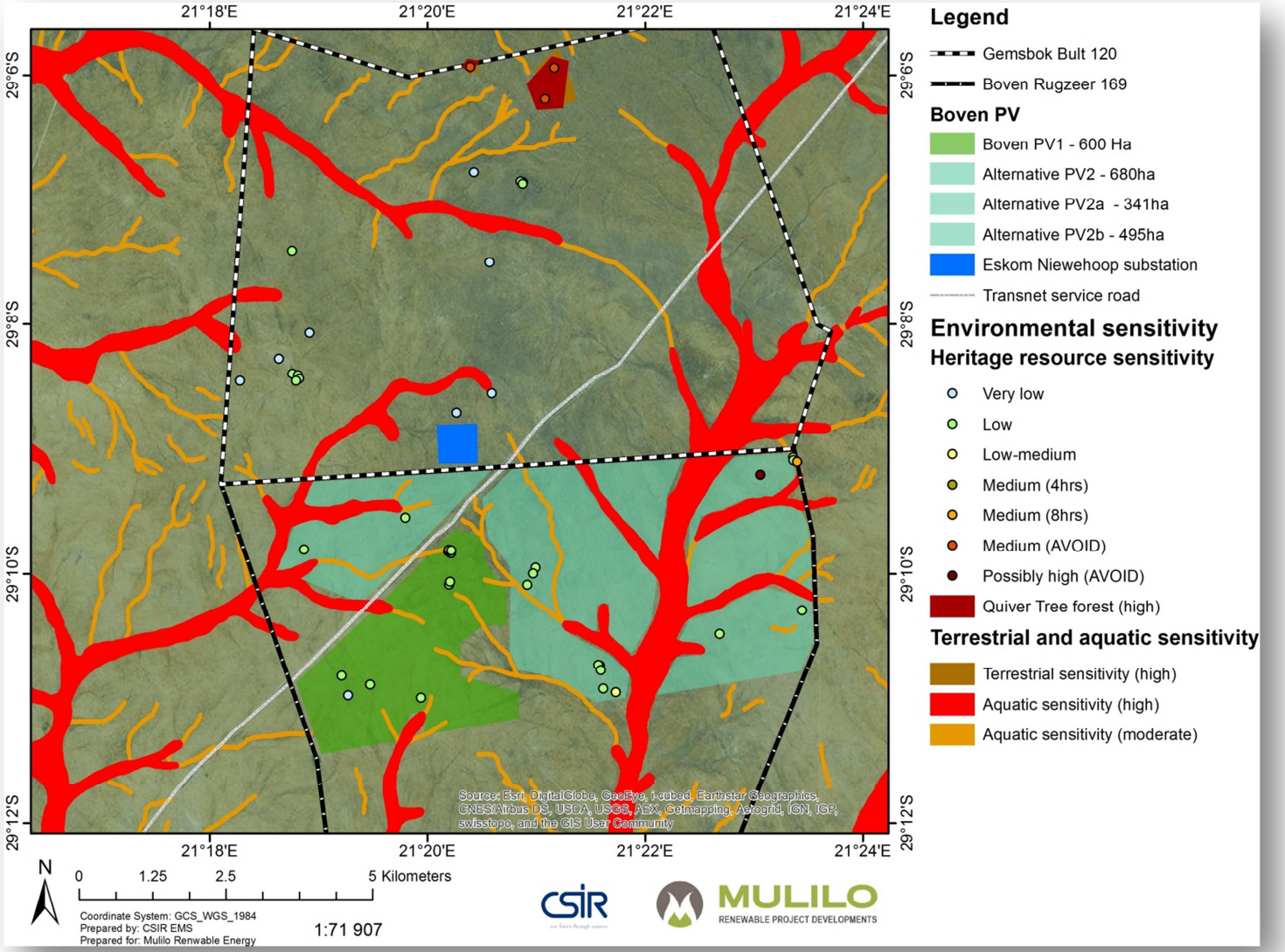

Figure 14.3: Overlay of the environmental sensitivity map with the alternative sites that were considered during the EIA

14.2.3 Technology alternatives

14.2.3.1 Solar technology and mounting system alternatives

As discussed in Section 2.2 of Chapter 2 of the Draft EIAr, two technologies were considered during the EIA, i.e. concentrated photovoltaic (CPV) and photovoltaic (PV) technology. CPV technology requires 5 ha/MW and PV technology requires 4 ha/MW, depending on whether it tracks with the sun or not. Both technologies would be constructed to avoid the sensitive environmental features shown in Figure 14.2. PV is less expensive to construct compared to CPV, which is a newer technology. Therefore, in terms of commercial criteria and given the need to be competitive in the REIPPPP bidding process, PV technology is the preferred option.

A concern raised by Transnet is the reflectiveness of the PV panels and how it could potentially affect the trains on the Sishen-Saldanha ore line. The glass used in the manufacture of PV panels is designed to maximise absorption of light (to improve the energy efficiency of the panels) and minimise reflection, glint and glare[1] [2]. Subsequently, solar PV panels are less reflective than water (Figure 14.4) and it is therefore not anticipated that the reflection of these panels will have an impact on the trains.

