**Appendix F: Impacts Assessment Methodology**

Potential impacts (terrestrial ecology (including flora, fauna and avifauna), wetlands, soils, heritage, visual and social) were assessed through the Basic Assessment process for the proposed **Harmony Moab Khotsong Solar PV Facility,** in the Free State Province. These impacts were identified through specialist reports included in **Appendix D** of the Basic Assessment Report. All the specialists followed the method outlined below to evaluate and assess the environmental impacts associated with the development.

Potential impacts associated with the construction and operation of the proposed solar energy facility and associated infrastructure are discussed below. The following methodology was used in assessing impacts related to the proposed development. All impacts are assessed according to the following criteria:

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

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

S = (E+D+M) P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

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

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

## IMPACT ASSESSMENT

This appendix serves to assess the significance of the positive and negative environmental impacts (direct, and indirect) expected to be associated with the development of Harmony Moab Khotsong Solar PV Facility and its associated infrastructure. This assessment has considered the construction of a PV facility with a contracted capacity of up to 100MW facility with a development footprint of approximately 450ha. The project will comprise the following key infrastructure and components:

- PV modules and mounting structures
- Access roads, internal roads and fencing around the development area
- Temporary and permanent laydown areas
- Administrative building, control room, workshop, storage building, guard house, auxiliary buildings and structures, water supply infrastructure, weather station
- Peripheral boundary wall & fencing
- Inverters, transformers and up to 5 on-site facility substations and switching substations
- Cabling between the project components, to be laid underground where practical
- Grid connection infrastructure to be connected to the existing:
    - Vaalreefs Eleven Substation via a ~2km power line (located south-east of the facility);
    - Southvaal Plant Substation via a ~0.5km power line (located north-west of the facility); and
    - Southvaal Substation via a ~4km power line (located north of the facility).

The full extent of the project site was considered through the Assessment phase by the independent specialists and the EAP. On-site sensitivities were identified through the review of existing information, desk-top evaluations and field surveys. A development footprint for the PV facility within the project site was proposed by the developer through consideration of the sensitive environmental features and areas identified through the EIA process.

The development of Harmony Moab Khotsong Solar PV Facility will comprise the following phases:

- ***Pre-Construction and Construction*** – will include pre-construction surveys; site preparation; establishment of access roads, laydown areas, and facility infrastructure (including PV panels, facility substation and O&M Hub); construction of foundations involving excavations; the transportation of components/construction equipment to site, manoeuvring and operating vehicles for unloading and installation of equipment; laying cabling; and commissioning of new equipment and site rehabilitation.
- ***Operation*** – will include the operation of the PV facility and the generation of electricity, which will be fed into the mines substation via the facility on-site substation and an overhead power line. The operation phase is expected to be approximately 20 years (with maintenance).
- ***Decommissioning*** – depending on the economic viability of the PV facility, the length of the operation phase may be extended beyond a 20-year period. At the end of the project's life, decommissioning will include site preparation, disassembling of the components of the PV facility, clearance of the relevant infrastructure at the site and appropriate disposal thereof, and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to those associated with construction activities. Therefore, these impacts are not considered separately within this chapter.

Environmental impacts associated with construction and decommissioning activities may include, among others, threats to biodiversity and ecological processes, including habitat alteration and impacts

to fauna, avifauna and flora, impacts to sites of heritage value, soil contamination, erosion and loss of agricultural land, nuisance from the movement of vehicles transporting equipment and materials.

Environmental impacts associated with the operation phase includes soil contamination, erosion, and potential invasion by alien and invasive plant species. Other impacts include visual impacts and night-time lighting impacts.

**Quantification of Areas of Disturbance on the Site**

Site-specific impacts associated with the construction and operation of Harmony Moab Khotsong Solar PV Facility relate to the direct loss of vegetation and species of special concern, disturbance of animals (including avifauna) and loss of habitat and impacts to soils. To assess the impacts associated, it is necessary to understand the extent of the affected area.

- The development area being assessed for Harmony Moab Khotsong Solar PV Facility is approximately 900ha in extent, of which the proposed infrastructure will occupy an area of approximately 450ha. This area includes infrastructure such as PV modules and mounting structures, Inverters and transformers, temporary and permanent laydown area, site offices and maintenance buildings, including workshop areas for maintenance and storage and site and internal access roads.
- The grid connection solution includes additional infrastructure, including a grid line servitude (up to 32m in width); on-site substation (footprint area up to 2ha in extent) and switching station (footprint area up to 2ha in extent).

# 1. TERRESTRIAL ECOLOGY AND WETLAND IMPACT ASSESSMENT

## 1.1. Terrestrial Ecology (including flora and fauna)

The majority of the ecological impacts associated with the development would occur during the construction phase as a result of the disturbance associated with site clearance, excavations, the operation of heavy machinery at the site and the presence of construction personnel. The significance of the impacts on terrestrial Ecology expected with the development of the Harmony Moab Khotsong Solar PV Facility has been assessed as medium to low, depending on the impact being considered, with the implementation of mitigation measures. Potential impacts and the relative significance of the impacts are summarised below.

***Results of the Ecological Impact Assessment***

The site falls within the Vaal Reefs Dolomite Sinkhole Woodland (LC) and the Vaal-Vet Sandy Grassland (EN) vegetation types. However, the occurrence of these vegetation types is limited within the development area. The Vaal-Vet Sandy Grassland dominated the southern portion of the site and is visible as undulating grassland but characterised by fairly deep, sandy soils. These remaining natural portions of this grassland would be regarded as being of high conservation value. The vegetation type is currently heavily affected by extensive transformation by agriculture, urban expansion, and mining operations. ***This southern portion of the development area (comprising Vaal-Vet Sandy Grassland and deeper sandy soils) has been excluded from the development footprint and the necessary mitigation implemented to ensure no indirect impacts affect the sensitive habitats***.

The Vaal Reefs Dolomite Sinkhole Woodland dominates the northern portions of the site and is visible as undulating plains, although here exposed low rocky ridges become evident, deeper sandy soils are absent and the grass composition also differs slightly by containing a higher proportion of sour grasses. The woodland component, associated with dolomite sinkholes are not well represented on this site, although a few bush clumps were noted. ***This portion of the development area is almost completely transformed and degraded. The northern portion of the site would therefore be regarded as generally of Moderate sensitivity, and suitable for a development of this nature.***

The site is listed as an Ecological Support Area 1 and 2 (ESA1 and ESA2) which functions in support of the Vaal River which is situated approximately 1km to the north of the site. In addition, the site also contains two prominent areas being regarded as Critical Biodiversity Areas 1 (CBA1) situated in the centre in the eastern portion of the development area. These CBA1 areas have been identified as being crucial for meeting conservation targets for the Endangered Vaal-Vet Sandy Grassland occurring in this area, but also to some extent the Vaal Reefs Dolomite Sinkhole Woodland in the area. These CBA1 areas have been identified as being Irreplaceable. **These portions of CBA1 occurring in the development area must as much as reasonably possible be excluded from development in order to ensure they remain intact (implementation of avoidance mitigation), in the event that areas of the development footprint cannot fully avoid the CBA areas, mitigation measures as recommended in the EMPr (Appendix G) must be implemented to mitigate any impacts.**

The majority of the development area still consists of natural grassland which is still in a fairly good condition. The surroundings as well as significant portions of the site has been affected and transformed by historical mining operations. Being a mining area, this results in transformation and degradation of large portions of land. ***The proposed solar development should therefore first consider the development***

***of areas considered as already transformed and of lower sensitivity (implementation of avoidance of sensitive areas as a mitigation strategy)***.

While the assessment and significance rating consider the **full extent of the development area**, the implementation of avoidance of sensitive areas as a mitigation strategy has been adopted. The southern portion of the development area (comprising Vaal-Vet Sandy Grassland, deeper sandy soils and CBA1 rating) has been **excluded as much as possible from the development footprint** and the necessary mitigation implemented to ensure no indirect impacts affect the sensitive habitats.

The following impacts on the ecosystem, ecology and biodiversity will be assessed:

- Loss of vegetation and consequently habitat and species diversity as a result.
- Loss of protected, rare or threatened plant species.
- Impacts on watercourses, wetlands or the general catchment.
- The impact that the development will have on exotic weeds and invasive species, both current and anticipated conditions.
- Any increased erosion that the development may cause.
- Fragmentation of habitat, disruption of ecological connectivity and -functioning in terms of the surrounding areas.
- Impacts that will result on the mammal population on and around the site.
- Any significant cumulative impacts that the development will contribute towards.

**Terrestrial Fauna**

Signs and tracks of mammals are fairly abundant on the site though the mammal population will be somewhat modified from the natural condition. Natural vegetation has a high carrying capacity for mammals which decreases significantly where mining or agriculture transforms this natural vegetation and in such transformed areas the mammal population is normally represented by a generalist mammal population. As indicated previously, the majority of this still consists of natural vegetation and accordingly the mammal population will also be largely natural in these areas. The mammal population in natural areas would however still be somewhat modified as a result of the surrounding fragmentation of habitat which affects the population dynamics and migration of mammals. Other impacts such as roads, herding, trapping and the proximity of mining activities would also further impact on mammals, especially reclusive and rare mammals dependant on pristine habitats. Rare and endangered mammals are often reclusive and avoid areas in close proximity to human activities and are also dependant on habitat in pristine condition. The site would therefore have a significant impact on the likelihood of such rare and endangered species occurring in the area, there is however still a likelihood that remaining natural areas may harbour species of high conservation value.

Wetland and riparian habitats also generally provide a higher abundance of resources and subsequently are also able to sustain a diverse and large mammal population. This will also be the case for the wetland system in the eastern portion of the site. Although surrounding mining operations and associated impacts will affect the mammals along the wetland as well, it will still be able to sustain a higher bio-load which in turn supports a larger mammal population and it is likely that the mammal population along the wetland will be substantial. Development in close proximity to this wetland will therefore have a significantly higher impact.

The mammal survey of the site was conducted by means of active searching, camera traps and recording any tracks or signs of mammals and actual observations of mammals. **From the survey the following actual observations of mammals were recorded**:

» Soil mounds of the Common Molerat (*Cryptomys hottentotus*) were common in most areas of the study area. This is a widespread species which has even become adapted to urban areas. It is a generalist species anticipated to occur in this area.

» Extensive colonies of Ground Squirrel (*Xerus inauris*) and Yellow Mongoose (*Cynictis penicillata*) occur in the study area. These are companion species which are widespread and common and found in most natural or disturbed habitats.

» Scat of Porcupines (*Hystrix africaeaustralis*) were noted in several areas. This is also a generalist species, widespread and common in almost all natural areas.

» Several burrows of small mammals were noted which could not be identified but do indicate a significant mammal population in the area.

» Several burrows and excavation of Aardvark (*Oryteropus afer*) occur in the study area. This is also a fairly widespread and common species but is highly reclusive and is also listed as a protected species and is therefore of significant conservation value.

» Several observations of Steenbok (*Raphicerus campestris*) and Common Duiker (*Sylvicapra grimmia*) were also made. These species are both widespread but confined to fairly natural or agricultural areas and generally avoid urban areas.

» Springhare (*Pedetes capensis*) is also common in the area and also indicate a significant prey base for larger carnivores. This species is widespread but confined to natural areas with deeper sandy soils.

» A Slender Mongoose (*Galerella sanguinea*) was also observed. Although also fairly widespread it is a less common species and requires natural vegetation in a fairly good condition. It also contributes toward and indicates a significant mammal diversity.

» Tracks of a large canid carnivore were observed which is likely that of a domestic dog associated with herding of livestock in this area. Herding dogs are also known to have a detrimental impact on the mammal population and will also have an additional impact on the already modified mammal population in the area.

» A Cape Hare (*Lepus capensis*) was also observed in the study area. This is also a widespread species but is dependent on open grassland habitats.

» A Serval (*Leptailurus serval*) was also observed in the western portion of the site. This is a rare species which is dependant on the close proximity of watercourses and wetlands. It is also Red Listed as a Near Threatened (NT) species due to the decline in suitable habitat.

These species identified on the site indicate a significant diversity, which although dominated by widespread and generalist species, also contain species of higher conservation value. This also indicates that although the mammal population will be somewhat modified, it remains likely that other species of high conservation value will still be present.

The most significant impact on mammals anticipated on the site itself is primarily concerned with the loss and fragmentation of available habitat. Transformation of the natural vegetation on the site will result in

a decrease in the population size as available habitat decreases. Since it is inevitable that the development will involve the transformation of natural grassland this contributes significantly toward habitat loss which in turn will result in a high impact on the mammal population. This also indicates the need to take extra care in determining the development area, which should focus on areas of lower sensitivity, should exclude areas of high sensitivity and the wetland system in the eastern portion of the site and should limit the extent of transformation as far as possible. **Current layout plans do indicate that areas of High Sensitivity are largely being avoided while mostly retaining development within areas of Moderate Sensitivity.**

## 1.2. Wetlands

The surface water features of the study area are dominated by a large valley bottom wetland system in the south eastern portion of the site. A few small depressions also occur in the southwest of the site and within the Mispah Game Reserve[1]. This is a seasonal system which flows mostly during the rainy season but did still illustrate an active hydrological regime at the time of the survey. The wetland transects the site from south to north and originates approximately 5 km to the south of the site. The catchment is also situated in agricultural areas used for crop production which will have a large impact on it though where it occurs on the site is still naturally functioning and provides ample wetland habitat which will provide unique habitats and will provide vital downstream ecological functions.

The Three small depression wetlands are situated in the southwest of the site and are included within the Mispah Game Reserve and are therefore highly unlikely to be affected by the development. These depressions are clearly affected by a tailings dam located approximately 350 meters to the west of these depressions and which cause seepage in the direction of these pans and which clearly has a high impact on them. These pans have become nutrient enriched which cause a large modification of their vegetation structure.

A Risk Assessment for the proposed solar facility and its effect on the valley bottom wetland system in the eastern portion of the site has been undertaken. Current layout plans indicate that the development will avoid the eastern portion of the development area which will significantly decrease the anticipated impact. The current layout plans indicate that **both the large valley bottom wetland and the three small depressions fall outside of the development footprint for the PV facility and therefore the impact on the wetland features is regarded as low.**

Description of the individual watercourses and wetlands which forms part of the study area (Appendix A: Map 3) (FW – Facultative wetland species, OW – Obligate wetland species, * - Exotic species).

| **Watercourse name:** | **Coordinates of sampling:** | **Flow regime:** |
|---|---|---|
| #1 Unchanneled valley bottom wetland – Main wetland in the east of the site | S 26.992289°, E 26.808740°<br>S 26.988173°, E 26.805267°<br>S 26.982773°, E 26.807467° | Seasonal |
| **Description of watercourse:**<br>The largest and most significant surface water feature in the area. This valley bottom wetland is a large system which originates approximately 5 km to the south of the site and then flows into the Vaal River about 4 km to the north of the site. The wetland therefore transects the eastern portion of the site and flows from south to north through it. The wetland is clearly an unchanneled system which does not have a defined main channel and banks though flow is still unidirectional from south to north. The width of | | |

[1] No development associated with the Solar PV facility will be located within the wetland areas, the gridline infrastructure is however located within the 500m regulated area and a water use licence process will be undertaken in this regard.

the wetland can also be quite broad and while varying in width over its course, may be as wide as 100 meters in some areas. The wetland is largely fed by the upper reaches while inflow from the side slopes are also likely. Development around this wetland is therefore also likely to directly affect it in terms of runoff generated by it and which will enter this system. Though this is a natural system it is clearly affected by several large impacts. The upstream catchment is utilised for agricultural crop production and these fields will undoubtedly contribute to significant impacts on the wetland. This will include increased surface runoff rates due to the absence of vegetation and high concentrations of fertiliser runoff as well as some herbicide and pesticide contamination. Other impacts also include several road crossings which will act as flow obstructions and large woodlots of exotic trees which will decrease the groundwater inflow into the wetland.

The wetland is clearly situated in a low lying shallow valley and in terms of topography clearly supports the formation of a wetland system and also aids in accurate delineation of the system. Vegetation within the wetland is also dominated by obligate wetland sedges and grasses which also confirm the presence of saturated soils. Surface water was still visible during the survey and also indicates that the system is at least seasonal in terms of its active hydrological regime. Soil samples also reliably confirm the presence of wetland conditions which indicate a seasonal zone of wetness within the wetland.

**Dominant plant species:**

Seepage wetland: *Setaria sphacelatum* (FW), *Eragrostis lappula* (OW), **Verbena bonariensis, *Veronica anagalis-aquatica, *Oenothera rosea, Agrostis lachnantha* (OW), *Scirpoides burkei.*

Wetland border: *Triumfetta soderi, Asparagus larcinus, Hyparrhenia hirta, Ziziphus mucronata, Eragrostis gummiflua, Cynodon dactylon, Hypoxis hemerocallidae*

**Protected plant species:**

None observed.

**Soil sample:**

The wetland is clearly defined but clearly is devoid of a channel and banks. Here it is also quite narrow when passing through a rocky area.

The valley bottom wetland can become quite broad in some areas.

Wetland sedges and grasses dominate the wetland. Note the presence of surface water indicating it is at least seasonal.

View of the wetland from the surrounding area. It is clearly situated in a shallow valley with a linear flow pattern.

| **Watercourse name:** | **Coordinates of sampling:** | **Flow regime:** |
|---|---|---|
| #2 Depression wetlands – series of three small wetlands in south west of the site | S 26.997414°, E 26.787146° | Seasonal |

**Description of watercourse:**

A series of three quite small depression wetlands located in the south west of the site. These wetlands are all located adjacent to each other and have a diameter of approximately 80 meters. These wetland areas are clearly visible as shallow but distinct depressions in the landscape. They are mainly fed by runoff and groundwater inflow from the south west. A large tailings dam is also situated to the south west of these wetlands (approximately 350 meters) and it is clear that seepage from this tailings dam has a large effect on them. High salt concentrations are quite evident as a result of this seepage and the wetland itself is also modified by higher salt concentrations while the vegetation is also heavily degraded and dominated by exotic weeds. These wetland areas are however located in the south west of the site and within the Mispah Nature Reserve and if this reserve is excluded from development the three small depressions should also remain unaffected by default.

The small depression wetlands form shallow but distinct depressions in the landscape and the topography therefore promotes the establishment of wetland conditions. Vegetation within these depressions are however quite modified and dominated by exotic weeds. This is most likely a consequence of seepage from the adjacent tailings dam which causes elevated salt concentrations and nutrient enrichment. Soil samples do however conclusively confirm the presence of wetland conditions which indicate a seasonal zone of wetness within the wetland.