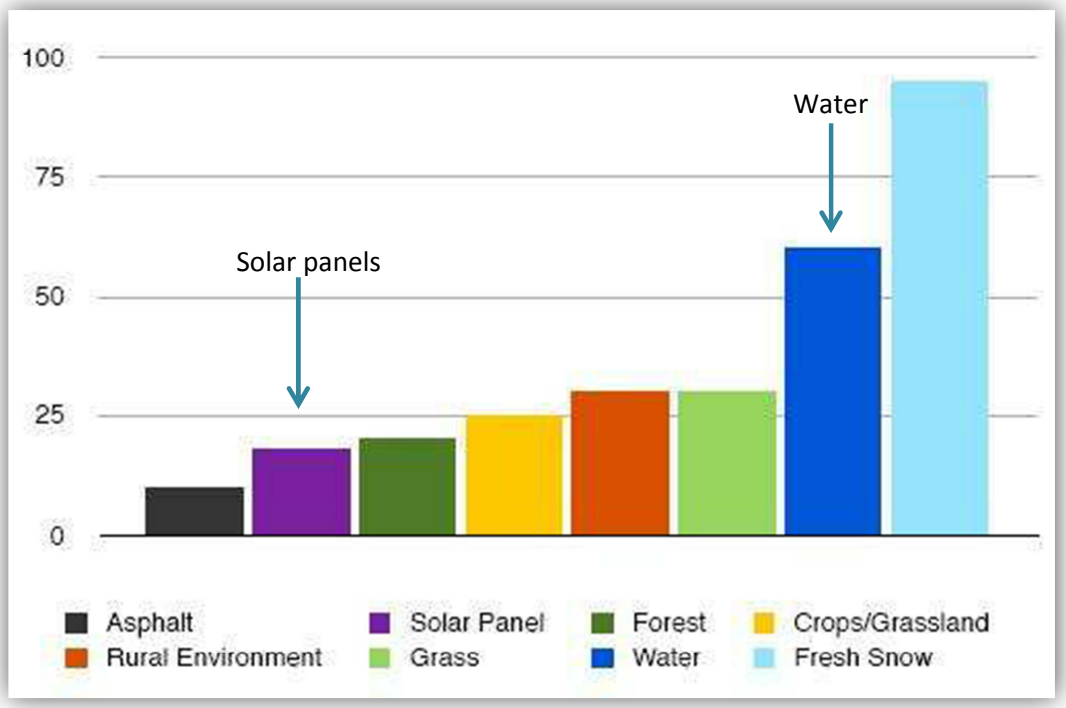

Figure 14.4: Reflected energy percentage of solar panels compared to other material (Source: Spaven Consulting, 2011).

[1] Spaven Consulting. (2011). Solar Photovoltaic energy facilities: assessment of potential for impact on aviation. January 2011. Report no: 10/344/RPS/1. United Kingdom.
[2] Building Research Establishment (BRE) United Kingdom. (2013). Planning guidance for the development of large scale ground mounted solar PV systems. Cornwall: BRE.

A PV facility's solar panels can be mounted in various ways to ensure maximum exposure of the PV panels to sunlight. The two main mounting systems included in the EIA were:

- Single axis tracking systems; and
- Fixed axis tracking systems.

In a fixed axis tracking system, the PV panels are installed at a set tilt facing North and cannot move, whereas in a single axis tracking system the panels follow the sun East to West to ensure maximum exposure to sunlight. The PV single axis tracking system technology has the following benefits:

- Low installation costs and fewer panels required for same output as other tracking technologies;
- Produces the most energy per hectare of any tracking system;
- Highly efficient panels not only require less land, but also less concrete, steel and cabling per MW; and
- The panel's anti-reflective glass and exceptional low-light performance characteristics enhances energy delivery.

The single axis tracking system will require more land, compared to the fixed axis tracking system, because it requires space to move with the sun. Based on the environmental sensitivities on site and the available development footprint of the Boven Solar PV1, the single axis tracking system can be used on site without having a higher environmental impact (i.e. will still be constructed to avoid the environmental sensitivities indicated in Figure 14.2) and would not exceed to 3 m height assessed by the visual specialist. Based on the higher efficiency of the single axis tracking system and the fact that it would be constructed within the development footprint which avoids all environmental sensitivities, the **preferred mounting system is a single axis tracking system.**

14.2.3.2 Battery storage facility

The proposed solar facility will include the construction and operation of a battery storage facility. This facility will be constructed next to the on-site substation and will be able to store electricity generated from the facility. This stored electricity can then be supplied to the grid during peak demand and/or when the sun is not shining. The two main battery storage technologies and different electrolytes that can be used are discussed in Chapter 2 (Project Description) and summarised below:

Redox Flow Battery (RFB):	**Solid State system:**
• Iron-chromium • Vanadium-vanadium • Zinc-bromine	• Lithium-ion • Sodium-ion • Lead-acid

Both technology alternatives and the electrolytes that can be used have their advantages and disadvantages, as outlined in Section 3.4.2 of Chapter 3 (Assessment of Alternatives). During the EIA process, a development footprint of 200 X 200 m and height of 30 m for the technology was assessed as part of the proposed solar energy facility. All the battery technology types that were considered fall within

the development footprint and from an environmental perspective (including ecological, heritage and visual perspective), one technology is not preferred over another. When considering the preferred technology from a feasibility perspective, the following will be, inter alia, considered:

- What technology would be the most financially viable to construct and operate on site?; and
- The maturity of the market (supply and demand) i.e. the need for a battery storage facility.

Based on the desktop review of the environmental risks and impacts associated with these types of facilities, the following mitigation measures have been included within the project's EMPr to ensure that any risk or impact would be suitably managed through appropriate management measures:

- Soil contamination from leakage from battery (during transport and on-site construction and operation)
  - Used batteries must be transported inside impermeable/sealed containers.
  - Containers must be well secured onto the transport vehicle.
  - The transport vehicle must be correctly identified, following international conventions, with symbols and colours that convey which corrosive and hazardous products are being transported.
  - A minimum set of equipment necessary to combat any simple spillage or leakage problems should be provided and the transport team trained on how to use it.
  - Drivers and personnel on site handling hazardous wastes from the battery storage facility should be trained in emergency procedures (including fires and spillages) and how to contact emergency response teams. In addition, they should be aware of the specific kind of hazardous material that is being transported and associated health and safety requirements.
  - Personal Protection Equipment (PPE) should be provided for the transport team and they should be trained in the use of the equipment, in case of any accident.
  - The construction and operation of this facility should adhere to the appropriate international standards and SANS requirements and should be located on an impermeable barrier/layer (e.g. concrete surface with acid lining).
  - Secondary containment (bunding) may need to be constructed and must have a capacity of at least 110% of the largest storage tank's capacity. The secondary containment should include the following:
    - The off-loading point must be located in the bunded area to ensure that any potential spill during the off-loading of the electrolyte solutions is contained;
    - Divert rainwater away from the bunded area to avoid rainwater mixing with electrolyte spillage potentially present within the secondary containment;
    - Ensure that the containment area is sloped to a sump; and
    - All drains should be covered.

  - Although highly unlikely, any spill/leakage from the battery storage facility must be attended to immediately and be handled in an environmental friendly manner (i.e. no discharge into the ground or any surface water body) and must be disposed of at an appropriate licenced hazardous waste disposal facility.
  - A spill kit (e.g. peatsorb/drip trays) should be available at strategic locations. In case of a spillage of hazardous chemicals where contamination of soil occurs, depending on the degree of contamination, excavation and removal to a hazardous waste disposal site might be necessary. If the spillage is widespread, a specialist will need to be immediately appointed to deal with the issue, the DEA notified and the notification process stipulated in the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN 331, 2 May 2014) should be followed.

- Risk of fire, explosion or release of toxic gas
  - The battery storage facility must be located outside (i.e. well-ventilated) and include vents (where necessary and applicable).
  - Should electrolyte solutions be stored on site, these should be stored away from incompatible materials such as all peroxides, such as hydrogen peroxide; chemicals that react with acid to generate a gaseous product, such as carbonate and bicarbonates, sulfites and bisulfites; strong reducing agents, such as alkaline metals (Li, Na, K) and alkaline earth metals (Be Mg Ca, Sr, Ba); reactive metals such as aluminum and zinc, all hydrides (such as LiAlH4, NaBH4), and some carbides (such as CaC2).
- Replacement of materials and waste generation
  - Any materials that are transported, stored or replaced should be appropriately handled according to the Materials and Safety Data Sheet (MSDS) and sent to a registered hazardous landfill site.
  - The MSDSs should be kept on site to ensure proper handling of the electrolytes.
  - PPE (appropriate gloves, safety glasses/face shield, appropriate clothing) should be worn when handling the electrolyte solutions.

The construction of such a facility with these dimensions was not considered to have a significant (“High”) environmental impact. From a feasibility and economical perspective, Mulilo has not determined what the preferred technology would be since with the current advancement in this field, by the end of 2015 (estimated date of commencement of construction) the preferred technology may be different from what would have been deemed the preferred technology in this report. Based on the above mitigation measures included within the project’s EMPr (Section B), all environmental risks and impacts associated with the transport, construction and operation (which includes the replacement of the materials) of the battery storage facility would be suitably managed, irrespective of the type of battery technology to be used on site. The preferred technology will not exceed the footprint of 30 m in height and 200 X 200 m footprint and would fall within the solar facility’s development footprint. It is imperative that the design specifications provided by the battery supplier be followed and implemented and that the MSDSs of the electrolytes be carefully examined to ensure that any disposal, handling, storage or transporting of these materials are undertaken with the measures outlined within the MSDS.

14.2.4 Layout Alternatives

Box 14. 1: Rochdale Envelope Approach

In order to provide context to this section, the term "Rochdale Envelope Approach"[1] needs to be described. The Rochdale Envelope Approach is named after two legal cases relating to a proposed business park in Rochdale in the United Kingdom. These cases considered applications for outline planning consent in the context of preparing an EIA. The goal of the Rochdale Envelope Approach is to allow for an EIA to be undertaken, based on the 'worst case scenario', whereby the Competent Authority granting the Environmental Authorisation will then decide whether, based on this 'worst case scenario', the environmental impacts are acceptable.

This approach is very useful since normally an EIA is undertaken prior to the technical assessment of the site which would consider the exact placement of, for example, the solar panels and associated infrastructure. The main principle behind this approach is that, should the development fall within the parameters set within this "envelope", as determined by the EIA process, the placement of the different components could be determined at a later stage provided that the components fall within the parameters of the envelope. This approach therefore allows for flexibility to the Developer during the detailed design phase in terms of engineering, design and construction parameters.

[1] Infrastructure Planning Commission (PIC), Using the 'Rochdale Envelope'. February 2011

The map provided in Figure 14.5 (and attached in Appendix B.2) shows the environmental sensitivity map superimposed on the layout of the preferred site, Boven Solar PV1. The layout takes into account the recommendation of the Ecological Impact assessment which indicated that the identified sensitive areas (specifically the red areas) must be excluded from the development footprint. From a heritage perspective, the current layout does include heritage features that have been identified as having "low" or "very low" sensitivity. The feature identified as having a "low" sensitivity is quartz background scatter on rocky substrate in a slightly elevated area and the "very low" features include an area of higher density background scatter in a partially deflated area and a flaked quartz outcrop with quartz flakes around it. The impact of the development on these features would therefore be negligible.

The current layout footprint is 400 ha in extent and is designed to avoid the significant ("High") environmental and heritage sensitive features identified on site and is therefore considered to be the Development Envelope of the proposed Boven Solar PV1 solar energy project (see Box 14. 1). The Boven Solar PV1 solar facility will require 300 ha for the development and therefore the 400 ha Development Envelope provides Mulilo with sufficient space for the placement of the solar field and associated infrastructure and allows for design optimisation during the detailed design phase of the project. Development within this footprint will not exceed (but may fall below) the parameters assessed in this EIA and outlined in Table 14.2. The specialist studies that have been undertaken and discussed throughout this Draft EIAr considered all the components that form part of the proposed project. This includes the solar field, building infrastructure and the associated infrastructure such as the on-site substation and the battery storage facility.

Since this Development Envelope considers all the environmental sensitivities that have been identified during this EIA, the specific locations of the solar field and building infrastructure does not need to be pre-defined and could occur within any location within the envelope without adding to the significance of the environmental impacts (as per the Rochdale Envelope Approach). Therefore, no layout alternatives have been considered as part of this EIA but rather, the restriction is placed on the Developer to develop the solar field and building infrastructure within the boundaries of and parameters set within the Development Envelope.

The same applies for the 132kV transmission line corridor from the proposed Nieuwehoop Substation to the on-site substation. The corridor was assessed by all specialists and no sensitive features were identified with the exception of the drainage line. The towers of the transmission line must be placed outside the predetermined buffer zone of the drainage line. The 132 kV overhead transmission line will be 30 m in height and span 2 km (Table 14.2). Therefore, within this corridor, the transmission line can be routed without one routing alternative having a higher environmental impact compared to another route.