**Dominant plant species:**

*Cyperus longus* (OW), **Tegetes minuta, *Bidens bipinnata.*

**Protected plant species:**

None observed.

**Soil sample:**

The small depression wetlands are clearly visible as depressions.

| **Watercourse name:** | **Coordinates of sampling:** | **Flow regime:** |
|---|---|---|
| #3 No wetland conditions | S 26.987061°, E 26.776743°<br>S 26.965037°, E 26.771725° | No wetland conditions |

**Description of watercourse:**

Current wetland resources including the National Wetland Map 5 (NWM 5) and the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) also indicate two additional wetland areas likely to occur in the area. The survey also sampled these areas and confirmed that no wetland conditions are present in these areas. They do not form part of any watercourse, wetland or surface water feature and are therefore not relevant for the development. The following results also confirm that these areas were surveyed and confirmed to be devoid of wetland conditions:

- A circular seepage wetland is indicated to the north of the tailings dam in the south west of the site. This area contains a slight slope and soils consist of deep sandy soils without any soil wetness indicators. Vegetation is also dominated by grasses and pioneer herbs and while significant disturbance is evident, wetland conditions are clearly absent. This area does not contain any seepage, does not form any prominent component of the local surface water drainage and does not form a wetland or watercourse.

- There is a probability indicated of an elongated watercourses system transecting the north western corner of the site. However, the on-site survey confirmed no wetland conditions occurring here and a channel or drainage line is also clearly absent.

Sampling to the north of the tailnigs dam confirm the absence of wetland conditions.

North western corner of the site contain no watercourse or wetland conditions.

**Risk Assessment**

A Risk Assessment for the proposed solar facility which will affect the valley bottom wetland system in the eastern portion of the site has been undertaken according to the Department of Water & Sanitation's

requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use (Appendix E). In the event that development of solar facilities extends into the eastern portion of the site, these areas will be located in close proximity to this wetland system and in so doing are likely to result in some impacts on it, especially in terms of runoff and sedimentation (Appendix A: Map 3). However, current layout plans do indicate that the development will avoid the eastern portion of the development area which will significantly decrease the anticipated impact. Furthermore, the development needs to ensure that it is compliant with all relevant legislation, especially in terms of its water use which is governed by the National Water Act (Act no 36 of 1998) (NWA). According to this act and with special relevance to the General Authorisation regulations for section 21(c) or (i) water uses (Notice 509 of 2016), any development which falls within the regulated area of a wetland system, a 500 m radius from the delineated boundary (extent) of any wetland or pan, requires application for the necessary authorisation from the Department of Water and Sanitation (DWS). The current layout plans indicate that portions of the development as well as associated grid connection powerline will be situated approximately 350 meters from this valley-bottom wetland system and given the clearance of vegetation and the large extent of the development is still likely to have an impact on it.

Several small depressions occur in the western portion of the site though are included within the Mispah Game Reserve and the development is unlikely to encroach into this area and these depressions will then be located outside the regulated 500 meters boundary from the development, they are not rated in terms of this risk assessment.

The large valley bottom wetland system is clearly the main wetland system in this area and is considered as still providing several essential functions and is therefore considered as highly sensitive and being of high conservation value. Current layout plans do indicate that the eastern portion of the development area will be excluded though development will still occur within 350 meters of the edge of the wetland and is then still likely to have some impact on it. The wetland and buffer zone should be regarded as no-go areas and no construction or operational activities including stockpiling, clearing, laydown areas, vehicle movement or any other associated activities should occur in or near this wetland system. Given the distance between the wetland area and current development layout (approximately 350 meters), the anticipated risk will be low. However, since the catchment of the wetland lies largely within the proposed development area it will most likely have a significant impact on the runoff generated and inflow into the wetland. As a result, the development will have to implement a comprehensive storm water management system which should ensure that the surface runoff patterns are retained as is, especially pertaining to solar panels, and that the development does not contribute toward increased surface flow, erosion and any impacts on downslope areas.

**Given the current layout plan, it is unlikely that infrastructure such as roads and powerlines will require crossing it and this was therefore not rated as a ris**k. However, should layout plans be modified, and it become apparent that development will encroach in proximity to the wetland or other infrastructure require crossing this system, the impacts should be re-assessed and the risk matrix amended.

## 1.4. Impact Assessment Tables

***Nature:***
Loss of vegetation and consequently habitat and species diversity as a result.

**Impact description**: Solar PV developments usually entail the removal of surface vegetation and may also involve modification of the surface topography. This therefore has a large impact in terms of the loss of vegetation, vegetation type and consequently habitat. As indicated from the discussion of the study area, the majority of the area still consists of natural grassland in a fairly good condition (Appendix A: Map 1). Where these areas of natural grassland will be affected by the development it will therefore result in significant impacts. The severity of this impact will also vary over the site in accordance with the differing conservation value of different portions of the site. As a result, the impact on the following areas of high conservation will be quite high (Appendix A: Map 4):

- The Mispah Game Reserve covers a large portion of the southern portion of the site. This is a Private Nature Reserve which has been proclamated as a Protected Area (PA) under the National Environmental Management Protected Areas Act (NEMPAA of 2003). The area is listed as a Private Nature Reserve within the South Africa Protected & Conservation Areas Database (SAPAD) and was proclamated in 2001 (Notice 23 of 2001). Development within any protected area is highly unlikely since this is largely prevented by the NEMPAA and any management plan of the protected area. This PA has also been taken into account in determining the provincial and national conservation targets and development within this PA will also affect these conservation targets.
- Two large CBA 1 areas have been delineated by the Free State Biodiversity Management Plan. These CBA 1 areas have been identified as being crucial for meeting conservation targets for the Endangered Vaal-Vet Sandy Grassland occurring in this area but also to some extent the Vaal Reefs Dolomite Sinkhole Woodland in the area. These CBA 1 areas have been identified as being Irreplaceable in terms of meeting conservation targets.
- Portions of remaining Vaal-Vet Sandy Grassland also occur in the south east of the site but which do not form part of the Mispah Game Reserve or identified CBA areas. However, since this vegetation type is currently listed as Endangered (EN) these areas must still be afforded a High level of sensitivity.

Should the development encroach into any of the above listed areas of high conservation value, the anticipated impact will be high (Appendix A: Map 4). The development should therefore, as far as possible, aim to avoid these areas in order to mitigate and decrease the anticipated impact. Current layout plans do indicate that areas of High Sensitivity are largely being avoided while mostly retaining development within areas of Moderate Sensitivity. Though this will still entail significant impacts, it will be significantly lower as opposed to the inclusion of areas of High Sensitivity. The remainder of the site, except areas as listed above, is dominated by Vaal Reefs Dolomite Sinkhole Woodland, a grassland vegetation type which, although it is also affected by significant transformation pressures, is not regarded as a Threatened Ecosystem and would therefore have a somewhat lower conservation value. However, the vegetation is still in a fairly good condition and still contains elements of conservation value. As a result, should development avoid areas of high conservation value and concentrate the development in these areas of moderate conservation value the impact will be lower but still significant. The solar development will also involve the clearance of a fairly large area and lead to irreversible transformation of the natural grassland and development should therefore be carefully planned, should focus on areas of lower sensitivity and should limit the extent of transformation as far as possible.

| | **Rating** | **Motivation** | **Significance** |
|---|---|---|---|
| ***Prior to Mitigation*** | | | |
| **Duration** | 5 | Permanent transformation of vegetation | **High Negative (95)** |
| **Extent** | 4 | Large development area | |
| **Magnitude** | 10 | Loss of a Threatened Ecosystem | |
| **Probability** | 5 | Impact is unavoidable | |
| ***Mitigation/Enhancement Measures*** | | | |
| ***Mitigation:*** | | | |

Should development avoid areas of high conservation value and concentrate the development in these areas of moderate conservation value the impact will be lower but still significant. The solar development will also involve the clearance of a fairly large area and lead to irreversible transformation of the natural grassland and development should therefore be carefully planned, should focus on areas of lower sensitivity and should limit the extent of transformation as far as possible.

| ***Post Mitigation/Enhancement Measures*** | | | |
|---|---|---|---|
| **Duration** | 5 | Permanent transformation of vegetation | **High Negative (64)** |
| **Extent** | 3 | Decreased development extent though still significant | |
| **Magnitude** | 8 | Loss of natural areas must be regarded as significant | |
| **Probability** | 4 | Loss of natural areas unavoidable | |

***Cumulative impacts:***

The area has a long history of transformation by mining and agricultural activities and the cumulative impact that this has had is extensive. This is also clearly evident in the degree to which the local vegetation types, Vaal-Vet Sandy Grassland and Vaal Reefs Dolomite Sinkhole Woodland is regarded as being affected by development pressures. The assessment has also indicated that the area is still dominated by natural grassland in fairly good condition (Appendix A: Map 1). Therefore, should the proposed development further increase vegetation and habitat loss of natural areas it will have a high cumulative impact. The only mitigation which may decrease the cumulative impact to some degree would be the exclusion of areas identified as having a high conservation value (See previous paragraphs). This would entail the preservation of at least a portion of the remaining natural areas though since the development will still result in significant transformation of natural areas, the cumulative impact will remain significant.

***Residual Risks:***

The solar development will involve the clearance of a fairly large area and lead to irreversible transformation of the natural grassland and residual impacts will remain high.

***Nature:***

***Loss of protected, rare or threatened plant species.***

***Impact description:*** *No Red Listed plant species could be identified on the site and the area is also not known to contain many such species though a few are still present in this region and a likelihood therefore remains that such a species may also be present on the site. However, given the large extent of the study area, it has been found to contain a fairly high number of protected plant species (Appendix B). These include the protected succulent and geophytic species, Euphorbia striata, Orthanthera jasminiflora, Boophone distichia, Pentharhinum insipidum, Schizocarpus nervosus, Satyrium sp., Raphionecma velutina, Babiana bainesii, Aloe greatheadii, Crinum graminicola, and Vachellia erioloba. Where development will affect these species, the necessary permits should be obtained and a significant proportion of these transplanted to adjacent areas where they will remain unaffected. In addition, there are also a few protected herbaceous plants (Helichrysum spp.) and a few specimens of the protected Vachellia erioloba (Camel Thorn). Where any of these will require removal, the necessary permits should be obtained to do so. Provided that this mitigation is successfully implemented, the anticipated impact should remain moderate to low.*

| | ***Rating*** | ***Motivation*** | ***Significance*** |
|---|---|---|---|
| ***Prior to Mitigation*** | | | |
| ***Duration*** | ***5*** | ***Permanent loss of protected species*** | ***High Negative (68)*** |
| ***Extent*** | ***4*** | ***Large development area*** | |
| ***Magnitude*** | ***8*** | ***High likelihood for the loss of protected species*** | |
| ***Probability*** | ***4*** | ***Many protected species known to occur on the site and therefore probability is high*** | |
| ***Mitigation/Enhancement Measures*** | | | |
| ***Mitigation:*** | | | |

*Where development will affect these species, the necessary permits should be obtained and a significant proportion of these transplanted to adjacent areas where they will remain unaffected. In addition, there are also a few protected herbaceous plants (Helichrysum spp.) and a few specimens of the protected Vachellia erioloba (Camel Thorn). Where any of these will require removal, the necessary permits should be obtained to do so. Provided that this mitigation is successfully implemented, the anticipated impact should remain moderate to low.*

| ***Post Mitigation/Enhancement Measures*** | | | |
|---|---|---|---|
| ***Duration*** | ***5*** | ***Permanent loss of protected species*** | ***Moderate Negative (39)*** |
| ***Extent*** | ***2*** | ***Decreased development extent maintained within areas of moderate sensitivity*** | |
| ***Magnitude*** | ***6*** | ***Loss of fewer protected species, provided mitigation is successfully implemented*** | |
| ***Probability*** | ***3*** | ***Probable that at least some protected species will be lost*** | |

***Cumulative impacts:***
*The area has a long history of transformation by mining and agricultural activities and the cumulative impact with regards to the loss of protected species is extensive. This is also clearly evident in the degree to which the local vegetation types, Vaal-Vet Sandy Grassland and Vaal Reefs Dolomite Sinkhole Woodland is regarded as being affected by development pressures. The assessment has also indicated that the area is still dominated by natural grassland in fairly good condition (Appendix A: Map 1). Therefore, should the proposed development further increase vegetation and habitat loss of natural areas it will also further increase the cumulative loss of protected species. The only mitigation which may decrease the cumulative impact to some degree would be the exclusion of areas identified as having a high conservation value and also implementing the transplanting of at least a portion of protected species on the site. This would entail the preservation of at least a portion of the remaining protected though since the development will still result in significant transformation of natural areas, the cumulative loss of protected species will still remain significant.*

***Residual Risks:***
*Despite comprehensive mitigation (dependant on this mitigation being successfully implemented) a residual loss of some protected species is still unavoidable.*

***Nature:***
Impacts on watercourses, wetlands or the general catchment.

**Impact description:** A large valley bottom wetland system occurs in the eastern portion of the site and is likely to be affected by the development (Appendix A: Map 3). Solar developments are well known to have significant impacts on surface water features as a result of the rain shadow caused by the panels and the coupled runoff and infiltration patterns, erosion caused by these runoff patterns and disruption of surface watercourses. However, current layout plans do indicate that the development will avoid the eastern portion of the development area which will significantly decrease the anticipated impact. The necessary mitigation should still be implemented to ensure no indirect impacts affect the wetland system. Development within 500 meters of this wetland system will require authorisation from DWS. Refer to the risk assessment (Section 4.3.7) for a more detailed discussion on the likely risks and impacts that the development will have on it. Given the distance between the wetland area and current development layout (approximately 350 meters), the anticipated impact will be low.

| | **Rating** | **Motivation** | **Significance** |
|---|---|---|---|
| ***Prior to Mitigation*** | | | |
| **Duration** | 5 | Permanent transformation of wetland areas | **High Negative (95)** |
| **Extent** | 4 | Spill over of impacts into downstream areas | |
| **Magnitude** | 10 | Direct wetland loss | |
| **Probability** | 5 | Impact is unavoidable | |
| ***Mitigation/Enhancement Measures*** | | | |

***Mitigation:***

Refer to the risk assessment for a more detailed discussion on the likely risks and impacts that the development will have on it. Given the distance between the wetland area and current development layout (approximately 350 meters), the anticipated impact will be low. However, since the catchment of the wetland lies largely within the proposed development area it will most likely have a significant impact on the runoff generated and inflow into the wetland. As a result, the development will have to implement a comprehensive storm water management system which should ensure that the surface runoff patterns are retained as is, especially pertaining to solar panels, and that the development does not contribute toward increased surface flow, erosion and any impacts on downslope areas.

| ***Post Mitigation/Enhancement Measures*** | | | |
|---|---|---|---|
| **Duration** | 5 | Permanent transformation of at least the catchment of wetland areas | **Low Negative (22)** |
| **Extent** | 3 | Wetlands excluded from development though at least local impacts on wetland systems still anticipated | |
| **Magnitude** | 3 | Significant distance between development and wetland will decrease magnitude though some impacts still probable | |
| **Probability** | 2 | Given the distance between development and wetland area the probability will be lower | |

***Cumulative impacts:***

The area has a long history of transformation by mining and agricultural activities and the cumulative impact that this has had is extensive this also includes the impacts on wetlands in the area. The assessment has also indicated that the wetlands in the area are still largely intact. Therefore, should the proposed development further increase wetland loss it will have a high cumulative impact. The only mitigation which may decrease the cumulative impact to would be the exclusion of wetland areas. This would entail the preservation of wetland areas though since the development will still result in significant transformation of natural areas, a residual cumulative impact will also still remain.

***Residual Risks:***

Should these wetland areas be excluded from the development and measures as indicated implemented the anticipated impact will be lower, i.e. impacts on the catchment will remain significant which will also result in some residual impact on the wetland areas.

***Nature:***

The impact that the development will have on exotic weeds and invasive species, both current and anticipated conditions.

**Impact description:** As was observed during the survey of the study area it contains several exotic weed and invader species. In addition, development (especially construction) will increase disturbance and exacerbate conditions susceptible to the establishment of exotic weeds and invaders. Without mitigation this will significantly increase the establishment of exotics and is likely to spread into the surrounding areas. It is therefore recommended that weed control be judiciously and continually practised. Monitoring of weed establishment should form a prominent part of management of the development area. Where category 1 and 2 weeds occur, they require removal by the property owner according to the Conservation of Agricultural Resources Act, No. 43 of 1983 and National Environmental Management: Biodiversity Act, No. 10 of 2004.

| | **Rating** | **Motivation** | **Significance** |
|---|---|---|---|
| ***Prior to Mitigation*** | | | |
| **Duration** | 4 | Long-term infestation | **High Negative (80)** |
| **Extent** | 4 | Spreading of infestation into neighbouring areas | |
| **Magnitude** | 8 | Infestation of a Threatened Ecosystem | |

| | | | |
|---|---|---|---|
| **Probability** | 5 | Impact is unavoidable | |

***Mitigation/Enhancement Measures***

***Mitigation:***

It is recommended that weed control be judiciously and continually practised. Monitoring of weed establishment should form a prominent part of management of the development area. Where category 1 and 2 weeds occur, they require removal by the property owner according to the Conservation of Agricultural Resources Act, No. 43 of 1983 and National Environmental Management: Biodiversity Act, No. 10 of 2004.

***Post Mitigation/Enhancement Measures***

| | | | |
|---|---|---|---|
| **Duration** | 3 | Limited duration if monitoring and eradication is maintained | **Moderate Negative (36)** |
| **Extent** | 3 | Limiting extent through monitoring and eradication | |
| **Magnitude** | 6 | Limited but unavoidable infestation | |
| **Probability** | 3 | Moderate probability remains | |

***Cumulative impacts:***

The area has a long history of transformation by mining and agricultural activities and significantly increases the cumulative impact of increased infestation by exotics. The assessment has also indicated that the area is still dominated by natural grassland in fairly good condition (Appendix A: Map 1). Therefore, should the proposed development further increase vegetation and habitat loss of natural areas and contribute to increased infestation it will have a high cumulative impact. The only mitigation which may decrease the cumulative impact to some degree would be the exclusion of areas identified as having a high conservation value. This would entail the decrease in transformation and consequently the cumulative impact of exotic weed infestation, however, the cumulative impact will remain significant.

***Residual Risks:***

Without mitigation this will significantly increase the establishment of exotics and is likely to spread into the surrounding areas.

***Nature:***

Any increased erosion that the development may cause.

**Impact description:** As indicated, because solar PV developments result in the removal of vegetation, this reduces infiltration and promotes runoff. Coupled with the rain shadow caused by panels and the resulting dripline, this increases runoff and erosion. This may also have a moderate impact on the wetland system in the eastern portion of the site. In order to reduce this impact, the development should implement a comprehensive storm water management system which should ensure that the surface runoff patterns are retained as is, especially pertaining to solar panels, and that the development does not contribute toward increased surface flow, erosion and any impacts on downslope areas.

| | **Rating** | **Motivation** | **Significance** |
|---|---|---|---|
| ***Prior to Mitigation*** | | | |
| **Duration** | 4 | Permanent modification of surface topography | **Moderate Negative (56)** |
| **Extent** | 4 | Spreading of erosion into neighbouring areas | |
| **Magnitude** | 6 | Limited magnitude due to the flat topography | |
| **Probability** | 4 | Highly likely to take place | |

***Mitigation/Enhancement Measures***

***Mitigation:***

In order to reduce this impact, the development should implement a comprehensive storm water management system which should ensure that the surface runoff patterns are retained as is, especially pertaining to solar panels, and that the development does not contribute toward increased surface flow, erosion and any impacts on downslope areas.

| | | | |
|---|---|---|---|
| ***Post Mitigation/Enhancement Measures*** | | | |
| **Duration** | 4 | Permanent modification of surface topography | **Moderate Negative (33)** |
| **Extent** | 3 | Limiting extent through storm water management | |
| **Magnitude** | 4 | Limited magnitude due to the flat topography | |
| **Probability** | 3 | Unlikely to occur as long as storm water management is maintained | |

***Cumulative impacts:***
The area has a long history of transformation by mining and agricultural activities and the cumulative impact (including surface erosion) that this has had is extensive. The assessment has also indicated that the area is still dominated by natural grassland in fairly good condition which will limit the current erosion (Appendix A: Map 1). Therefore, should the proposed development further increase vegetation and habitat loss of natural areas it have a further significant cumulative impact on erosion in the area. The only mitigation which may decrease the cumulative impact to some degree would be the exclusion of areas identified as having a high conservation value. This would entail the decrease in transformation and consequently the cumulative impact of erosion, however, the cumulative impact will remain significant.

***Residual Risks:***
Erosion may also have a significant impact on the wetland systems in the study area (including the Vaal River to the north of the site).

***Nature:***
Fragmentation of habitat, disruption of ecological connectivity and -functioning in terms of the surrounding areas.

**Impact description:** The region is affected by high levels of transformation as a result of both mining operations and agricultural crop production which results in high levels of habitat fragmentation and the disruption of ecosystem processes. The proposed development will also require the transformation of fairly large areas consisting of natural grassland in fairly good condition and will therefore also significantly contribute toward this impact. The only mitigation that can be applied to decrease this impact is to restrict development to areas being of low sensitivity and should limit the extent of transformation as far as possible. Despite this mitigation it is highly likely that areas of moderate sensitivity will still be included in the development area and the resulting impact on habitat loss, fragmentation and the disruption of ecological processes will remain significant.

| | **Rating** | **Motivation** | **Significance** |
|---|---|---|---|
| ***Prior to Mitigation*** | | | |
| **Duration** | 5 | Permanent loss and fragmentation of habitat | **High Negative (68)** |
| **Extent** | 4 | Large development area | |
| **Magnitude** | 8 | High impact due to fragmentation of a Threatened Ecosystem | |
| **Probability** | 4 | Highly likely to take place | |
| ***Mitigation/Enhancement Measures*** | | | |

***Mitigation:***
The only mitigation that can be applied to decrease this impact is to restrict development to areas being of low sensitivity and should limit the extent of transformation as far as possible. Despite this mitigation it is highly likely that areas of moderate sensitivity will still be included in the development area and the resulting impact on habitat loss, fragmentation and the disruption of ecological processes will remain significant.

| | | | |
|---|---|---|---|
| ***Post Mitigation/Enhancement Measures*** | | | |
| **Duration** | 5 | Permanent loss and fragmentation of habitat | **High Negative (64)** |
| **Extent** | 3 | Decreased development area, though still fairly large | |

| | | | |
|---|---|---|---|
| **Magnitude** | 8 | High impact due to fragmentation of a Threatened Ecosystem | |
| **Probability** | 4 | Highly likely to take place | |

***Cumulative impacts:***

The area has a long history of transformation by mining and agricultural activities and the cumulative impact that this has had is extensive. This is also clearly evident in the degree to which the local vegetation types, Vaal-Vet Sandy Grassland and Vaal Reefs Dolomite Sinkhole Woodland is regarded as being affected by development pressures. The assessment has also indicated that the area is still dominated by natural grassland in fairly good condition (Appendix A: Map 1). Therefore, should the proposed development further increase vegetation and habitat loss of natural areas it will have a high cumulative impact on habitat fragmentation. The only mitigation which may decrease the cumulative impact to some degree would be the exclusion of areas identified as having a high conservation value (See previous paragraphs). This would entail the preservation of at least a portion of the remaining natural areas though since the development will still result in significant transformation of natural areas, the cumulative impact will remain significant.

***Residual Risks:***

The area is largely still dominated by natural grassland in fairly good condition and it is unavoidable that the development will result in transformation of a significant portion of natural grassland and consequently the residual impact on habitat fragmentation and the loss of ecosystem processes would remain significant.

***Nature:***

Impacts that will result on the mammal population on and around the site.

**Impact description:** The most significant impact on mammals anticipated on the site itself is primarily concerned with the loss and fragmentation of available habitat. Transformation of the natural vegetation on the site will result in a decrease in the population size as available habitat decreases. Since it is inevitable that the development will involve the transformation of natural grassland this contribute significantly toward habitat loss which in turn will result in a high impact on the mammal population. This also indicates the need to take extra care in determining the development area, which should focus on areas of lower sensitivity, should exclude areas of high sensitivity and the wetland system in the eastern portion of the site and should limit the extent of transformation as far as possible Current layout plans do indicate that areas of High Sensitivity are largely being avoided while mostly retaining development within areas of Moderate Sensitivity. Though this will still entail significant impacts, it will be significantly lower as opposed to the inclusion of areas of High Sensitivity.

| | **Rating** | **Motivation** | **Significance** |
|---|---|---|---|
| ***Prior to Mitigation*** | | | |
| **Duration** | 5 | Given the largely natural development area and permanent loss of habitat the duration will be permanent | **High Negative (76)** |
| **Extent** | 4 | Extensive loss of natural areas | |
| **Magnitude** | 10 | High given the largely natural mammal population and presence of Red Listed species | |
| **Probability** | 4 | High given the largely natural mammal population and loss of habitat | |

***Mitigation/Enhancement Measures***

***Mitigation:***

The development should focus on areas of lower sensitivity, should exclude areas of high sensitivity and the wetland system in the eastern portion of the site and should limit the extent of transformation as far as possible. Current layout plans do indicate that areas of High Sensitivity are largely being avoided while mostly retaining development within areas of Moderate Sensitivity. Though this will still entail significant impacts, it will be significantly lower as opposed to the inclusion of areas of High Sensitivity. Though this will still entail significant impacts, it will be significantly lower as opposed to the inclusion of areas of High Sensitivity. Construction itself may also affect the mammal population and care should therefore be taken to ensure none of the faunal species on site is harmed.

The hunting, capturing or harming in any way of mammals on the site should not be allowed. Voids and excavations may also act as pitfall traps to fauna and these should continuously be monitored and any trapped fauna removed and released in adjacent natural areas.

Near Threatened Serval (*Leptailurus serval*) occurs in the development area it is clear that the proposed development will have a significant impact on it. According to the National Red List (2016) the following recommendations and mitigation should be implemented where this species will be affected:

- Natural habitat should be conserved as far as possible. Managers and landowners must avoid wetland loss and should retain natural grassland areas in a good condition.
- The Serval population on the site should be monitored to determine abundance and trends and to determine the impact that development has on the population dynamics. Monitoring should also include the implementation of fixed camera traps for long term monitoring. Due to their specialised habitat requirements at small spatial scales, they may serve as a useful ecosystem indicator of the effect of habitat fragmentation in transformed landscapes.
- Monitoring of the Serval population must be introduced as a compliance measure in Environmental Impact Assessment reports.
- The development site should incorporate the long-term persistence of Serval and associated habitats into onsite biodiversity management practices. Buffer habitats could be modelled based on minimum wetland size and available cover

| ***Post Mitigation/Enhancement Measures*** | | | |
|---|---|---|---|
| **Duration** | 5 | Given the largely natural development area and permanent loss of habitat the duration will be permanent | **High Negative (72)** |
| **Extent** | 3 | Decreased development area, though still fairly large | |
| **Magnitude** | 10 | High given the largely natural mammal population and presence of Red Listed species | |
| **Probability** | 4 | High given the largely natural mammal population and loss of habitat | |

***Cumulative impacts:***

The area has a long history of transformation by mining, agriculture and urban expansion and the cumulative impact that this has had on the mammal population is extensive. Therefore, should the proposed development further encroach into natural areas it will have a further increased cumulative impact on the mammal population. The only mitigation which may decrease the cumulative impact to some degree would be the exclusion of areas identified as having a high conservation value. This would entail the preservation of at least a portion of the remaining natural areas though since the development will still result in significant transformation of natural areas, the cumulative impact on the mammal population will remain significant.

***Residual Risks:***

Transformation of the indigenous vegetation on the site will result in a decrease in the mammal population size as available habitat decreases and consequently the residual impact will remain high.

## 1.5 Cumulative Impact

As previously indicated, the area has a long history of transformation by mining and agricultural activities and the cumulative impact that this has had is extensive. This is also clearly evident in the degree to which the local vegetation types, Vaal-Vet Sandy Grassland and Vaal Reefs Dolomite Sinkhole Woodland is regarded as being affected by development pressures. The assessment has also indicated that the area is still dominated by natural grassland in fairly good condition (Appendix A: Map 1). Therefore, should the proposed development further increase vegetation and habitat loss of natural areas it will have a high cumulative impact. The only mitigation which may decrease the cumulative impact to some degree would be the exclusion of areas identified as having a high conservation value (See previous paragraphs). This would entail the preservation of at least a portion of the remaining natural areas though since the development will still result in significant transformation of natural areas, the cumulative impact will remain significant.

| | Overall impact of the proposed project considered in isolation | Cumulative impact of the project and other projects in the area |
|---|---|---|
| ***Extent*** | 4 | 4 |
| ***Duration*** | 5 | 4 |
| ***Magnitude*** | 10 | 8 |
| ***Probability*** | 5 | 4 |
| ***Significance*** | **High (95)** | **High (64)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Irreversible | Irreversible |
| ***Irreplaceable loss of resources?*** | Yes | Yes |
| ***Can impacts be mitigated?*** | Yes – but limited | Yes – but limited |
| ***Confidence in findings:*** **High** | | |
| ***Mitigation:***<br>The only mitigation which may decrease the cumulative impact to some degree would be the exclusion of areas identified as having a high conservation value (See previous paragraphs). This would entail the preservation of at least a portion of the remaining natural areas though since the development will still result in significant transformation of natural areas, the cumulative impact will remain significant. | | |

## 1.6. Conclusion

The study area is fairly large and is dominated by undulating grassland plains with gentle slopes that generally slopes toward the north and east, toward lower lying watercourses and wetlands. The extent of the study area is approximately 1500 hectares. **A significant portion of this development area has however been transformed by the existing mining plants and infrastructure**. A large wetland area is also present in the eastern portion, with a few small depression wetlands also occurring in the southern portion.

The study area is still largely dominated by natural grassland and which can broadly be divided into a northern and southern portion where the northern portion is dominated by Vaal Reefs Dolomite Sinkhole Woodland and also north of a large tarred road while the southern portion is dominated by Vaal-Vet Sandy Grassland and situated south of the tarred road.

Being a mining area, this results in transformation and degradation of large portions of land. The cumulative impact of development and mining in this area is therefore high. The proposed solar development should therefore first consider the development of areas considered as already transformed and of low sensitivity. These include areas previously cleared for construction activities, portions transformed by ploughing for crop production and degraded areas associated with the mining operations which also includes areas of shallow excavations and rubble dumps.

**Current layout plans do indicate that areas of High Sensitivity are largely being avoided** while mostly retaining development within areas of Moderate Sensitivity. Though this will still entail significant impacts, it will be significantly lower as opposed to the inclusion of areas of High Sensitivity.

It has been confirmed that Near Threatened Serval (*Leptailurus serval*) occurs in the development area it is clear that the proposed development will have a significant impact on it. According to the National Red List (2016) the several recommendations and mitigation should be implemented where this species will be affected.

The surface water features of the study area are dominated by a large valley bottom wetland system in the eastern portion of the site. A few small depressions also occur in the south west of the site and within the Mispah Game Reserve.

A Risk Assessment for the proposed solar facility which will affect the valley bottom wetland system in the eastern portion of the site has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use (Appendix E). In the event that development of solar facilities extends into the eastern portion of the site, these areas will be located in close proximity to this wetland system and in so doing are likely to result in some impacts on it, especially in terms of runoff and sedimentation (Appendix A: Map 3). However, **current layout plans do indicate that the development will avoid the eastern portion of the development area which will significantly decrease the anticipated impact**. The current layout plans indicate that portions of the development as well as associated grid connection powerline will be situated approximately 350 meters from this valley-bottom wetland system and given the clearance of vegetation and the large extent of the development is still likely to have an impact on it.

Moderate-high impacts include the loss of protected plant species, increased infestation by exotic weeds, increased habitat fragmentation, the impact on mammals (which also includes a Near Threatened species) and the increased cumulative impact. **Suitable mitigation should enable the development to decrease many of these impacts to moderate levels.** This will mostly be achieved by excluding areas of high conservation value as listed which will in turn decrease the severity of the impacts and will also decrease the extent and in so doing the anticipated impacts will be somewhat lower. **Current layout plans do indicate that areas of High Sensitivity are being avoided while retaining development within areas of Moderate Sensitivity**.

The most significant impact on mammals anticipated on the site itself is primarily concerned with the loss and fragmentation of available habitat. Transformation of the natural vegetation on the site will result in a decrease in the population size as available habitat decreases. Since the area is already largely transformed, the mammal population will already be heavily modified and the impact caused by the proposed development should be fairly low. Additional measures which will further mitigate these impacts include the exclusion of remnants of natural grassland and the exclusion of natural wetland areas in the southern portion of the site. Construction itself may also affect the mammal population and care should therefore be taken to ensure none of the faunal species on site is harmed. The hunting, capturing or harming in any way of mammals on the site should not be allowed. Voids and excavations may also act as pitfall traps to fauna and these should continuously be monitored and any trapped fauna removed and released in adjacent natural areas.

The impact significance has been determined and should development take place without mitigation it is anticipated that several moderate-high to high impacts will occur. The impact on remaining natural patches of grassland as well as the wetland systems in the southern portion of the site will especially be heavily affected. However, should adequate mitigation be implemented as described these can all be reduced to moderate and low-moderate impacts. This is however subject to the development footprint being within areas of low sensitivity and avoiding any patches of remaining natural grassland as well as the wetland systems on the site.

Should development of the solar facility be able remain within transformed areas, this will greatly decrease the anticipated impacts. Being a mining area, this results in transformation and degradation of large portions of land. The cumulative impact of development and mining in this area is therefore high. The proposed solar development should therefore first consider the development of areas considered as already transformed and of low sensitivity. These include the old ploughed fields and areas which previously consisted of buildings and structures. Only if no remaining options remain should the development consider encroaching into remaining natural areas. However, in this instance it will result in high impacts. Likewise the remaining natural wetland areas in the southern portion of the site will also have a high level of sensitivity and should be avoided by development but will be discussed in greater detail in the wetland assessment section of the report.

Due to the largely transformed nature of the development area, no protected or endangered plant species were noted. Although the possibility remains that may be present in those patches of remaining natural grassland, the likelihood is considered fairly low. The area does however contain quite a substantial infestation of invasive trees, and this will pose a risk of spreading into surrounding natural areas, especially as construction of the solar development will increase disturbance in the area. The proposed development will also have to implement a comprehensive monitoring and eradication programme to ensure that invasive plant species are removed from the area and prevented from re-establishing.

Given the largely transformed condition of the site no protected or endangered plant species were noted. Although the possibility remains that may be present in those patches of remaining natural grassland, the likelihood is considered fairly low. The anticipated impact on the loss of protected or endangered plant species is therefore fairly low

## 2. AVIFAUNA IMPACT ASSESSMENT

From an avifaunal perspective it is evident that bird diversity is positively correlated with vegetation structure, and floristic richness is not often regarded to be a significant contributor of patterns in bird abundance and their spatial distributions. Although grasslands are generally poor in woody plant species, and subsequently support lower bird richness values, it is often considered as an important habitat for many terrestrial bird species such as larks, pipits, korhaans, cisticolas, widowbirds including large terrestrial birds such as Secretarybird, cranes and storks. Many of these species are also endemic to South Africa and display particular narrow distribution ranges. Due to the restricted spatial occurrence of the Grassland Biome and severe habitat transformation, many of the bird species that are restricted to the grasslands are also threatened or experiencing declining population sizes.

The full extent of the development area was considered, during the survey eight avifaunal habitat types were identified on the extent of the development area and surroundings, consisting of four untransformed types and four transformed units.

The project site is also surrounded by slimes dams and an impoundment to the east (c. 700m from the site), which provided additional habitat for waterbird and shorebird taxa (especially the latter). Approximately 222 bird species are expected to occur in the wider study area, of which 109 species were observed in the development area (during two independent surveys). Before the studies were conducted the expected species richness included five threatened or near threatened species, 18 southern African endemics and 17 near-endemic species. However, **the occurrence of threatened and near threatened bird species was predicted to be low, although the natural broad-scale habitat units provided foraging habitat for the occasional occurrence of the vulnerable Lanner Falcon (*Falco biarmicus*) and the regionally near threatened Abdim's Stork (*Ciconia abdimii*).**

In addition, the valley-bottom seep/stream on the south eastern part of the development area provides suitable foraging habitat for the regionally endangered African Marsh Harrier (*Circus ranivorus*), although this species was not observed during the respective surveys. The African Marsh Harrier was recorded on the study site during the survey period, it is therefore recommended that all potential habitat be conserved (as a precautionary principle) which included the seep zone/stream on the eastern part of the development area**. The recommendations made have been included in the final layout of the Moab Khotsong Solar PV Facility which is located to the northern parts of the development area, avoiding the valley bottom and the habitats associated with it.**

**Conservation Areas, Protected Areas, and Important Bird Areas**

There are no formal/legal protected or conservation areas or any Important Bird and Biodiversity Areas in close proximity to the study area. However, the southern section of the study area overlaps with the Mispah Game Farm (see figure 1), which is already partly transformed by a slimes dam.