Table 14.2: Parameter of components within the Development Envelope

COMPONENT FALLING WITHIN THE DEVELOPMENT ENVELOPE	PARAMETER
PV modules with Single Axis Tracking	Height : 3 m
Solar measuring station	Height : 5 m; Footprint : 100 m2
Offices	Height : 5 m; Footprint : 50 X 50 m
Operational and Maintenance control centre	Height : 5 m; Footprint : 50 X 50 m
Warehouse/workshop	Height : 5 m; Footprint : 50 X 50 m
Ablution facilities	Height : 5 m; Footprint : 50 X 50 m
Inverter stations	Height : 3 m; Footprint : 20 X 20 m
On-site substation and substation building	Height : 30 m; Footprint : 200 X 200 m
Guard House	Height : 3 m; Footprint : 10 X 10 m
Energy Storage Facility	Height : 30 m; Footprint : 200 X 200 m
22/33 kV Internal distribution lines	Height : 3 m; Footprint : 12 m servitude

ASSOCIATED INFRASTRUCTURE (COMPONENTS FALLING OUTSIDE THE DEVELOPMENT ENVELOPE)	
132kV Overhead transmission lines	Height : 30 m; Footprint: 32 m servitude
Internal access roads	Length : 2 km; Width : < 8 m
Laydown area (construction phase) and panel maintenance and cleaning area (operational phase)	Footprint : 20 ha
Storm water channels	Length : >1000 m
Water pipelines	Length : >1000 m; Diameter : < 0.3 m Throughput : < 100 L/s

Table 14.2 above details the components fall within the Development Envelope and associated infrastructure that falls outside the Development Envelope. Figure 14.5 shows the Development Envelope, the 132 kV transmission line corridor, the location of the laydown area/panel maintenance cleaning area and the proposed routing of the pipelines and internal access roads.

Table 14.3 details the coordinates of the development envelope, the transmission line corridor and the internal access roads and proposed pipelines:

Table 14.3: Component coordinates of the Boven Solar PV1 project

Project component	Latitude	Longitude	Latitude	Longitude
Development Envelope	29°11'9.61"S	21°20'4.83"E	29° 9'55.70"S	21°19'56.17"E
	29°10'58.31"S	21°20'4.74"E	29° 9'55.99"S	21°20'9.58"E
	29°10'57.50"S	21°19'59.89"E	29°10'2.93"S	21°20'9.61"E
	29°11'4.39"S	21°19'56.21"E	29°10'3.00"S	21°20'23.86"E
	29°11'4.93"S	21°19'32.58"E	29°10'8.45"S	21°20'23.92"E
	29°11'21.53"S	21°19'42.24"E	29°10'8.61"S	21°20'12.87"E
	29°11'21.50"S	21°18'59.80"E	29°10'19.45"S	21°20'24.29"E
	29°10'48.28"S	21°18'53.51"E	29°10'41.41"S	21°20'24.48"E
	29°10'21.94"S	21°19'26.28"E	29°10'33.65"S	21°20'3.35"E
	29°10'20.32"S	21°19'43.55"E	29°10'38.20"S	21°20'2.74"E
	29°10'26.03"S	21°19'58.06"E	29°10'46.00"S	21°20'19.40"E
	29°10'22.71"S	21°20'0.04"E	29°10'54.57"S	21°20'23.20"E
	29°10'12.16"S	21°19'37.54"E	29°11'9.58"S	21°20'23.46"E
132 kV transmission line corridor			29° 8'21.70"S	21°19'18.66"E
			29° 8'21.77"S	21°19'8.35"E
			29° 8'41.51"S	21°20'11.49"E
			29° 8'48.69"S	21°20'2.51"E
Pipeline 1	Start point		29° 7'4.09"S	21°19'55.17"E
	Point 1		29° 7'24.08"S	21°19'51.25"E
	Point 2		29° 8'20.17"S	21°19'52.30"E
	Point 3		29° 8'20.34"S	21°20'36.40"E
	Point 4		29° 9'7.81"S	21°20'37.75"E
	Point 5		29° 9'34.82"S	21°20'10.47"E
	Point 6		29° 9'55.46"S	21°20'17.40"E
	End-point		29° 9'55.74"S	21°20'7.04"E
Pipeline 2	Start point		29° 7'21.22"S	21°22'40.23"E
	Point 1		29° 7'23.95"S	21°22'37.73"E
	Point 2		29° 7'22.41"S	21°22'29.85"E
	Point 3		29° 8'5.42"S	21°21'53.61"E
	Point 4		29° 8'20.53"S	21°21'32.03"E
	Point 5		29° 8'19.84"S	21°20'36.41"E
	Point 6		29° 9'7.81"S	21°20'37.75"E
	Point 7		29° 9'34.82"S	21°20'10.47"E
	Point 8		29° 9'55.46"S	21°20'17.40"E
	End-point		29° 9'55.74"S	21°20'7.04"E
Internal access road	Start point		29°10'33.95"S	21°19'3.74"E
	Point 1		29°10'34.81"S	21°19'4.67"E
	End-point		29°10'34.56"S	21°19'10.23"E

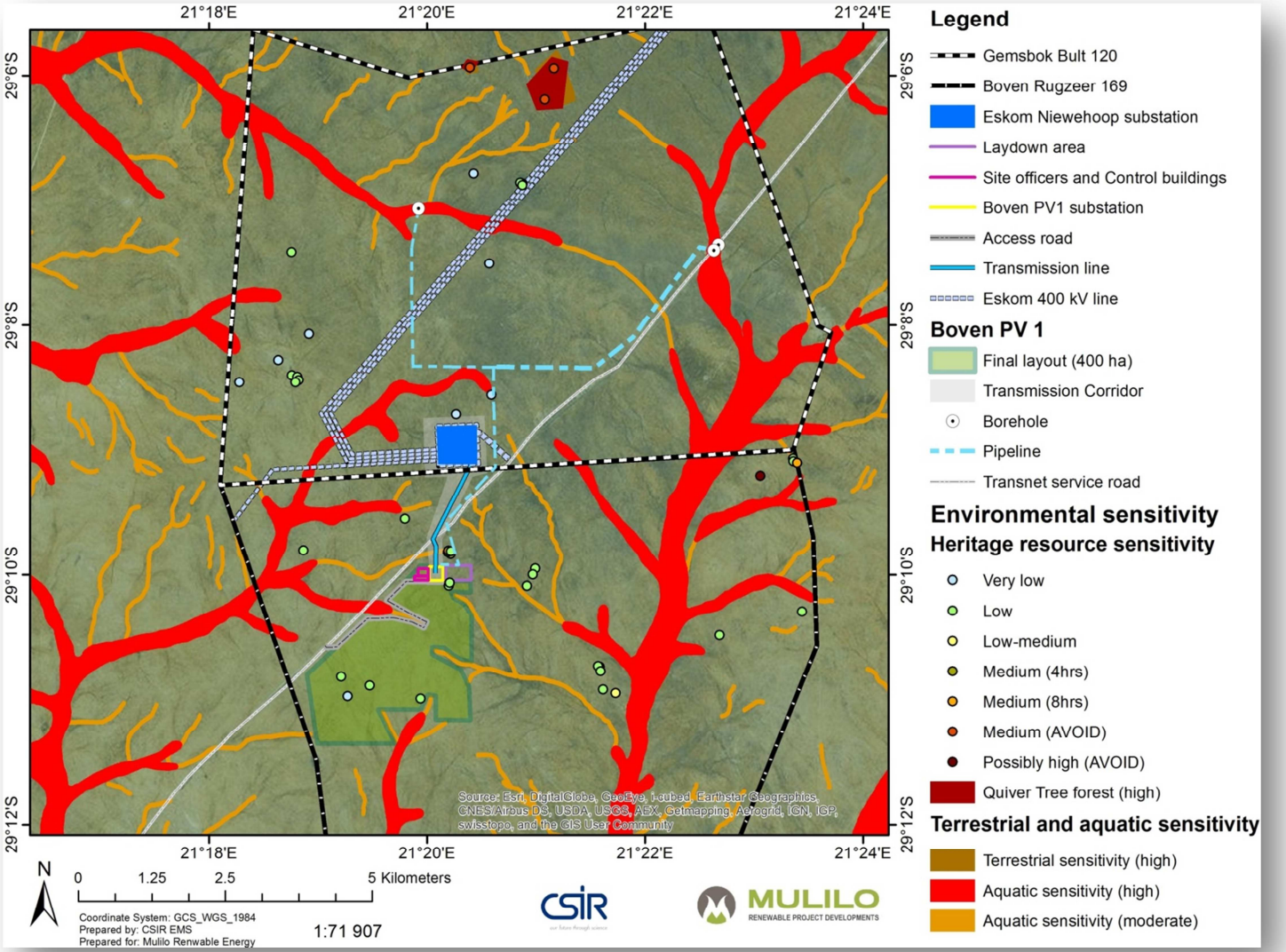

Figure 14.5: Map showing the Development Envelope superimposed on the environmental sensitivity map

14.3 CUMULATIVE EFFECTS

In Chapter 6 (Plan of Study for EIA) of the Scoping Report, it was indicated that the cumulative impacts will be assessed by identifying other solar energy project proposals and other applicable projects, such as construction and upgrade of electricity generation, transmission or distribution facilities in the local area (i.e. within 20 km of the proposed Boven Solar PV1 project) that have been approved (i.e. positive EA has been issued) or currently underway. The projects that have been identified and discussed in Table 14.4 below are:

- EIA, WULA and EMPr for the proposed Solar CSP Integration Project: Project 1 – Solar substation, 2 X 400 kV powerlines from Aries to the solar substation and 400 kV powerline from Nieuwehoop to the Solar substation;
- Nieuwehoop 400/50 kV Substation loop in and loop out lines, Northern Cape Province;
- Proposed construction of Gemsbok PV1 75 MW Solar PV facility on the remaining extent of Portion 3 of the Farm Gemsbok Bult 120, Kenhardt, Northern Cape (i.e. this project);
- Proposed construction of Gemsbok PV2 75 MW Solar PV facility on the remaining extent of Portion 3 of the Farm Gemsbok Bult 120, Kenhardt, Northern Cape; and
- Proposed construction of Boven PV1 75 MW Solar PV facility on the remaining extent of the Farm Boven Rugzeer 169, Kenhardt, Northern Cape.

Cumulative heritage impact

In terms of the cumulative heritage impacts, because of the very low density of archaeological sites reported in the region, cumulative impacts to archaeological resources will be minimal (i.e. **low** significance). No mitigation or management measures are required, although in the preferred Boven Solar PV1 site it would be preferable to avoid the vicinity of the pan in order to protect what little archaeology does occur there (this was avoided). In terms of the cultural landscape, although cumulative impacts would occur through the construction of three similar facilities in close proximity to one another, these impacts are of low significance because of the site's remote location and the other existing features that already bring industrial features into the landscape (railway, proposed substation and power lines).

In the absence of comprehensive data on further alternative energy or other developments to the northeast of Kenhardt, it is impossible to realistically assess cumulative impacts on fossil heritage resources. The palaeontological heritage impact significance of all three solar energy developments proposed within the Nieuwehoop Solar Development is rated equally as low. The potentially fossiliferous sedimentary rock units represented within this area are of widespread occurrence and this is also likely to apply to most of the fossils they contain. It concluded that the significance of the cumulative impacts on fossil heritage resource posed by the known solar energy developments to the northeast of Kenhardt are **low**.

Table 14.4: EIA processes currently underway within 20 km of the proposed project

PROJECT NAME	APPLICANT	DEA REFERENCE NUMBER	BRIEF PROJECT DESCRIPTION	PHASE
EIA, WULA and EMPr for the proposed Solar CSP Integration Project: Project 1 – Solar substation, 2 X 400 kV powerlines from Aries to the solar substation and 400 kV powerline from Nieuwehoop to the Solar substation	Eskom Holdings SOC Limited	DEA Reference Number: 12/12/20/2606 NEAS Reference Number: DEA/EIA/0000785/2011	The proposed Solar Park Integration Project entails the construction of a substation at the Upington Solar Park, 400 kV transmission lines to the east and south of Upington to feed the electricity into Eskom's National Grid as well as the construction of a number of 132 kV power lines inter-linking the IPP solar plants with the Eskom Grid and distributing the power generated to Upington.	The project received a positive EA on 14 February 2014.
Nieuwehoop 400/50 kV Substation loop in and loop out lines, Northern Cape Province	Eskom Holdings SOC Limited	DEA Reference: 12/12/20/1166	Construction of the 400/50kv Nieuwehoop substation between the Garona and Aries substations, and 3km Loop In and Loop Out Lines.	The project received a positive EA on 21 February 2011. Site preparation for the construction of the Nieuwehoop Substation has commenced.
Proposed construction of Gemsbok PV1 75 MW Solar PV facility on the remaining extent of Portion 3 of the Farm Gemsbok Bult 120, Kenhardt, Northern Cape.	Mulilo Renewable Project Developments (Pty) Ltd	DEA reference number: 14/12/16/3/3/2/710	Mulilo Renewable Project Developments (Pty) Ltd intends to develop a 75 MW Solar PV power generation project on the farm Gemsbok Bult (Remaining Extent of Portion 3 of Farm No. 120).	These projects are being undertaken parallel (i.e. joint Public Participation Process) and are collectively referred to as the Nieuwehoop Solar Development. The Draft EIA reports are currently available for public review.
Proposed construction of Gemsbok PV2 75 MW Solar PV facility on the remaining extent of Portion 3 of the Farm Gemsbok Bult 120, Kenhardt, Northern Cape	Mulilo Renewable Project Developments (Pty) Ltd	DEA reference number: 14/12/16/3/3/2/711	Mulilo Renewable Project Developments (Pty) Ltd intends to develop a 75 MW Solar PV power generation project on the farm Gemsbok Bult (Remaining Extent of Portion 3 of Farm No. 120).	
Proposed construction of Boven PV1 75 MW Solar PV facility on the remaining extent of the Farm Boven Rugzeer 169, Kenhardt, Northern Cape **(i.e. this project)**.	Mulilo Renewable Project Developments (Pty) Ltd	DEA reference number: 14/12/16/3/3/2/712	Mulilo Renewable Project Developments (Pty) Ltd intends to develop a 75 MW Solar PV power generation project on the farm Boven Rugzeer (Remaining Extent of Farm No. 169 in the Northern Cape of South Africa.	