***Results of the Avifauna Impact Assessment***

The study area consists of four discrete broad-scale habitat units that are of **untransformed** nature and important to bird species:

1. *Open dolomite grassland with scattered bush clumps:* This unit is prominent on the study site and covers nearly the entire surface area of the study site. It is represented by two discrete floristic

variations which also provide habitat for two discrete avifaunal associations. The first floristic variation consists of open untransformed to slightly grazed dolomite grassland. The grassland variation is represented by untransformed and semi-transformed Vaal Reefs Sinkhole Dolomite Woodland in the north, and depending on grazing intensity, the graminoid layers is dominated "late-successional" graminoids such a *Cymbopogon caesius, C. pospischilii, Trachypogon spicatus, Triraphis andropogonoides* and *Eragrostis chloromelas.* The latter was prominent where grazing by livestock was eminent. On dolomite outcrops the graminoid layer was significantly taller and dominated by *Setaria sphacelata, Schizachyrium sanguineum* and *Tristachya rehmannii.* In the south the grassland composition occurred on predominantly sandy soils with high affinities towards the Vaal-Vet Sandy Grassland, of which the compositions consists of a large part of secondary graminoid taxa such as *Aristida congesta* and *Pogonarthria squarrosa*. The bird composition is composed of typical grassland taxa dominated by insectivorous and granivore passerine bird species such as Desert Cisticola, (*Cisticola aridulus*), Cloud Cisticola (*C. textrix*), Melodious Lark (*Mirafra cheniana*), Rufous-naped Lark (*Mirafra africana*), Eastern Clapper Lark (*Mirafra fasciolata*), African Pipit (*Anthus cinnamomeus*) and during the peak dry season also Plain-backed Pipit (*Anthus leucophrys*) and Capped Wheatear (*Oenanthe pileata*). Prominent non-passerine species include Orange River Francolin (*Scleroptila gutturalis*), Swainson's Spurfowl (*Pternistis swainsonii*), Northern Black Korhaan (*Afrotis afraoides*) and, Crowned Lapwing (*Vanellus coronatus*).

The bush clumps form a prominent mosaic characterised by the dominance of a woody layer of *Searsia lancea, Vachellia karoo* and *Asparagus laricinus*. In some areas localised disturbances, was responsible for the proliferation of agrestal weeds and secondary graminoids such as *Bidens cf. biternata, Tagetes minuta, Eragrostis curvula* and *Hyparrhenia hirta*. The occurrence of bush clumps were more prominent on the northern parts of the study site and invariably corresponds to dolomite outcrops. The eminent increase in vertical heterogeneity provided by the woody layer is responsible for a "Bushveld" bird association consisting of insectivorous passerines such as Black-chested Prinia (*Prinia flavicans*), Chestnut-vented Warbler (*Sylvia subcoerulea*), Kalahari Scrub Robin (*Cercotrichas paena*), Fiscal Flycatcher (*Melaenornis silens*), African Red-eyed Bulbul (*Pycnonotus nigricans*) as well as granivores such as Yellow Canary (*Crithagra flaviventris*), Southern Masked Weaver (*Ploceus velatus*) and Black-faced Waxbill (*Brunhilda erythronotos*). Passerine bird taxa are represented by Laughing Dove (*Spilopelia senegalensis*), Ring-necked Dove (*Streptopelia capicola*), Acacia Pied Barbet (*Tricholaema leucomelas*) and White-backed Mousebird (*Colius colius*).

2. *Depressions:* This unit is highly localised on the southern section of the study site. It is represented by discrete depressions which become inundated during precipitation events. It is represented by *Cynodon dactylon* and *Verbena bonariense*. This habitat provides habitat for a unique bird composition represented by many smaller wetland-associated passerine species, although larger non-passerines such as waterfowl were uncommon since the presence of open water and lentic conditions were mostly absent, which will discourage waterfowl and shorebirds from utilising this particular habitat. Typical bird species include Zitting Cisticola (*C. juncidis*), Levaillant's Cisticola (*C. tinniens*), Common Waxbill (*Estrilda astrild*) and Lesser Swamp Warbler (*Acrocephalus gracilirostris)*.

3. *Imperata cylindrica seep zones*: This unit is also highly localised on the southern part of the study site and characterised by a seasonal wet conditions which were colonised by tall *Imperata cylindrica* grassland with Seriphium plumosum along the edges. It provides habitat for a unique

bird composition represented by many smaller wetland-associated passerine species such as Zitting Cisticola (*Cisticola juncidis*), Levaillant's Cisticola (*C. tinniens*) and African Stonechat (*Saxicola torquata*). It also provides foraging habitat for non-passerine species such as the Blacksmith Lapwing (*Vanellus armatus*) and Hadeda Ibis (*Bostrychia hagedash*), while it holds at least one to two pairs of Marsh Owl (*Asio capensis*).

4. *Valley-bottom seep/stream*: A small perennial valley-bottom seep/stream is located on the south-eastern part of the study site. The upper reaches are permanently inundated and characterised by obligatory wetland-associated vegetation such as *Phragmites australis, Typha capensis, Cyperus* spp., *Nasturtium officinale* which were interspersed by patches of *Imperata cylindrica*. The lower reached are often colonised by dense patches of *Panicum schinzii*. Some parts along the system has formed open ponds which provide foraging and roosting habitat for waterbirds such as Yellow-billed Duck (*Anas undulata*), Egyptian Goose (*Alopochen aegyptiaca*) and South African Shelduck (*Tadorna cana*). The upper reaches also provide ephemeral foraging habitat for the endangered African Marsh Harrier (*Circus ranivorus*).

The study area also consists of four discrete broad-scale habitat units that are of **transformed** nature (Figure 11 and Figure 13):

5. *Agricultural land*: These are represented commercial cultivated land which is used for the production of maize. The bird composition is often of low richness and composed of generalist taxa such as Speckled Pigeon (*Columba guinea*), Ring-necked Dove (*Streptopelia capicola*) and Cape Sparrow (*Passer melanurus*).

6. *Eucalyptus plantations*: These areas are represented exotic plantations consisting of *Eucalyptus* spp. In general this habitat provides habitat for a poor richness of bird species, although on the study site the vertical heterogeneity was responsible for a diverse assemblage of bird species which included Swallow-tailed Bee-eater (*Merops hirundineus*), Orange River White-eye (*Zosterops pallidus*), Southern Masked Weaver (*Ploceus velatus*), Red-eyed Dove (*Streptopelia semitorquata*), Neddicky (*Cisticola fulvicapilla*), Cape Robin-chat (*Cossypha capensis*), Red-billed Firefinch (*Lagonosticta senegala*) and Cardinal Woodpecker (*Dendropicos fuscescens*).

7. *Rehabilitated grassland and pastures*: These areas are represented by rehabilitated land consisting of monotonous stands of *Chloris cf. gayana* and *Cynodon dactylon* pastures. These often provide habitat for widespread Highveld bird species with dominants such as Desert Cisticola (*Cisticola aridulus*), Ant-eating Chat (*Myrmecocichla formicivora*) and Quailfinch (*Ortygospiza atricollis*).

8. *Pollution control dams*: These areas are confined to the extreme southern part of the study site and are represented by a series of small ponds. These, although of artificial origin, attract a variety of waterbird species which include amongst others species such as Yellow-billed duck (*Anas undulata*), Red-billed Teal (*A. erythrorhyncha*), Egyptian Goose (*Alopochen aegyptiacus*), Red-knobbed Coot (*Fulica cristata*), Common Moorhen (*Gallinula chloropus*), Little Grebe (*Tachybaptus ruficollis*) and Reed Cormorant (*Microcarbo africanus*).

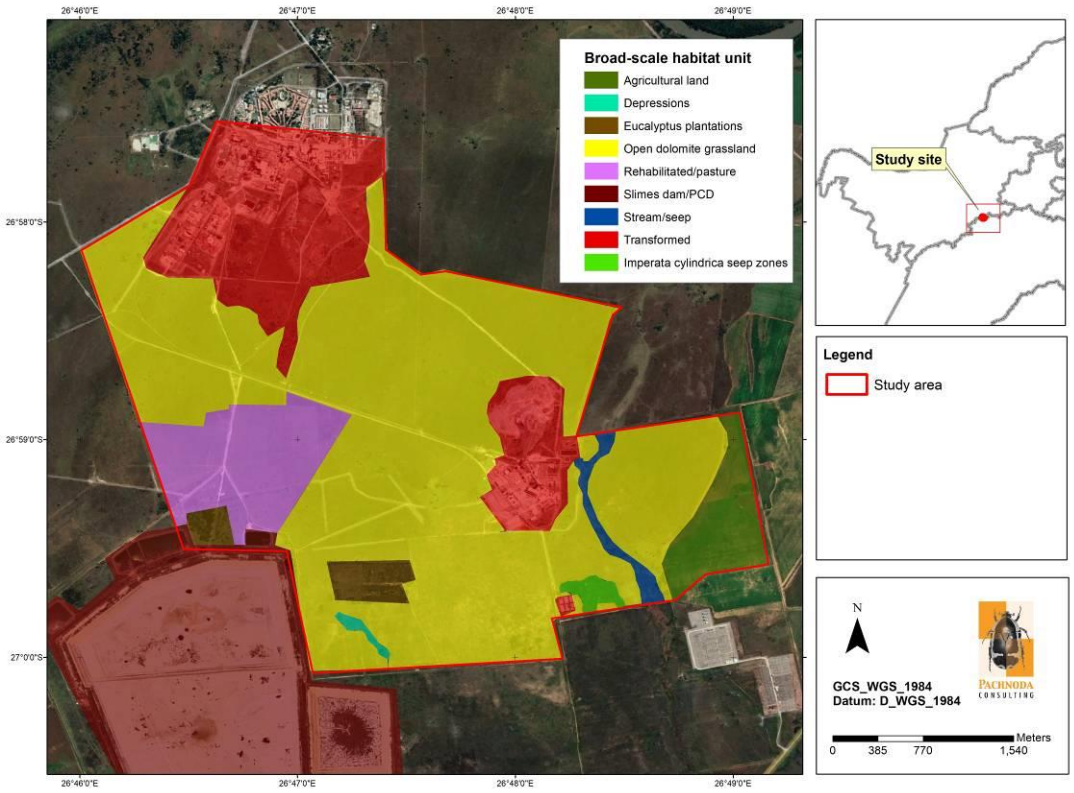



**Figure 1:** A map illustrating the avifaunal habitat types on the study and development areas.

Approximately 222 bird species are expected to occur in the study area (refer to Appendix 1 and Table 1). The expected richness was inferred from the South African Bird Atlas Project (SABAP1 & SABAP2)[2] (Harrison et al., 1997; www.sabap2.birdmap.africa) and the presence of suitable habitat in the study area. The expected richness is also strongly correlated with favourable environmental conditions (e.g. during good rains) and seasonality (e.g. when migratory species are present). This equates to 22 % of the approximate 987[3] species listed for the southern African subregion[4] (and approximately 25 % of the 871 species recorded within South Africa[5]). However, the species richness obtained from the pentad grid 2655_2645 corresponding to the study area[6] is lower than the expected number of species with an average of 57.3 species recorded for each full protocol card submitted (for observation of two hours or more; range = 33 - 94 species). The lower richness is explained due to the spatial scale of the pentad grid and habitat variability, whereby the study site is much smaller in surface area and will encompass less habitat variability (as opposed to a larger surface area, e.g. the 2655_2645 also incorporate habitat unit which consists of the Vaal River and tributaries, urban gardens and parks, wetlands and extensive *Vachellia* woodland).

According to field observations (May and July 2022), the total number of species observed on the study area is *ca*. 109 species (see Appendix 1). It shows that the surveys on the study area produced a higher tally when compared to the average richness recorded for the corresponding pentad grid and were

[2] The expected richness statistic was derived from the pentad grid 2655_2645 totalling 226 bird species and modified according to habitat suitability, personal observations and probability of occurrence (based on 64 submitted cards, 54 being full protocol cards and 10 being ad hoc cards).
3 *sensu* www.zestforbirds.co.za (Hardaker, 2020) including four recently confirmed bird species (vagrants).
4 A geographical area south of the Cunene and Zambezi Rivers (includes Namibia, Botswana, Zimbabwe, southern Mozambique, South Africa, eSwatini and Lesotho).
5 With reference to South Africa (including Lesotho and eSwatini (BirdLife South Africa, 2022).
[6] Including observations made during the May 2022 and July 2022 surveys.

regarded as sufficient. On a national scale, the species richness per pentad on the study area is considered to be high

***Areas of high sensitivity***

The wetland-associated habitat units (c. depressions, pollution control dams, Imperata cylindrica seeps and the valley-bottom seeps) and their respective buffers are of high sensitivity. These features provide habitat for a variety of collision-prone bird species which include waterbird and shorebird taxa. The placement of electrical infrastructure and PV panels in close proximity to these pans/dams as well as on areas where the frequency of fly-overs by waterbirds are high could increase potential avian collisions with the infrastructure.

***Areas of medium sensitivity***

It includes the open grassland and bush clump mosaics which are prominent in the wider study region and provides potential suitable foraging habitat for some collision-prone bird species, including the Northern Black Korhaan (*Afrotis afraoides*) with the potential to interact (e.g. collide) with the proposed electrical infrastructure. In addition, reporting rates for threatened and near threatened bird species are anticipated to be relatively low for these units, thereby suggesting a medium sensitivity rating instead of a high sensitivity even though the majority of the habitat is natural.

***Areas of low sensitivity***

These habitat units are represented by transformed habitat, mine infrastructure, agricultural and rehabilitated land and the *Eucalyptus* plantations. These habitat types are of artificial origin and although the bird richness was often high on certain parts of these units (e.g. areas with tree cover) most of the bird species are either generalists or have widespread distribution ranges.

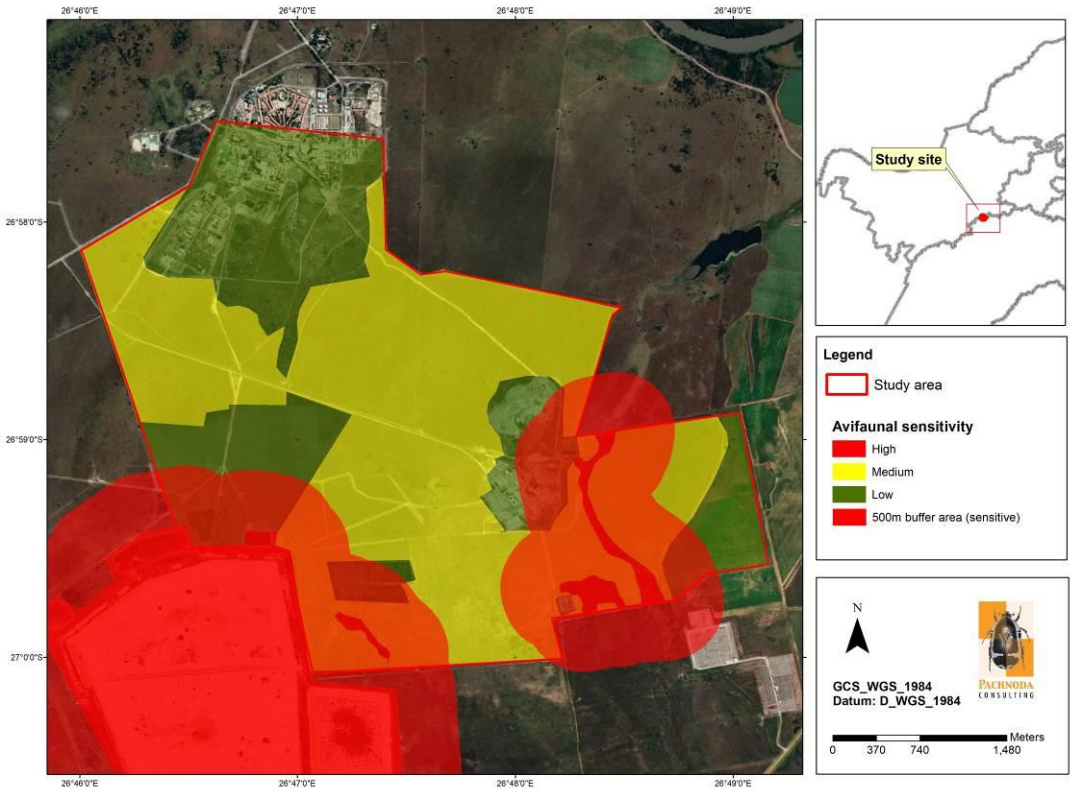



**Figure 2**: A map illustrating the avifaunal sensitivity of the study area based on habitat types supporting bird taxa of conservation concern and important ecological function.

## 2.1. Impact Assessment Tables

***1. Nature:***
Losses of natural habitat and displacement of birds through physical transformation, modifications, removals and land clearance. This impact is mainly restricted to the construction phase and is permanent.

| PV Layout (and associated infrastructure) | Without mitigation | With mitigation |
|---|---|---|
| ***Extent*** | Local (2) | Local (2) |
| ***Duration*** | Long-term (4) | Long-term (4) |
| ***Magnitude*** | High (8) | Moderate (6) |
| ***Probability*** | Definite (5) | Highly Probable (4) |
| ***Significance*** | **High (70)** | **Medium (48)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Yes | Yes |
| ***Can impacts be mitigated?*** | Yes, to some extent | Yes, to some extent |

***Mitigation:***
It is difficult to mitigate against the loss of habitat since clearing of vegetation (or habitat) will be required for the infrastructure associated with the project. Both the PV facility and associated infrastructure occur predominantly on habitat types of medium and low sensitivity. The best practicable mitigation will be to consolidate infrastructure (e.g. proposed powerlines) to areas where existing impacts occur (e.g. placing the proposed powerline alongside existing powerlines) and to avoid areas of high sensitivity.