Cumulative terrestrial ecology impact

From a terrestrial environmental viewpoint, the significance cumulative impact on the loss of vegetation and habitat fragmentation, increased risk of plan invasion and increased animal mortality is predicted to be **low** because of the approximate sizes of the disturbed areas and the low plant cover. A number of protected plants and their habitats were observed during this study; including the species, *Acacia erioloba*, *Aloe dichotoma* and *Boscia* spp. and therefore the significance of the cumulative loss of these species would be considered to have a **medium** negative impact. Considering that the proponent proposes to establish three PV solar plants (inclusive of this project) within close proximity, coupled to the proposed Eskom 400 kV transmission lines that will also be constructed in the area, the cumulative impact on animal movement and bird collisions could be of **medium** to **high** significance.

Cumulative aquatic ecology impact

The potential for changes in the hydrological regime do exist and therefore there is the potential for erosion and increased run-off. With mitigation and considering the low average annual rainfall for the region, the cumulative impact significance would be **low**.

Cumulative socio-economic impact

Development of more solar energy facilities in the study area is likely to negatively impact on biodiversity, farming and tourism. These impacts might further negatively affect local industries, and consequently diminish certain livelihood strategies. However, the relationship of biodiversity, tourism and farming to the majority of local livelihood strategies is weak. As a result, cumulative impacts on biodiversity, tourism and farming in the study area appear to be acceptable. Similarly, the incidence and severity of the in-migration of job seekers as well as increases in social deviance will probably increase as more solar energy facilities are developed in the study area. Such increases are also associated with most other forms of economic and social development and should therefore be expected only from industrial scale developments in the study area.

Finally, the cumulative success of the proposed project and other projects offering significant socio-economic benefits are likely to present a major economic pull factor which is bound to exacerbate in-migration into the study area as well as increases in social deviance. However, the cumulative socio-economic benefit offered by industrial scale development in the study area is considered to outweigh the potential negative impacts associated with economic growth.

Cumulative impact on soil and agricultural potential

The proposed development is on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable and important for agricultural production. However, the proposed site is located on land which has very low agricultural potential and is only suitable for low intensity grazing. This reduces the significance of all agricultural impacts. Therefore, the cumulative impact due to the regional loss of agricultural land resources as a result of other developments on agricultural land in the region would therefore be **very low**.

Cumulative visual impact

There are other solar projects in the ZF Mgcawu District according to the SDF report for the district but these are more than 50 km from the proposed Boven Solar PV1 site (Siyanda SDF, 2012)[3]. South-west of Kenhardt is the experimental Aries 10 MW photovoltaic plant adjacent to the Aries Substation (Figure 14.6). This project is also more than 50 km from the Boven Solar PV1 project and was not be included in the cumulative impact assessment. Eskom plans to build 400 kV transmission lines from Aries Substation to Nieuwehoop Substation in 2015 and Ferrum Substation to Nieuwehoop Substation in 2017 (Eskom 2013)[4]. The Nieuwehoop Substation will contain structures up to 30 m high and will appear similar to the Aries substation.

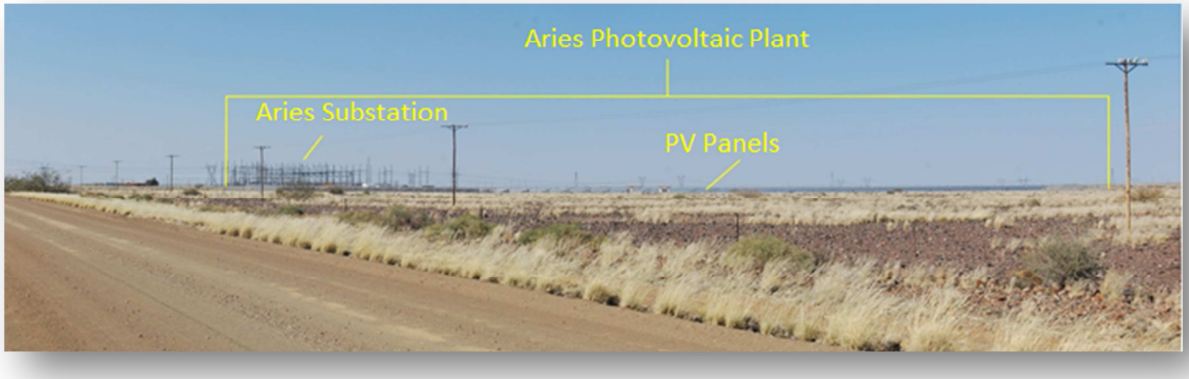

Figure 14.6: Aries 10 MW photovoltaic plant from 2km away, with the Aries substation behind it.

The three solar projects will be built in a landscape that is already considerably impacted on and altered by large industrial type structures. Within 10 km of the developments, the viewsheds are very similar and the same visual receptors will be affected by them. The intensity of the cumulative visual impact of these projects is therefore likely to be moderate to high due to the size of the projects but the significance will be **low** due to the fact that the landscape will be altered by a substation and high voltage transmission lines for the same sensitive visual receptors, and very few sensitive visual receptors are likely to be affected.

[3] Siyanda DM. 2012. *Siyanda District Municipal Spatial Development Framework Final Combined SDF Report*. Spatial Development Framework. Upington, South Africa: Siyanda District Municipality. Siyanda DM SDF 2012
[4] Eskom. 2013. *Transmission Ten-Year Development Plan 2013-2022*. Transmission Development Plan. Johannesburg, South Africa: Eskom

Cumulative traffic impact

Even though 60 trucks may be arriving on site during the construction phase, should all three projects commence at the same time, the cumulative impact of this on the general traffic would be negligible (low) as the additional peak hour traffic would be at most 6 trips.

Summary of the cumulative effects

As shown in Table 14.5 below and discussed in the section above, the overall cumulative significance of the proposed Nieuwehoop Solar Development, Eskom Nieuwehoop Substation and transmission lines will be low. The determination of the cumulative impact significance as low means that the impacts would remain local and that the impacts are reversible, should they occur. The most significant cumulative impact would be to animal movement and bird collisions. With the management and mitigation measures included in the EMPr (Section B) and with combined efforts with Eskom, it is currently estimated that this impact would be suitably managed through adequate monitoring and the inclusion of flappers/bird deflectors and fencing, where required. The socio-economic cumulative benefit associated with the proposed project is of medium-high significance and would contribute to the local and district municipal economy. These benefits would be further enhanced through the implementation of Plans such as a Workforce Recruitment Plan, a Stakeholder Engagement Plan and the Economic Development Plan.

Table 14.5: Summary of cumulative impacts

CUMULATIVE IMPACT	IMPACT SIGNIFICANCE
Heritage	
Archaeology and cultural landscape	Low - negative
Fossil heritage resources	Low - negative
Ecological: Terrestrial	
Loss of vegetation	Low - negative
Habitat fragmentation	Low - negative
Increased risk of plan invasion and increased animal mortality	Low - negative
Loss of SCC	Medium- negative
Animal movement and bird collisions	Medium to High - negative
Ecological: Aquatic	
Increased potential for erosion	Low - negative
Reduction in permeable surfaces	Low - negative
Socio-economic	
Socio-economic negative impacts	Medium - negative
Socio-economic benefits	Medium - High - positive
Soil and agricultural potential	
Regional loss of agricultural land resources	Very low - negative
Visual	
Visual impact significance (cumulative viewshed)	Low - negative
Traffic	
Increase in traffic generation	Low - negative

14.4 PERMITS AND LICENSES REQUIRED

a) Permit in terms of the National Water Act (Act No. 36 of 1998)

Section 21 of the Act lists the following water uses that need to be licensed:

(a) taking water from a water resource;
(b) storing water;
(c) impeding or diverting the flow of water in a watercourse;
(d) engaging in a stream flow reduction activity contemplated in section 36;
(e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
(f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
(g) disposing of waste in a manner which may detrimentally impact on a water resource;
(h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
(i) altering the bed, banks, course or characteristics of a watercourse;
(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
(k) using water for recreational purposes.

In terms of the applicability of NWA, the following should be noted:

- No wetlands occur on the Boven Solar PV1 site, in terms of the NWA wetland definition;
- Man-made pans are present on site but are avoided by the Boven Solar PV1 development;
- The stormwater management plan would be designed to ensure that runoff from the site does not result in erosion or changes in hydrological features in any of the natural drainage lines associated with the site;
- No development is going to occur within the drainage lines or alluvial watercourses present on site. The infrastructure that will cross the drainage lines is the proposed transmission lines but the towers will be placed outside the required buffer so as to avoid the drainage line;
- The pipelines that may be constructed from the boreholes to the site will be located within the watercourses identified on site (Section c and i);
- Groundwater abstraction will occur via boreholes located on the site, as discussed in Chapter 2 and Chapter 13.

The following correspondence was received from DWS, dated 18 August 2014: “Our assessment indicates that the quaternary drainage region D53B falls within Zone 5 of the General Authorisations which allows for the abstraction of 45 m^3 of water per hectare per annum for Small Industrial Users only (as extended under Notice 837 in the Government Gazette of 23 September 2010). Kindly note that energy developments/projects are not part of small industrial users and as such cannot be entitled to the water use allowance set aside for small industrial users as determined by the General Authorisation”. During a

telephonic conversation with the case officer from DWS, Mr KK Sekwaila in October 2014, it was indicated that even if the water use does not fall within the Government Gazette discussed above, it does not necessarily mean that WULA process would be required but DWS can now, based on a renewable energy project's water requirements and water availability in the area, determine whether a project requires a GA or a WULA. As per Annexure 2 attached to the DWS letter, the CSIR has compiled the information document required for the Pre-application Consultation (attached in Appendix D.5) and will arrange the Pre-application Consultation with DWS during the commenting period of the Draft EIAr phase.

b) Permit in terms of the National Forest Act (Act 84 of 1998)

The Ecological Impact Assessment lists the plant species of conservation concern (i.e. protected plant species) that were observed primarily within the greater study region, specimens of *Acacia erioloba* were found within the riparian zones of the alternative site, but not within the Boven Solar PV1 site's boundary.

It is therefore not expected that any permit would be required in terms of the Act. The absence or presence of these species will be confirmed as part of the plant rescue and protection plan and should any species be present and determined that they will be impacted on, permits will be obtained from DAFF.

c) Permit in terms of the Northern Cape Nature Conservation Act (Act 09 of 2009)

All species listed by the Northern Cape Nature Conservation Act will require removal permits should they be impacted upon by the construction activities. This includes an Aloe species, *Aloe claviflora,* observed south of the proposed laydown area.

Should this species need to be removed, a permit would be required in terms of the Act. The absence or presence of these species will be confirmed as part of the plant rescue and protection plan and should any species be present and determined that they will be impacted on, permits will be obtained from DENC.

d) Permit in terms of the National Heritage Resources Act (Act 25 of 1999)

Neither the Heritage Impact Assessment nor the Palaeontological Impact Assessment indicated that permits would be required at this stage.