***Residual:***

Decreased bird species richness, low evenness values and subsequent loss of avian diversity on a local scale. The impact will also result in sterilisation of local landscapes and increased fragmentation of habitat.

***2. Nature:***
The creation of novel or new avian habitat for commensal bird species or superior competitive species. This is expected to occur during the operation phase of the facility.

| **PV Layout (and associated infrastructure)** | **Without mitigation** | **With mitigation** |
|---|---|---|
| ***Extent*** | Footprint (1) | Footprint (1) |
| ***Duration*** | Medium-term (3) | Medium-term (3) |
| ***Magnitude*** | Minor (2) | Minor (2) |
| ***Probability*** | Probable (3) | Improbable (2) |
| ***Significance*** | **Low (18)** | **Low (12)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Moderate | Moderate |
| ***Irreplaceable loss of resources?*** | No | No |
| ***Can impacts be mitigated?*** | Yes, with experimentation | Yes |

***Mitigation:***
Apply bird deterrent devices and remove nest structures constructed on infrastructure associated with the PV facility under the guidance of the ECO.

***Residual:***
Secondary displacement by completive bird species such as crows and increased fecundity rate for commensal bird species that are adapted to anthropogenic activities. The impact is regarded as low.

***3. Nature:***
Avian collision impacts related to the PV facility during the operation phase (collision with the PV panels).

| **PV Layout (and associated infrastructure)** | **Without mitigation** | **With mitigation** |
|---|---|---|
| ***Extent*** | Site and immediate surroundings (4) | Site and immediate surroundings (3) |
| ***Duration*** | Long-term (4) | Long-term (4) |
| ***Magnitude*** | High (8) | Moderate (6) |
| ***Probability*** | Highly Probable (4) | Probable (3) |
| ***Significance*** | **High (64)** | **Medium (39)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Yes, potential loss of waterfowl and certain shorebird taxa species. | Yes, potential loss of waterfowl and certain shorebird taxa species. |
| ***Can impacts be mitigated?*** | Yes, with experimentation | Yes, with experimentation |

***Mitigation:***
Apply bird deterrent devices such as rotating flashers/reflectors to the panels for birds that may mistake the panels for open water and to prevent them from landing on the panels - these should especially be placed at panels nearest to wetland features, pollution control dams and slimes dams. Security/CCTV cameras may be installed to quantify mortalities (cameras are also installed along the perimeter fence for security measures and may also proved effective to quantify mortalities). Buffer wetland features, slimes dams and pollution control dams by at least 500m. If post-construction monitoring predicts and/or confirms bird mortalities, an option is to employ video cameras at selected areas to document bird mortalities and to conduct direct observations and carcass searches on a regular and systematic basis.

***Residual:***

Direct mortality is possible and may still occur irrespective of applied mitigation measures. Regular and systematic monitoring is proposed to assess the efficacy of applied mitigation and further research and testing is suggested to improve mitigation measures (e.g. bird deterrent devices). The residual impact is regarded as moderate.

***4. Nature:***
Avian collision impacts related to overhead power lines during operation.

| **Overhead powerline corridors** | **Without mitigation** | **With mitigation** |
|---|---|---|
| ***Extent*** | Local (2) | Local (2) |
| ***Duration*** | Long-term (4) | Long-term (4) |
| ***Magnitude*** | Moderate (6) | Minor (2) |
| ***Probability*** | Highly Probable (4) | Probable (3) |
| ***Significance*** | **Medium (48)** | **Low (24)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Yes (to some extent), owing to the potential loss of terrestrial bird and waterbird species. | Yes (to some extent), owing to the potential loss of terrestrial bird and waterbird species. |
| ***Can impacts be mitigated?*** | Yes | Yes |

***Mitigation:***
Apply bird deterrent devices to the power lines and make use of "bird-friendly" pylon structures. It is highly to retrofit existing powerlines with bird deterrent devices. To aid post-construction monitoring and/or monitoring of bird mortality rates, it is advised to conduct direct observations and carcass searches on a regular and systematic basis. Collisions will be reduced if the proposed corridors are placed alongside existing powerlines.

***Residual:***
Direct mortality is possible and may still happen irrespective of applied mitigation measures. The residual impact will be low.

***5. Nature:***
Avian electrocution related to the new distribution lines during operation.

| **Overhead powerline corridors** | **Without mitigation** | **With mitigation** |
|---|---|---|
| ***Extent*** | Local (2) | Local (2) |
| ***Duration*** | Long-term (4) | Long-term (4) |
| ***Magnitude*** | Moderate (6) | Minor (2) |
| ***Probability*** | Probable (3) | Probable (3) |
| ***Significance*** | **Medium (36)** | **Low (24)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Yes (to some extent), owing to the potential loss of terrestrial bird and waterbird species. | Yes (to some extent), owing to the potential loss of terrestrial bird and waterbird species. |
| ***Can impacts be mitigated?*** | Yes, to some extent | Yes, to some extent |

***Mitigation:***
Avoid the placement of overhead electrical infrastructure in close proximity to wetland features and pollution control dams. Make use of bird-friendly pylons and bird guards as recommended by EWT.

***Residual:***
Direct mortality is possible and may still happen irrespective of applied mitigation measures. The residual impact will be low.

## 2.2. Cumulative Impact Assessment

Cumulative impacts are defined as impacts that result from additional or incremental activities caused by past or present actions together with the current project. Therefore, cumulative impacts are those that will affect the general avifaunal community on the study area due to other planned solar farm projects and electrical infrastructure in the region.

According to the National Screening Report, there is currently eight solar PV facilities with an approved environmental authorisation under consideration within 30km of the proposed Harmony Moab Khotsong PV facility. Four of these are within 2.3 km of the study site.

***1. Nature:***
Regional losses of natural habitat and subsequent displacement of birds.

| | **Overall impact of the proposed project considered in isolation** | **Cumulative impact of the project and other projects in the area** |
|---|---|---|
| ***Extent*** | Local (2) | Local and immediate surroundings (3) |
| ***Duration*** | Long-term (4) | Long-term (4) |
| ***Magnitude*** | Moderate (6) | Moderate (6) |
| ***Probability*** | Highly Probable (4) | Highly Probable (4) |
| ***Significance*** | **Medium (48)** | **Medium (52)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Loss of resources?*** | Yes | Yes |
| ***Can impacts be mitigated?*** | To some extent | To some extent |
| ***Confidence in findings:*** High. | | |

***Mitigation:***
It is difficult to mitigate against the loss of habitat without considering alternative sites. The best practicable mitigation will be to consolidate infrastructure (e.g. proposed powerline) to areas where existing impacts occur (e.g. placing the proposed powerline alongside existing powerlines) and to concentrate infrastructure on land with a low biodiversity conservation value.

***2. Nature:***
Avian collision impacts related to the PV facility during the operational phase (collision with the PV panels).

| | **Overall impact of the proposed project considered in isolation** | **Cumulative impact of the project and other projects in the area** |
|---|---|---|
| ***Extent*** | Site and immediate surroundings (3) | Local and immediate surroundings (3) |
| ***Duration*** | Long-term (4) | Long-term (4) |
| ***Magnitude*** | Moderate (6) | High (8) |
| ***Probability*** | Probable (3) | Highly Probable (4) |
| ***Significance*** | **Medium (39)** | **Medium (60)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Yes, potential loss of waterfowl and certain shorebird taxa species. | Yes, potential loss of waterfowl and certain shorebird taxa species. |

| | | |
|---|---|---|
| ***Can impacts be mitigated?*** | Yes, to some extent | Yes, to some extent |
| ***Confidence in findings:*** Low. | | |
| ***Mitigation:*** Apply bird deterrent devices to the panels for birds that may mistake the panels for open water and to prevent them from landing on the panels. To aid post-construction monitoring and/or monitoring of bird mortality rates, it is advised to employ video cameras to document any bird mortalities and to conduct direct observations and carcass searches on a regular and systematic basis. Apply appropriate buffer zones to water features and wetlands. | | |

***3. Nature:***
Avian collision impacts related to the powerline reticulation and new distribution lines during operation.

| | **Overall impact of the proposed project considered in isolation** | **Cumulative impact of the project and other projects in the area** |
|---|---|---|
| ***Extent*** | Local (2) | Local (2) |
| ***Duration*** | Long-term (4) | Long-term (4) |
| ***Magnitude*** | Minor (2) | Moderate (6) |
| ***Probability*** | Probable (3) | Probable (3) |
| ***Significance*** | **Low (24)** | **Medium (36)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Yes, potential loss of waterfowl and certain shorebird taxa species. | Yes, potential loss of waterfowl and certain shorebird taxa species. |
| ***Can impacts be mitigated?*** | Yes, to some extent | Yes, to some extent |
| ***Confidence in findings:*** High. | | |
| ***Mitigation:*** Apply bird deterrent devices to the power line and make use of "bird-friendly" pylon structures. **Allow for construction of new powerlines parallel to existing lines**. To aid post-construction monitoring and/or monitoring of bird mortality rates, it is advised to conduct direct observations and carcass searches on a regular and systematic basis. As a priority, all new power lines should be marked with bird diverters. | | |

***4. Nature:***
Avian electrocution related to the powerline reticulation and new distribution lines during operation**.**

| | **Without mitigation** | **With mitigation** |
|---|---|---|
| ***Extent*** | Local (2) | Local (2) |
| ***Duration*** | Long-term (4) | Long-term (4) |
| ***Magnitude*** | Minor (2) | Low (4) |
| ***Probability*** | Probable (3) | Probable (3) |
| ***Significance*** | **Low (24)** | **Medium (36)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Yes, potential loss of waterfowl and certain shorebird taxa species. | Yes, potential loss of waterfowl and certain shorebird taxa species. |
| ***Can impacts be mitigated?*** | Yes, to some extent | Yes, to some extent |
| ***Confidence in findings:*** Moderate. | | |
| ***Mitigation:*** | | |

Apply bird deterrent devices to the power line and make use of "bird-friendly" pylon structures. As a priority, all new power lines should be marked with bird diverters. Make use of bird-friendly pylons and bird guards. **Position electrical infrastructure in close proximity to existing infrastructure**.

## 2.3. Conclusion

Eight avifaunal habitat types were identified on the study site and surroundings, consisting of four untransformed types (ranging from open grassland with bush clump mosaics, depressions, Imperata cylindrica seep zones to a valley-bottom see/stream) and four transformed units (ranging from agricultural land, *Eucalyptus* plantations, rehabilitated grassland and pastures to pollution control dams). The study site was also surrounded by slimes dams and an impoundment to the east (c. 700m from the site), which provided additional habitat for waterbird and shorebird taxa (especially the latter). Approximately 222 bird species are expected to occur in the wider study area, of which 109 species were observed in the study area (during two independent surveys). The expected richness included five threatened or near threatened species, 18 southern African endemics and 17 near-endemic species. However, the occurrence of threatened and near threatened bird species was predicted to be low, although the natural broad-scale habitat units provided foraging habitat for the occasional occurrence of the vulnerable Lanner Falcon (*Falco biarmicus*) and the regionally near threatened Abdim's Stork (*Ciconia abdimii*). In addition, the valley-bottom seep/stream on the eastern part of the study site provides suitable foraging habitat for the regionally endangered African Marsh Harrier (*Circus ranivorus*), although this species was not observed during the respective surveys. Although the African Marsh Harrier was recorded on the study site during the survey period, it was recommended that all potential habitat be conserved (as a precautionary principle) which included the seep zone/stream on the eastern part of the study site. Sixteen southern African endemics and 11 near-endemic species were confirmed on the study site.

An evaluation of potential and likely impacts on the avifauna revealed that the impact significance was moderate to low after mitigation (depending on the type of impact). However, the risk for certain waterbirds (mainly large-bodied waterfowl such as the South African Shelduck *Tadorna cana* and Egyptian Goose *Alopochen aegyptiacus*) colliding with the PV infrastructure remained eminent due to the presence of wetland-associated features and pollution control dams in the study area. Post-construction monitoring was recommended along with the installation of appropriate bird diverters to minimise the potential risk of collision trauma in birds.

No fatal-flaws were identified during the assessment, although it was strongly recommended that the proposed mitigation measures and monitoring protocols (e.g. post construction monitoring) be implemented during the construction and operational phase of the project.

## 3. SOILS AND AGRICULTURAL POTENTIAL IMPACT ASSESSMENT

Observations made during the site visit include recording the presence of farm buildings, cattle handling facilities and water troughs. The larger area around the study area was also assessed by driving through the area to gain an understanding of the agro ecosystem within which the study area functions.

Vaalbos and Clovelly is found in the southwestern parts of the study area and covers a small area. Both the Vaalbos and Clovelly have dephs between 500 and 1000 mm respectively. The lithic horizon mainly consisted of iron ore. All soil forms have chromic topsoils indicating sufficient amount of organic carbon. The grid connection corridor primarily consists of transported Technosols, which is material intentionally transported by humans.

The largest part of the Moab PV Facility development area consists of land with Moderate (Class 06 and 07) land capability. This land capability class is present within the entire center boundary of the development area while the eastern and western section of the boundary consists of land with Moderate-High (Class 08 and 09) land capability.

The largest part of the development area assessed, has Low-Moderate agricultural potential. Low-Moderate agricultural potential has been assigned to the Glenrosa soil form. It is possible that the weathering of the shallow soils allows root penetration and water infiltration, which would increase the agricultural potential dramatically. The High agricultural potential is allocated to the Hutton, Vaalbos, Nkonkoni and Clovelly soil form due to its deep soil depth and was found in the north-western, southern and center part of the study area (102.5ha).

Following the consideration of all the desktop and gathered baseline data above, the findings of the report are not the same as the Environmental Screening Tool. No irrigation infrastructure, such as centre pivots or drip irrigation, are present within the project area and irrigated agricultural is currently not practiced in the area.

The area is not currently used for livestock farming although the Proposed Moab PV Facility project area can support 77 head of cattle at the long-term grazing capacity of 7ha/LSU (DALRRD, 2018). Considering the soil properties, land capability and agricultural potential of the development area, most of the area has **Low Agricultural Sensitivity** with only 166ha having **Medium Agricultural Sensitivity**. Soil in the project area will have Low sensitivity, depending on the successful implementation of mitigation measures to prevent soil erosion, compaction, and pollution. It should be noted that development will only be taken place in the development footprint and thus not the entire development area.

### 3.1. Impact Assessment Tables

Impact: Change in land use from livestock grazing to energy generation

***Nature:*** Prior to construction of the project infrastructure, the PV development area will be fenced off and livestock farming will be excluded from the development footprint area.

| | **Without mitigation** | **With mitigation** |
|---|---|---|
| ***Extent*** | Local (1) | Local (1) |
| ***Duration*** | Medium duration (3) | Medium duration (3) |
| ***Magnitude*** | Moderate (6) | Low (4) |
| ***Probability*** | Definite (4) | Definite (4) |
| ***Significance*** | **Medium (40)** | **Medium (32)** |

| | | |
|---|---|---|
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Moderate | Moderate |
| ***Irreplaceable loss of resources?*** | Yes | Yes |
| ***Can impacts be mitigated?*** | No | N/A |

***Mitigation:***

- Vegetation clearance must be restricted to areas where infrastructure is constructed.
- No materials removed from development area must be allowed to be dumped in nearby livestock farming areas.
- All left-over construction material must be removed from site once construction on a land portion is completed.
- No open fires made by the construction teams are allowable during the construction phase.

***Residual Impacts:***

The residual impact from the construction of the Moab PV Facility and Associated Infrastructure is considered medium.

***Cumulative Impacts:***

Any additional infrastructure development in support of the Moab PV Facility, will result in additional areas where grazing veld will be disturbed.

Impact: Soil erosion

***Nature:*** All areas where vegetation is removed from the soil surface in preparation for the infrastructure construction will result in exposed soil surfaces that will be prone to erosion. Both wind and water erosion are a risk, as the area falls within a region that experiences thunderstorms in the summer months and sometimes strong winds during the dry winter months, especially August and September.

| | **Without mitigation** | **With mitigation** |
|---|---|---|
| ***Extent*** | Local (1) | Local (1) |
| ***Duration*** | Medium-term (3) | Medium-term (3) |
| ***Magnitude*** | Moderate (6) | Low (4) |
| ***Probability*** | Probable (3) | Improbable (2) |
| ***Significance*** | **Medium (30)** | **Low (16)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Yes | No |
| ***Can impacts be mitigated?*** | Yes | N/A |

***Mitigation:***

- Land clearance must only be undertaken immediately prior to construction activities and only within the development footprint;
- Unnecessary land clearance must be avoided;
- Level any remaining soil removed from excavation pits (where the PV modules will be mounted) that remained on the surface, instead of allowing small stockpiles of soil to remain on the surface;
- Where possible, conduct the construction activities outside of the rainy season; and
- Stormwater channels must be designed to minimise soil erosion risk resulting from surface water runoff.

***Residual Impacts:***

The residual impact from the construction and operation of the project on the susceptibility to erosion is considered low.

***Cumulative Impacts:***

Any additional infrastructure development in support of the project will result in additional areas exposed to soil erosion through wind and water movement.

Impact: Soil compaction

***Nature:*** The clearing and levelling of land for construction of the infrastructure will result in soil compaction. In the area where the access roads and substation will be constructed, topsoil will be removed, and the remaining soil material will be deliberately compacted to ensure a stable surface prior to construction.

| | **Without mitigation** | **With mitigation** |
|---|---|---|
| ***Extent*** | Local (1) | Local (1) |
| ***Duration*** | Medium-term (3) | Medium-term (3) |
| ***Magnitude*** | Moderate (6) | Low (4) |
| ***Probability*** | Probable (3) | Improbable (2) |
| ***Significance*** | **Medium (30)** | **Low (16)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Yes | No |
| ***Can impacts be mitigated?*** | Yes | N/A |

***Mitigation:***

- Vehicles and equipment must travel within demarcated areas and not outside of the construction footprint;
- Unnecessary land clearance must be avoided;
- Materials must be off-loaded and stored in designated laydown areas;
- Where possible, conduct the construction activities outside of the rainy season; and
- Vehicles and equipment must park in designated parking areas.

***Residual Impacts:***

The residual impact from the construction and operation of the project on soil compaction is considered low.

***Cumulative Impacts:***

Any additional infrastructure development in support of the project, will result in additional areas exposed to soil compaction.