Should a palaeontologist undertake mitigation work on site, he will need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection). Ngwao-Boswa Ya Kapa Bokoni (Heritage Northern Cape; for built environment and cultural landscapes) and the South African Heritage Resources Agency (SAHRA for archaeology and palaeontology) are required to provide comment on the proposed project in order to facilitate final decision making by the DEA.

e) Astronomy Geographic Advantage (Act 21 of 2007)

The Astronomy Geographic Advantage (Act 21 of 2007) aims is to provide for the preservation and protection of areas within the Republic that are uniquely suited for optical and radio astronomy; to

provide for intergovernmental co-operation and public consultation on matters concerning nationally significant astronomy advantage areas; and to provide for matters connected therewith. This site falls within 18 km of a Square Kilometer Array (SKA) station and based on distance to the nearest SKA station, the location of the station, and the information currently available on the detailed design of the PV installation, this facility poses a high risk of detrimental impact on the SKA.

Based on the comments received from Square Kilometre Array (SKA), prior to any construction or site preparation taking place, appropriate Electromagnetic Interference (EMI) studies must be conducted by Mulilo Renewable Energy (or appropriate third parties engaged with by Mulilo Renewable Energy) to the satisfaction of the SKA Project Office in order to mitigate all risk of Electromagnetic Interference on the SKA. The mitigation of all risk associated with radio frequency interference on the SKA must be confirmed by measurement following construction to the satisfaction of the SKA Office. Should the risk of radio interference still exist, based on measurements, further mitigation methods must be implemented to remove outstanding risk of radio frequency interference. Mulilo has confirmed that this will be undertaken, should this project receive preferred bidder status.

14.5 REASONED OPINION AS TO WHETHER THE ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED, AND CONDITIONS THAT SHOULD BE MADE IN RESPECT OF THAT AUTHORISATION

Based on the findings of the specialist studies; the proposed project is considered to have an **overall low negative** environmental impact and an overall **medium-high positive** socio-economic impact.

The preferred site for the development is the Boven Solar PV1 site using PV technology with a single axis tracking mounting system. The battery storage technology to be constructed and operated on site will be confirmed during the detailed design phase of the project.

All environmental risks potentially associated with the transportation, construction, operation and maintenance of the battery storage facility have been addressed in the EIA and management measures included in the EMPr. The bulk of the project will be undertaken within the Development Envelope of this project, as discussed in Section 14.2.4 of this Chapter. The Development Envelope is 400 ha in extent although the final development footprint will be 300 ha. The larger area has been proposed to provide Mulilo with design optimisation opportunities during the detailed design phase of this project. The components detailed in Table 14.2 will be constructed within the Development Envelope and the development avoids the sensitive environmental features determined by the specialist studies undertaken for this study.

In accordance with the Guideline on Need and Desirability in terms of the EIA Regulations of 2010 (GN 891 of 2014), this EIA considered the nature, scale and location of the development as well as the wise use of land (i.e. is this the *right time* and *place* for the development of this proposed project). When considering the timing of this project, the IRP2010 proposes to secure 17 800 MW of renewable energy capacity by 2030. In August 2011, the DoE launched the IPP Procurement Programme and invited potential IPPs to submit proposals for the financing, construction, operation and maintenance of the first 3 725 MW of various renewable energy project (including solar and wind) and it is Mulilo's intention to bid these projects in the 2015 bidding process to be potentially selected as an IPP. On a provincial level,

the Northern Cape Province is currently facing considerable constraints in the availability and stability of electricity supply. This is a consequence of South Africa's electricity generation and supply system being overstretched, and the reliance of the Northern Cape, as many other South African provinces, on the import of power to service its energy needs. The development of solar energy is important for South Africa to reduce its overall environmental footprint from power generation (including externality costs), and thereby to steer the country on a pathway towards sustainability. On a municipal planning level, the proposed project does not go against any of the objectives set within the !Kheis Municipality draft IDP 2012-2017. The proposed project will be in line with/supportive of the IDP's objective of creating more job opportunities. The proposed solar energy facility will assist in local job creation during the construction and operation phases of the project (if approved by the DEA). It should however be noted that employment during construction phase will be temporary. During the operational phase of the project (estimated to be more 20 years), long-term employment opportunities will be created.

The locality of the proposed Boven Solar PV1 project will fall within an area that has already been changed into an industrial area by the presence of the Sishen-Saldanha ore line and the Nieuwehoop Substation and Eskom transmission lines that will be constructed within this area. The locality of this project would not have a significant ("High") impact on any sensitive viewers (as determined during the Visual Impact Assessment), will not significantly negatively impact on any environmental features (as discussed in Section 14.2.2 and 14.2.3.2) and have a low negative impact on the current agricultural land use of the site.

Section 24 of the Constitutional Act states that "everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that –

(i) Prevents pollution and ecological degradation;

(ii) Promotes conservation; and

(iii) Secures ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

Based on this, this EIA was undertaken to ensure that these principles are met through the inclusion of appropriate management and mitigation measures and monitoring requirements. These measures will be undertaken to promote conservation by avoiding the sensitive environmental features present on site (refer to Figure 14.5) and through appropriate monitoring and management plans to, inter alia, monitor the impacts on birds and protection of SCC potentially present within this area (refer to the draft EMPr).

The outcomes of this project therefore succeeds in meeting the environmental management objectives of protecting the ecologically sensitive areas and support sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the towns nearest to the project site (refer to Sections 14.1.1 and 14.1.5). The findings of the EIA show that all natural resources will be used in a sustainable manner (i.e. this project is a renewable energy project and the majority of the negative site specific and cumulative environmental impacts are considered to be of "low" significance) while the benefits from the project will promote justifiable economic and social development.

All the required permits, licenses (including a WULA) and authorisations (including an EA) will be obtained prior to the construction of this facility (as discussed in Section 14.4). It is proposed that the draft EMPr be finalised, following input and comments from various stakeholders and authorities, and be implemented during all phases of this project. The recommendations and management measures to be adhered to on site have been included in the draft EMPr included in Section B of this report. The main recommended mitigation and management measures are outlined in Section 14.1 of this Chapter and should be adhered to, to ensure that all identified impacts are suitably managed and monitored.

It is therefore the reasoned opinion of the EAP for this EIA process, Ms Surina Brink, that the Boven Solar PV1 75 MW Solar PV facility proposed on the Farm Boven Rugzeer (Remaining Extent of Farm 169), near Kenhardt, should receive Environmental Authorisation in terms of the EIA Regulations.