Impact: Soil pollution

***Nature:*** The following construction activities can result in the chemical pollution of the soil:

1. Petroleum hydrocarbon (present in oil and diesel) spills by machinery and vehicles during earthworks and the removal of vegetation as part of site preparation;
2. Spills from vehicles transporting workers, equipment, and construction material to and from the construction site;
3. The accidental spills from temporary chemical toilets used by construction workers;
4. The generation of domestic waste by construction workers;
5. Spills from fuel storage tanks during construction;
6. Pollution from concrete mixing;
7. Pollution from road-building materials; and
8. Any construction material remaining within the construction area once construction is completed.

| | **Without mitigation** | **With mitigation** |
|---|---|---|
| ***Extent*** | Local (1) | Local (1) |
| ***Duration*** | Short-term (2) | Short-term (2) |
| ***Magnitude*** | Moderate (6) | Low (4) |
| ***Probability*** | Low (4) | Improbable (2) |
| ***Significance*** | **Medium (36)** | **Low (14)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Yes | No |
| ***Can impacts be mitigated?*** | Yes | N/A |

***Mitigation:***

- Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills;
- Any waste generated during construction must be stored into designated containers and removed from the site by the construction teams;
- Any left-over construction materials must be removed from site;
- The construction site must be monitored by the Environmental Control Officer (ECO) to detect any early signs of fuel and oil spills and waste dumping;

***Residual Impacts:***
The residual impact from the construction and operation of the proposed project will be low to negligible.

***Cumulative Impacts:***
Any additional infrastructure that will be constructed to strengthen and support the operation of the Moab PV facility and waste not removed to designated waste sites will increase the cumulative impacts associated with soil pollution in the area.

**Operational phase**

Impact: Soil erosion

During the operational phase, staff and maintenance personnel will access the project area daily. The following impacts on soil are expected for this phase:

***Nature:*** The areas where vegetation was cleared will remain at risk of soil erosion, especially during a rainfall event when runoff from the cleared surfaces will increase the risk of soil erosion in the areas directly surrounding the project area.

| | **Without mitigation** | **With mitigation** |
|---|---|---|
| ***Extent*** | Local (1) | Local (1) |
| ***Duration*** | Medium-term (3) | Medium-term (3) |
| ***Magnitude*** | Moderate (6) | Low (4) |
| ***Probability*** | Probable (3) | Improbable (2) |
| ***Significance*** | **Medium (30)** | **Low (16)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Yes | No |
| ***Can impacts be mitigated?*** | Yes | N/A |

***Mitigation:***

- The area around the project, including the internal access roads, must regularly be monitored to detect early signs of soil erosion on-set; and
- If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.

***Residual Impacts:***
The residual impact from the operation of the project on the susceptibility to erosion is considered low.

***Cumulative Impacts:***
Any additional infrastructure that will be constructed to strengthen and support the operation of the project will result in additional areas exposed to soil erosion through wind and water movement.

Impact: Soil pollution

***Nature:*** During the operational phase, potential spills and leaks from maintenance vehicles and equipment and waste generation on site can result in soil pollution. Also, any spillages around the workshop area or damaged infrastructure, such as inverters and transformers, can be a source of soil pollution.

| | **Without mitigation** | **With mitigation** |
|---|---|---|

| | | |
|---|---|---|
| ***Extent*** | Local (1) | Local (1) |
| ***Duration*** | Short-term (2) | Short-term (2) |
| ***Magnitude*** | Moderate (6) | Low (4) |
| ***Probability*** | Low (4) | Improbable (2) |
| ***Significance*** | **Medium (36)** | **Low (14)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Yes | No |
| ***Can impacts be mitigated?*** | Yes | N/A |

***Mitigation:***

- Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills;
- No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area; and
- Regularly monitor areas alongside the roads, parking area and workshop for any signs of oil, grease and fuel spillage or the presence of waste.

***Residual Impacts:***
The residual impact from the operation of the proposed project will be low to negligible.

***Cumulative Impacts:***
The operation of any additional infrastructure to strengthen and support the operation of the Moab PV facility and waste not removed to designated waste sites will increase the cumulative impacts associated with soil pollution in the area.

## 2.2. Cumulative Impact Assessment

Assessment of cumulative impact of decrease in areas available for livestock farming

**Nature:**
**Decrease in areas with suitable land capability for cattle farming.**

| | **Overall impact of the proposed project considered in isolation** | **Cumulative impact of the project and other projects in the area** |
|---|---|---|
| **Extent** | Local (1) | Regional (2) |
| **Duration** | Short duration - 2-5 years (2) | Long-term (4) |
| **Magnitude** | Low (4) | Low (4) |
| **Probability** | Highly likely (4) | Highly likely (4) |
| **Significance** | **Low (28)** | **Medium (40)** |
| **Status (positive/negative)** | Negative | Negative |
| **Reversibility** | High | Low |
| **Loss of resources?** | Yes | Yes |
| **Can impacts be mitigated?** | Yes | No |

**Confidence in findings:**
**High.**

**Mitigation:**
**The only mitigation measure for this impact is to keep the footprints of all renewable energy facilities as small as possible and to manage the soil quality by avoiding far-reaching soil degradation such as erosion.**

Assessment of cumulative impact of areas susceptible to soil erosion

**Nature:**
**Increase in areas susceptible to soil erosion**

| | **Overall impact of the proposed project considered in isolation** | **Cumulative impact of the project and other projects in the area** |
|---|---|---|

| | | |
|---|---|---|
| **Extent** | Local (1) | Regional (2) |
| **Duration** | Medium-term (3) | Medium-term (3) |
| **Magnitude** | Moderate (6) | Moderate (6) |
| **Probability** | Probable (3) | Probable (3) |
| **Significance** | **Medium (30)** | **Medium (33)** |
| **Status (positive/negative)** | Negative | Negative |
| **Reversibility** | Low | Low |
| **Loss of resources?** | Yes | Yes |
| **Can impacts be mitigated?** | Yes | No |
| **Confidence in findings:**<br>**High.** | | |
| **Mitigation:**<br>**Each of the projects should adhere to the highest standards for soil erosion prevention and management, as defined in Sections 11.2.1 and 11.2.2. above.** | | |

Assessment of cumulative impact of areas susceptible to soil compaction

| **Nature:**<br>**Increase in areas susceptible to soil erosion** | | |
|---|---|---|
| | **Overall impact of the proposed project considered in isolation** | **Cumulative impact of the project and other projects in the area** |
| **Extent** | Local (1) | Regional (2) |
| **Duration** | Medium-term (3) | Medium-term (3) |
| **Magnitude** | Low (4) | Low (4) |
| **Probability** | Improbable (2) | Probable (3) |
| **Significance** | **Low (16)** | **Low (27)** |
| **Status (positive/negative)** | Negative | Negative |
| **Reversibility** | Low | Low |
| **Loss of resources?** | No | No |
| **Can impacts be mitigated?** | Yes | Yes |
| **Confidence in findings:**<br>High. | | |
| **Mitigation:**<br>Each of the projects should adhere to the highest standards for soil compaction prevention and management, as defined in Sections 11.2.1 and 11.2.2 above. | | |

Assessment of cumulative impact of increased risk of soil pollution

| **Nature:**<br>**Increase in areas susceptible to soil pollution** | | |
|---|---|---|
| | **Overall impact of the proposed project considered in isolation** | **Cumulative impact of the project and other projects in the area** |
| **Extent** | Local (1) | Regional (2) |
| **Duration** | Short-term (2) | Short-term (2) |
| **Magnitude** | Moderate (6) | Moderate (6) |
| **Probability** | Probable (3) | Probable (3) |
| **Significance** | **Low (27)** | **Medium (30)** |
| **Status (positive/negative)** | Negative | Negative |
| **Reversibility** | Low | Low |
| **Loss of resources?** | Yes | Yes |
| **Can impacts be mitigated?** | Yes | No |

**Confidence in findings:**
High.

**Mitigation:**
Each of the projects should adhere to the highest standards for soil pollution prevention and management, as defined in Sections 11.2.1 and 11.2.2. above.

## 2.3. Conclusion

Following the data analysis and impact assessment above, the proposed Moab PV Facility and Associated Infrastructure is considered an acceptable development within the development footprint area that was assessed for the purpose of compiling the Agricultural Assessment Report.

The soil forms present within the development footprint consist mostly of Glenrosa soil form which is shallow soils with depths between 100 and 200mm. The Glenrosa soils are assigned Low sensitivity to the proposed development. Areas with deeper soils are also present and these soils were assigned Medium sensitivity (166ha). There is no rainfed or irrigated crop production within the development footprint. There is also no irrigation infrastructure, such as centre pivots or drip irrigation, present within the project area. The grazing capacity (according to DALRRD, 2018), is 7ha/LSU, indicating that the proposed development area of 545ha has forage to feed 77 head of cattle.

The project infrastructure layout aims to avoid any crop fields and to be located directly next to the Harmony Moab Plant. I therefore confirm that all reasonable measures have been taken to avoid or minimize fragmentation and disturbance of agricultural activities, provided that the mitigation measures provided in this report are implemented.

It is my professional opinion that this application be considered favourably, permitting that the mitigation measures are followed to prevent soil erosion and soil pollution and to minimise impacts on the veld quality of the farm portions that will be affected. The project infrastructure should also remain within the proposed project area that will be fenced o

## 4. HERITAGE IMPACT ASSESSMENT

The areas surveyed as part of this assessment have been transformed through agricultural interventions and/or mining activity. As such, the results of the survey only identified one archaeological site of scientific cultural value - CM1. A 30m no-go development buffers was therefore recommended, however no development activity relating to the PV development will impact or encroach on this resource.

No impacts to the cultural landscape are anticipated.

The site visit confirmed that the area has been disturbed from farming and mining so no fossils were present on the surface. The geological structures suggest that the rocks are the right age and type to contain fossils, but the area is covered in deep cultivated soils.

Since there is an extremely small chance that fossils from the Vryheid Formation may occur below ground and may be disturbed, a Fossil Chance Find Protocol is recommended.

### 4.1. Impact Assessment Tables

| **NATURE:** It is possible that buried archaeological resources may be impacted by the proposed development in the preferred location | | | | |
|---|---|---|---|---|
| | | **Without Mitigation** | | **With Mitigation** |
| **MAGNITUDE** | **M (6)** | One archaeological resource of significance was identified within the development area | **M (6)** | One archaeological resource of significance was identified within the development area |
| **DURATION** | **H (5)** | Where manifest, the impact will be permanent. | **H (5)** | Where manifest, the impact will be permanent. |
| **EXTENT** | **L (1)** | Limited to the development footprint | **L (1)** | Limited to the development footprint |
| **PROBABILITY** | **H (5)** | It is likely that significant will be impacted | **L (1)** | It is unlikely that significant resources will be impacted |
| **SIGNIFICANCE** | **L** | (6+5+1)x5 = 60 | **L** | (6+5+1)x1 = 12 |
| **STATUS** | | Negative | | Negative |
| **REVERSIBILITY** | **L** | Any impacts to heritage resources that do occur are irreversible | **L** | Any impacts to heritage resources that do occur are irreversible |
| **IRREPLACEABLE LOSS OF RESOURCES?** | **H** | Likely | **L** | Not Likely |
| **CAN IMPACTS BE MITIGATED** | | Yes | | |
| **MITIGATION:**<br>● A no-impact buffer of 30m is implemented around Site CM1 as per Figure 7.2<br>● Should any previously unrecorded archaeological resources or possible burials be identified during the course of construction activities, work must cease in the immediate vicinity of the find, and SAHRA must be contacted regarding an appropriate way forward. | | | | |
| **RESIDUAL RISK:** None | | | | |

| **NATURE:** It is possible that buried palaeontological resources may be impacted by the proposed development in the preferred location | | | | |
|---|---|---|---|---|
| | | **Without Mitigation** | | **With Mitigation** |
| **MAGNITUDE** | **H (8)** | According to the SAHRIS Palaeosensitivity Map (Figure 3.1), the area proposed for development of the PV facilities is underlain by sediments that have very high palaeontological sensitivity. | **H (8)** | According to the SAHRIS Palaeosensitivity Map (Figure 3.1), the area proposed for development of the PV facilities is underlain by sediments that have very high palaeontological sensitivity. |
| **DURATION** | **H (5)** | Where manifest, the impact will be permanent. | **H (5)** | Where manifest, the impact will be permanent. |
| **EXTENT** | **L (1)** | Limited to the development footprint | **L (1)** | Limited to the development footprint |
| **PROBABILITY** | **L (1)** | It is unlikely that significant fossils will be impacted | **L (1)** | It is unlikely that significant fossils will be impacted |
| **SIGNIFICANCE** | **L** | (8+5+1)x1=14 | **L** | (8+5+1)x1=14 |
| **STATUS** | | Negative | | Negative |
| **REVERSIBILITY** | **L** | Any impacts to heritage resources that do occur are irreversible | **L** | Any impacts to heritage resources that do occur are irreversible |
| **IRREPLACEABLE LOSS OF RESOURCES?** | **L** | Unlikely | **L** | Not Likely |
| **CAN IMPACTS BE MITIGATED** | | Yes | | |
| **MITIGATION:**<br>● The attached Chance Fossil Finds Procedure must be implemented for the duration of construction activities<br>● Should any previously unrecorded palaeontological resources be identified during the course of construction activities, work must cease in the immediate vicinity of the find, and SAHRA must be contacted regarding an appropriate way forward. | | | | |
| **RESIDUAL RISK:**<br>None | | | | |

## 4.2. Cumulative Impact Assessment

This application is for the proposed development of a solar energy facility and associated grid connection to facilitate activities at the Harmony Moab Khotsong mine. The location of the proposed PV facility within an area with existing mining activities may lend itself to cumulative impacts. However, in terms of cumulative impacts to heritage resources, it is preferable that industrial-type infrastructure is clustered within an area in order to prevent the sprawl of industrial development across otherwise sensitive cultural landscapes.

As such, it is not anticipated that the proposed development will have a negative cumulative impact on significant heritage resources.

## 4.3. Conclusion

The areas surveyed as part of this assessment have been transformed through agricultural interventions and/or mining activity. As such, it is not surprising that the results of the survey only identified one site of scientific cultural value - CM1 within the Alternative Area proposed for the Noab PV development graded IIIC.

The identified site of archaeological significance has the potential to provide scientific insight into the past and as such, it is recommended that this area is not impacted by the proposed development. It is therefore recommended that no-go development buffers as per the recommendations below are

implemented. Further, it is recommended that these sites are mapped on all relevant SDPs and that on-going conservation measures are put in place in the EMPrs for the developments.

Furthermore, no impacts to significant palaeontological heritage is anticipated on condition that the attached Chance Fossil Finds Process is implemented and no impacts to the cultural landscape are anticipated.

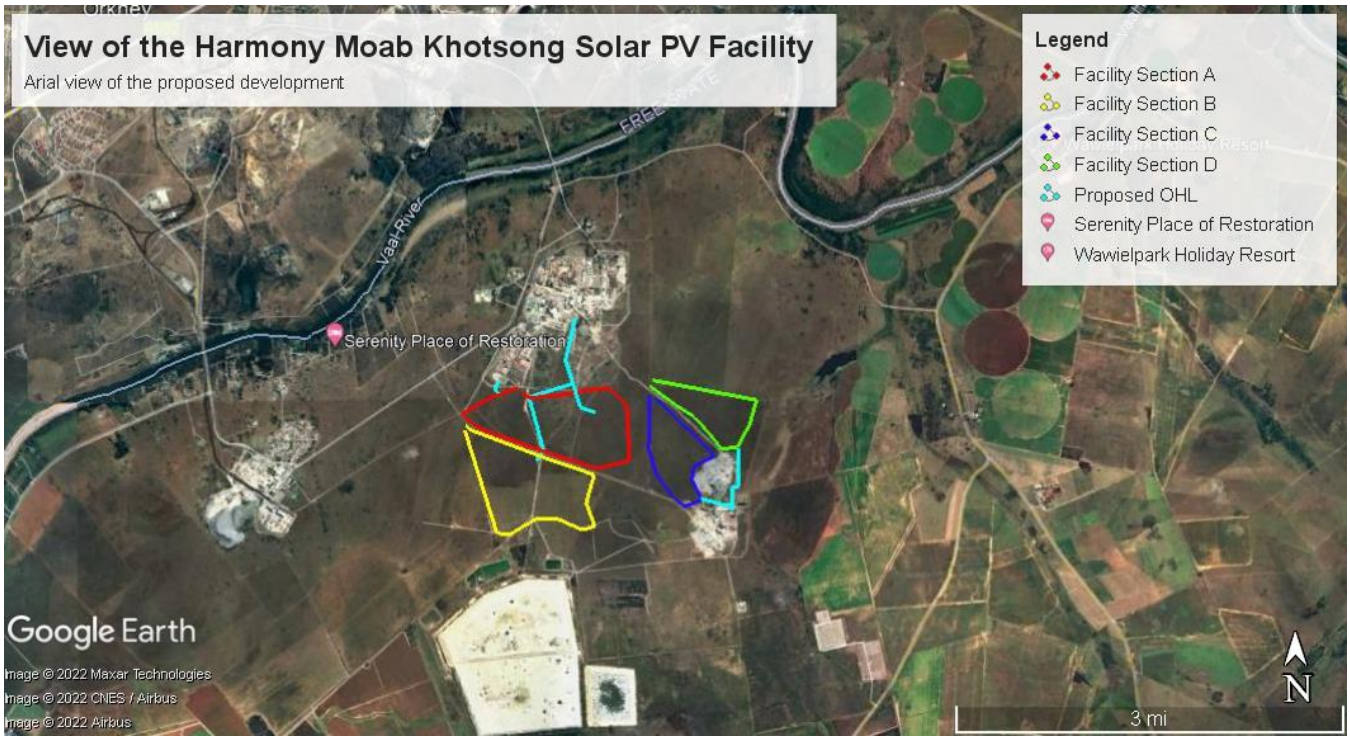
## 5. VISUAL IMPACT ASSESSMENT

The proposed Harmony Moab Khotsong Solar PV development is located in close proximity to the Vaal River, approximately 1.2km to the north. Most of the site is located within the Vaal River Mining Area, a degraded grassland transformed by mining. The landscape is dominated by plains with some scattered, slightly irregular undulating plains and hills. The site is located in an area with relatively low significance in elevation.

According to the South African National dataset of 2013-2014 (Geoterrainimage, 2015) the study area comprehends the following land cover categories:
Natural areas:

- Mainly Grassland;
- Low shrubland; and
- Wetlands.
- Transformed areas:
  - Mine infrastructure and build-up land;
  - Eucalyptus plantations; and
  - Cultivation and Agriculture

A number of large gold and diamond mines are located in between the solar PV sites, namely Taulekoa Mine next to Goedgenoeg 433, Kopanong Gold Mine next to Pretorius Kraal 53 and Great Noligwa Mine next to Groot Vaders Bosch 592. The cultural landscape is characterised by agriculture with abrupt transitions into industrial areas and mining compounds. The installation of solar PV plants is therefore unlikely to have any impacts on the landscape character of the area.


View of the Harmony Moab Khotsong Solar PV Facility
Arial view of the proposed development
Legend
Facility Section A
Facility Section B
Facility Section C
Facility Section D
Proposed OHL
Serenity Place of Restoration
Wawielpark Holiday Resort
Vaal River
Serenity Place of Restoration
Google Earth
Image © 2022 Maxar Technologies
Image © 2022 CNES / Airbus
Image © 2022 Airbus
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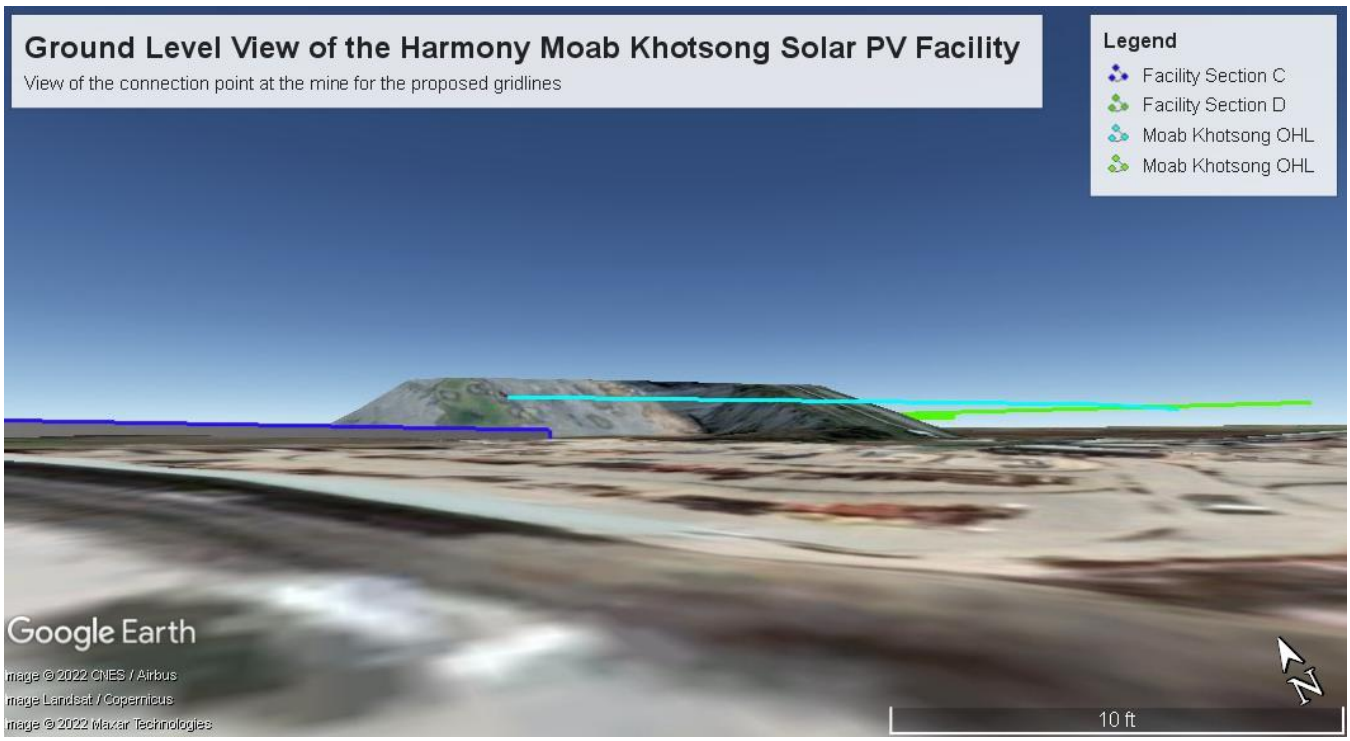
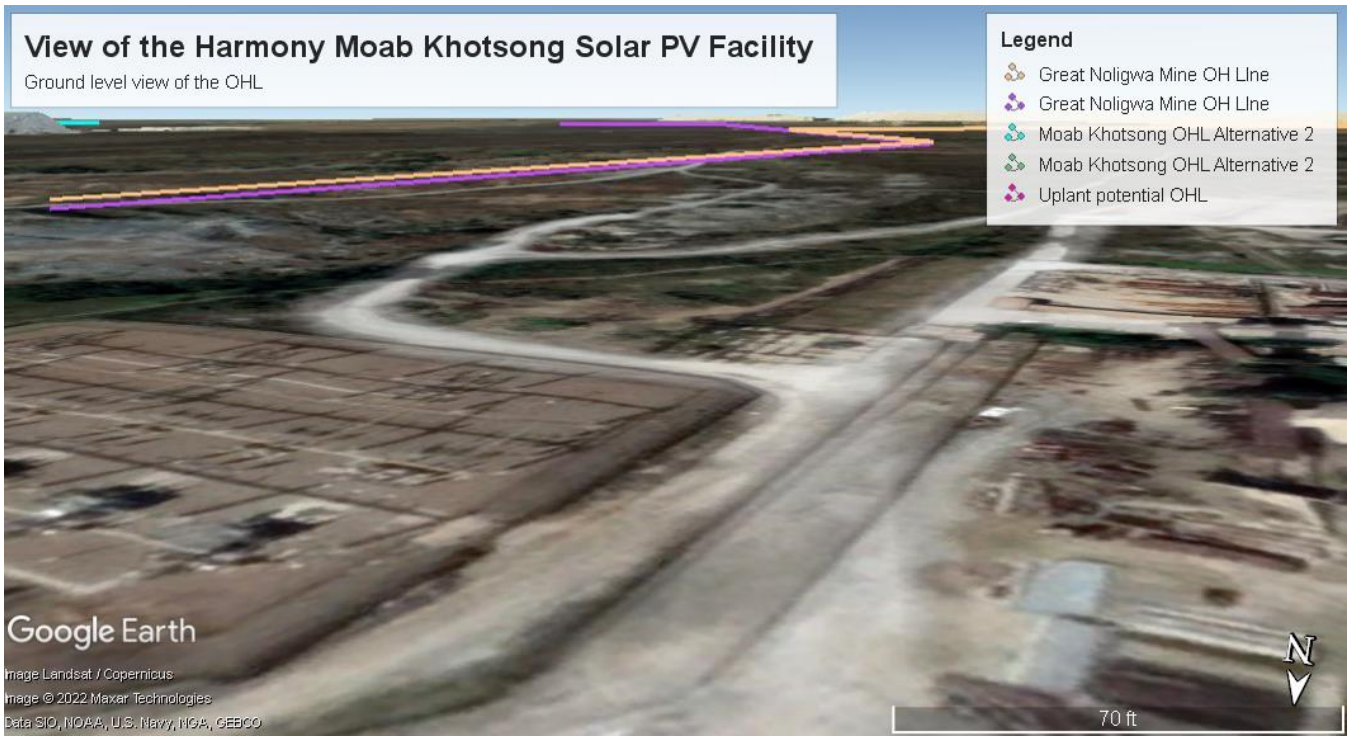
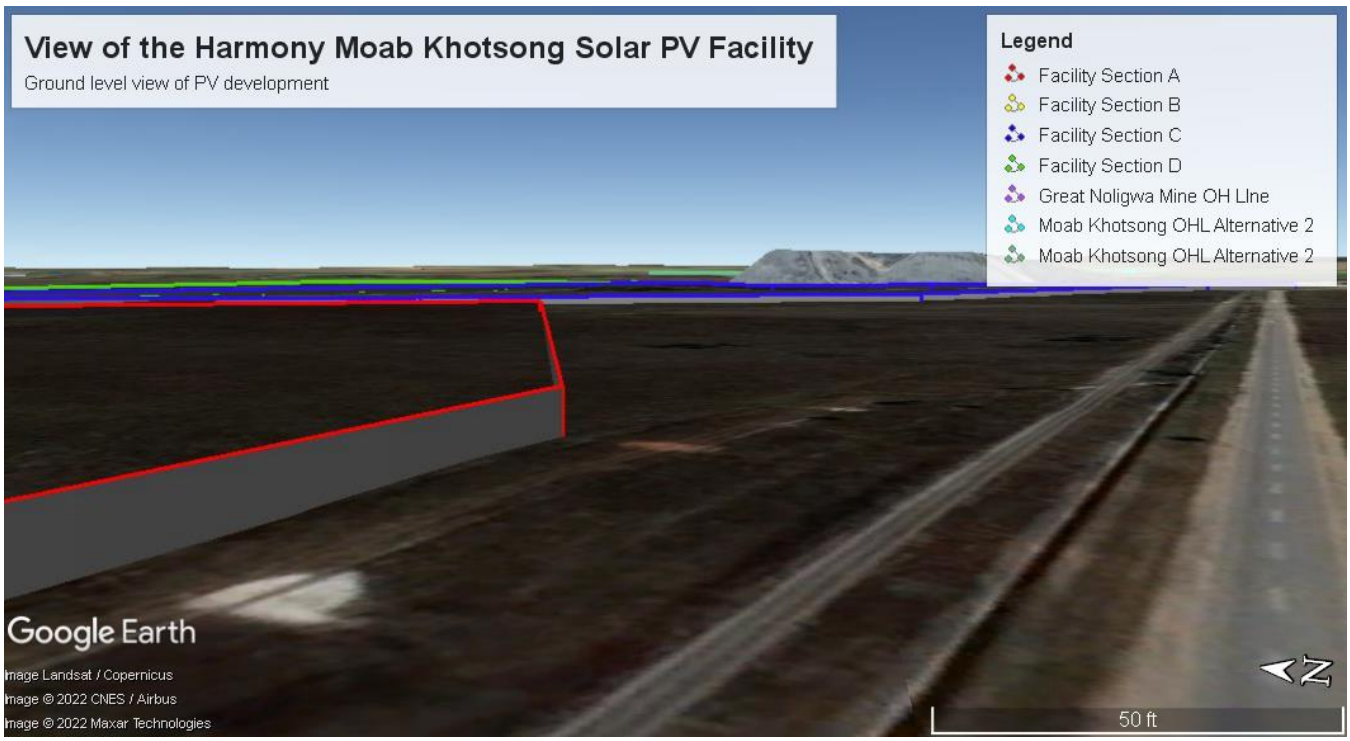
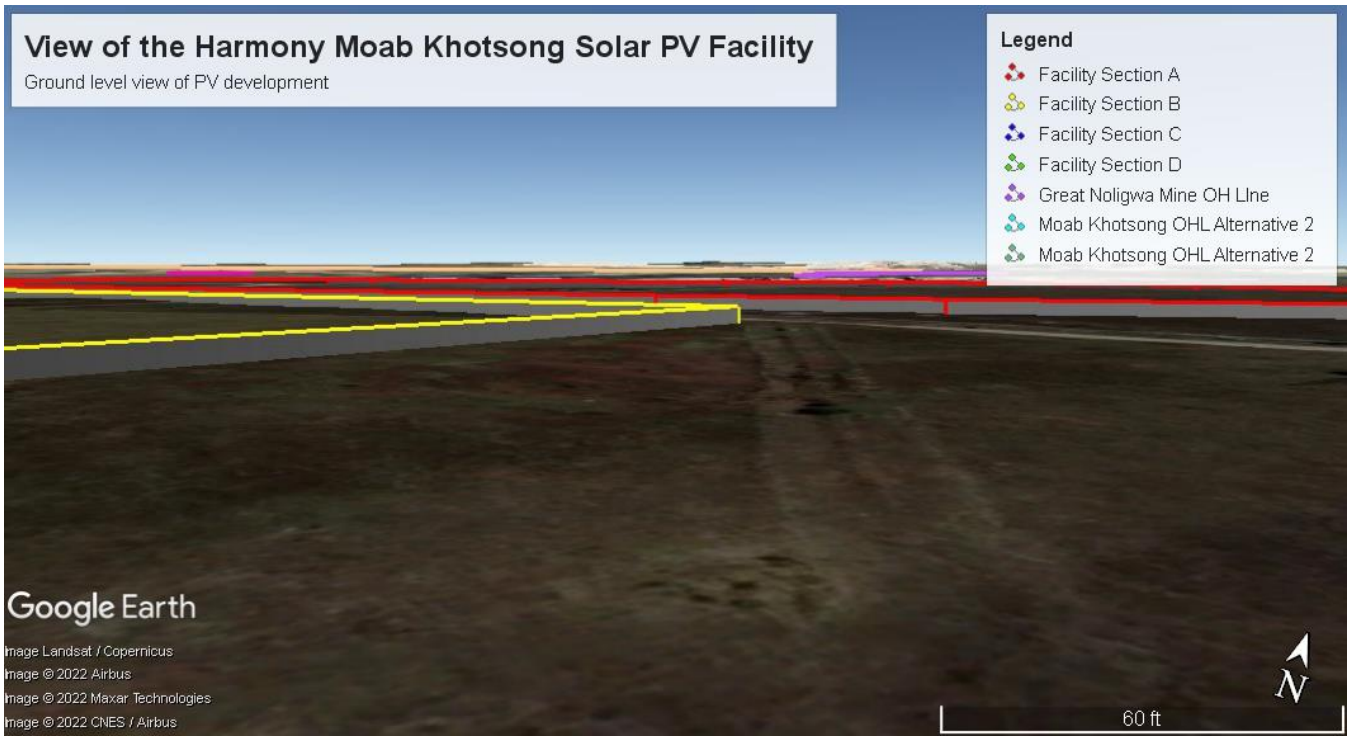
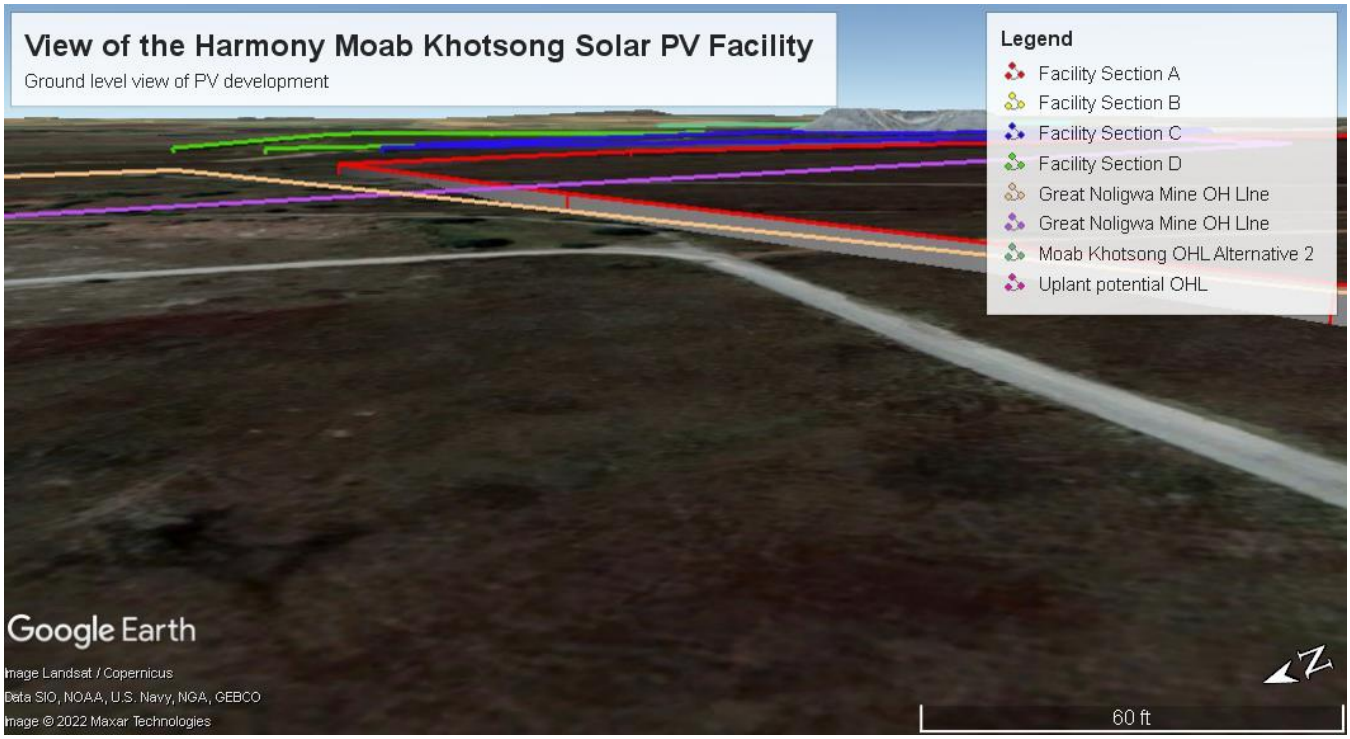
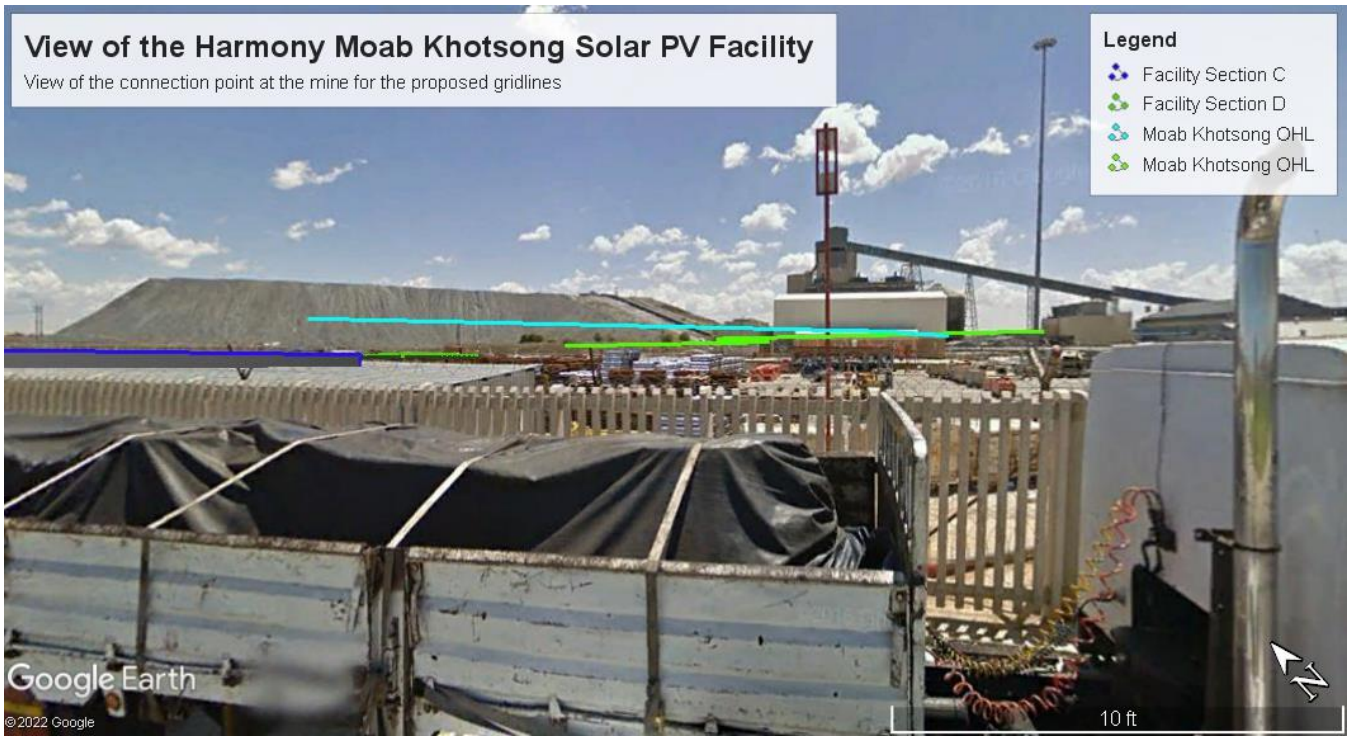

Ground Level View of the Harmony Moab Khotsong Solar PV Facility
View of the connection point at the mine for the proposed gridlines
Legend
Facility Section C
Facility Section D
Moab Khotsong OHL
Moab Khotsong OHL
Google Earth
Image © 2022 CNES / Airbus
Image Landsat / Copernicus
Image © 2022 Maxar Technologies
10 ft
N


View of the Harmony Moab Khotsong Solar PV Facility
Ground level view of the OHL
Legend
Great Noligwa Mine OH Line
Great Noligwa Mine OH Line
Moab Khotsong OHL Alternative 2
Moab Khotsong OHL Alternative 2
Uplant potential OHL
Google Earth
Image Landsat / Copernicus
Image © 2022 Maxar Technologies
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
N
70 ft


View of the Harmony Moab Khotsong Solar PV Facility
Ground level view of PV development
Legend
Facility Section A
Facility Section B
Facility Section C
Facility Section D
Great Noligwa Mine OH Line
Moab Khotsong OHL Alternative 2
Moab Khotsong OHL Alternative 2
Google Earth
Image Landsat / Copernicus
Image © 2022 CNES / Airbus
Image © 2022 Maxar Technologies
50 ft


View of the Harmony Moab Khotsong Solar PV Facility
Ground level view of PV development
Legend
Facility Section A
Facility Section B
Facility Section C
Facility Section D
Great Noligwa Mine OH Line
Moab Khotsong OHL Alternative 2
Moab Khotsong OHL Alternative 2
Google Earth
Image Landsat / Copernicus
Image © 2022 Airbus
Image © 2022 Maxar Technologies
Image © 2022 CNES / Airbus
N
60 ft

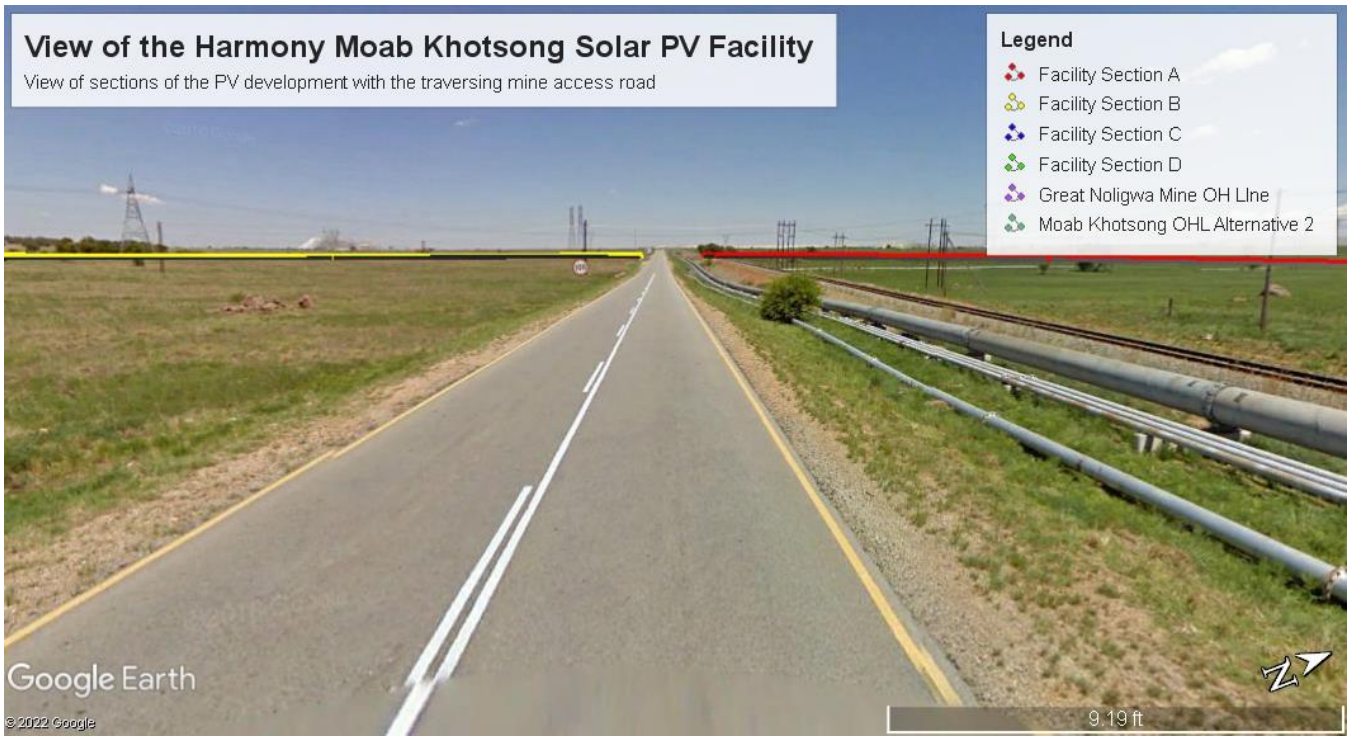

View of the Harmony Moab Khotsong Solar PV Facility
Ground level view of PV development
Legend
Facility Section A
Facility Section B
Facility Section C
Facility Section D
Great Noligwa Mine OH Line
Great Noligwa Mine OH Line
Moab Khotsong OHL Alternative 2
Uplant potential OHL
Google Earth
Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2022 Maxar Technologies
60 ft

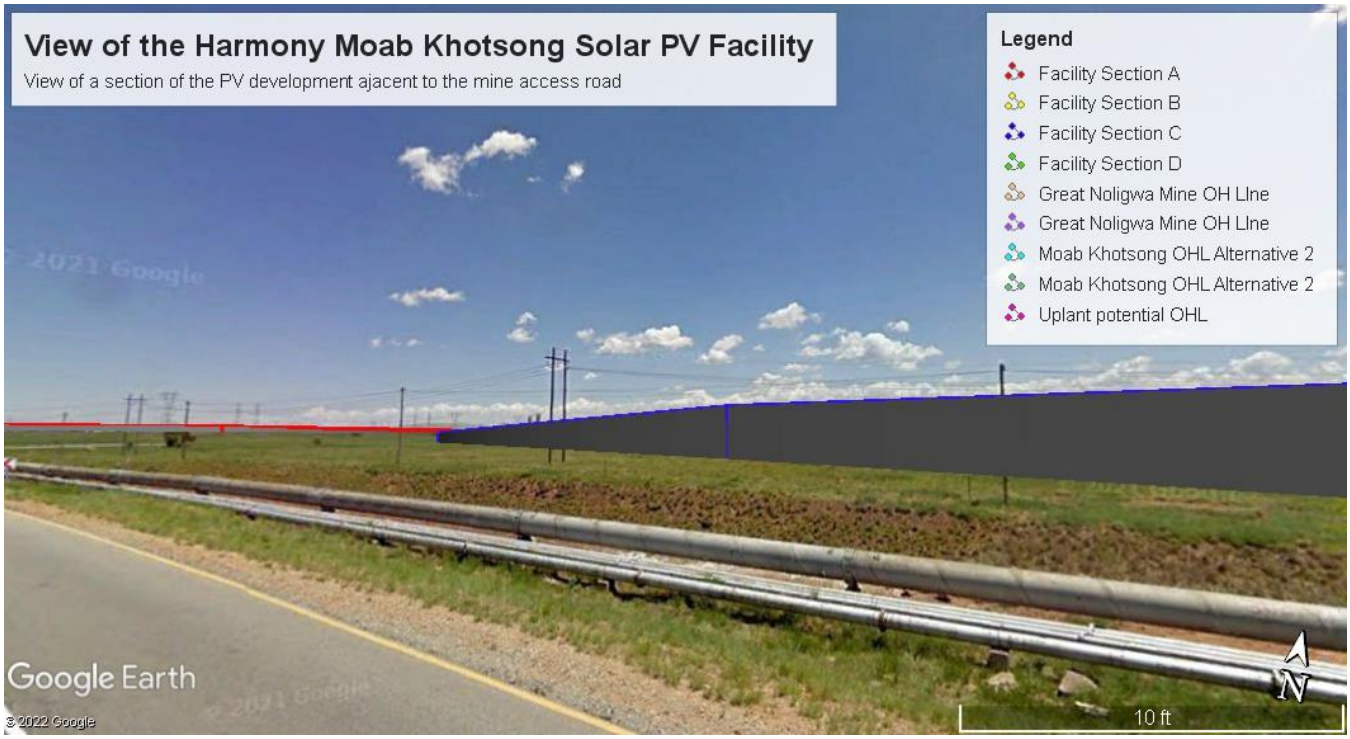

View of the Harmony Moab Khotsong Solar PV Facility
View of the connection point at the mine for the proposed gridlines
Legend
Facility Section C
Facility Section D
Moab Khotsong OHL
Moab Khotsong OHL
Google Earth
© 2022 Google
10 ft
N


View of the Harmony Moab Khotsong Solar PV Facility
View of surrounding area, the PV development is located west (In yellow)
Legend
Facility Section B
Google Earth
© 2022 Google
9.51 ft
N

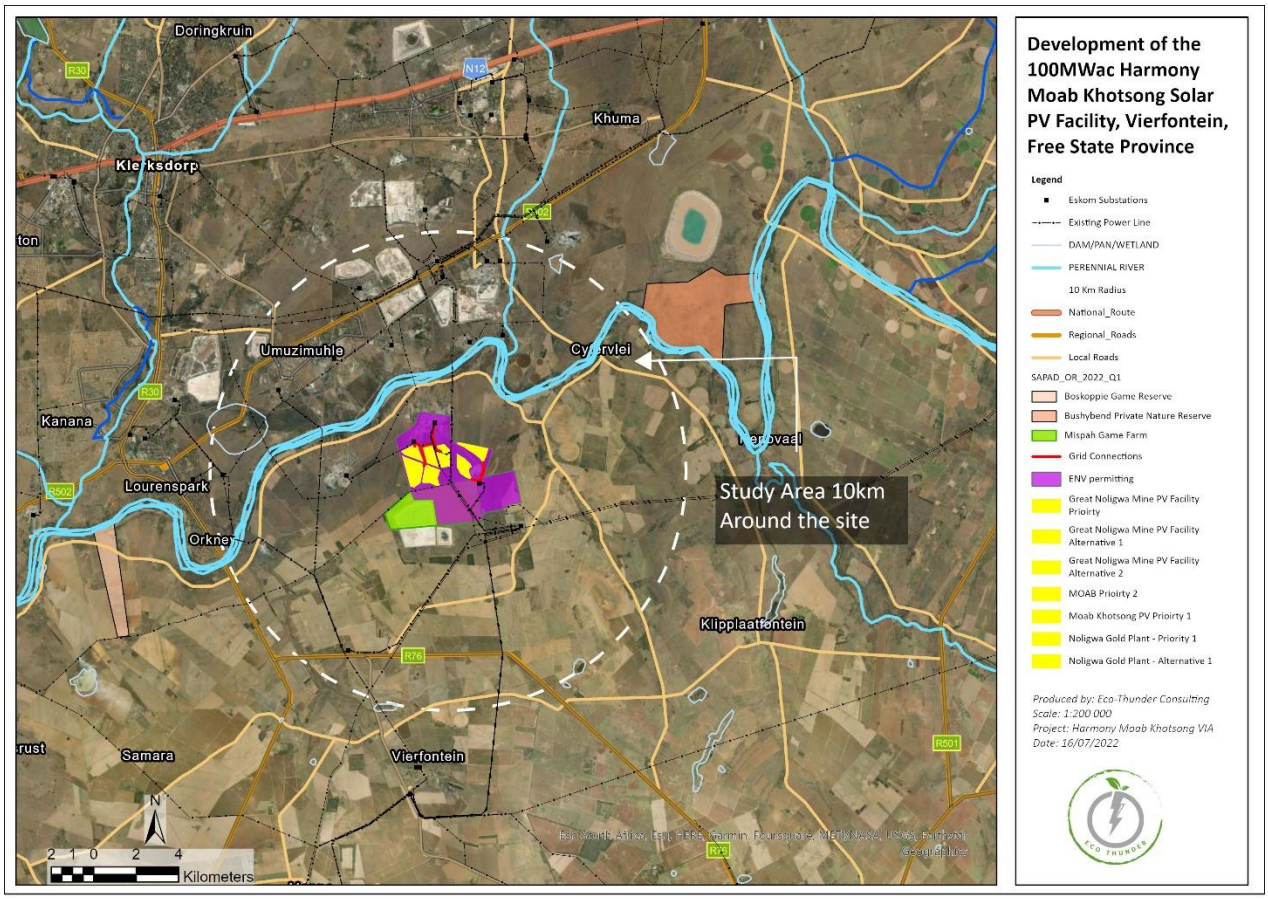

View of the Harmony Moab Khotsong Solar PV Facility
View of surround area, the PV development is located to the north, and this view is south facing
Legend
Google Earth
© 2022 Google
10 ft
N

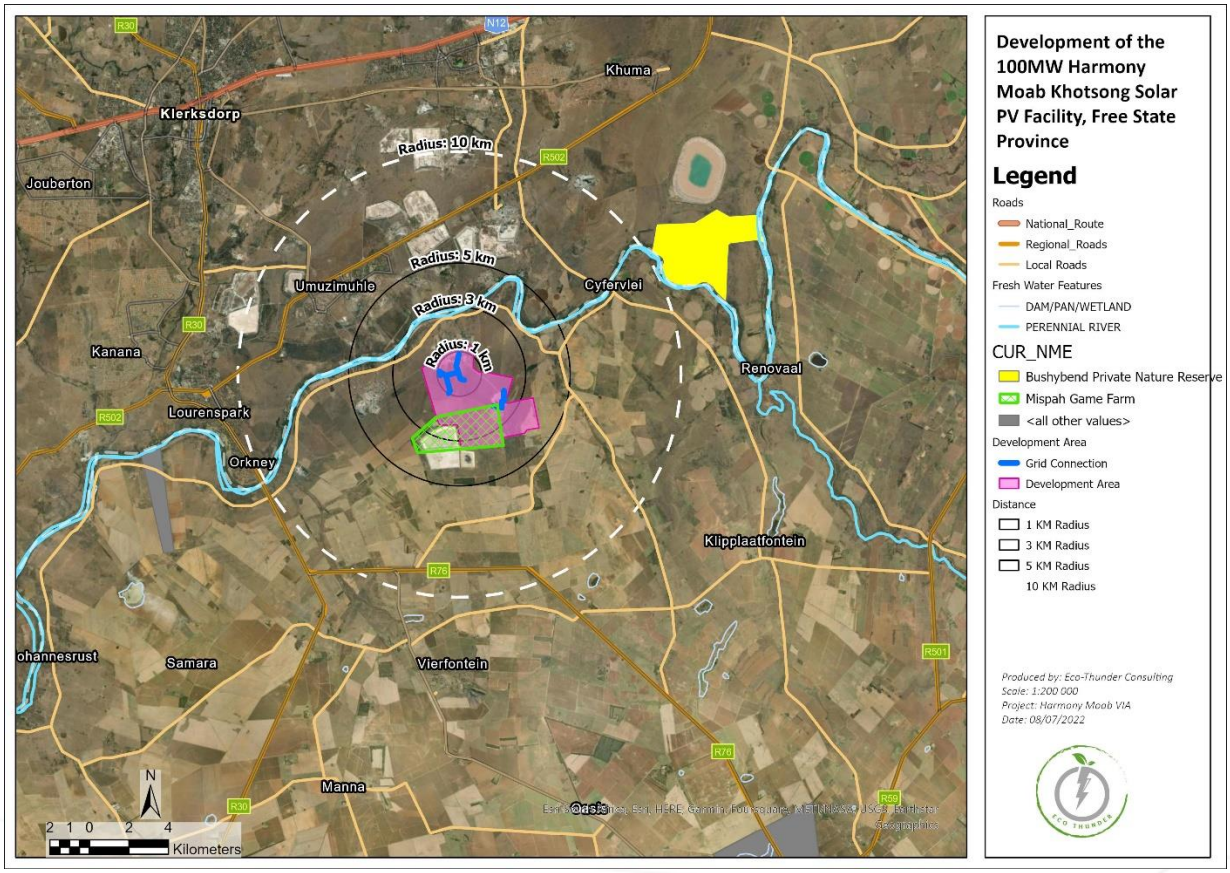

View of the Harmony Moab Khotsong Solar PV Facility
View From the unnamed road located ajacent to mining pipeline infrastucture
Legend
Facility Section A
Facility Section B
Proposed OHL
Google Earth
© 2022 Google
10 ft
N

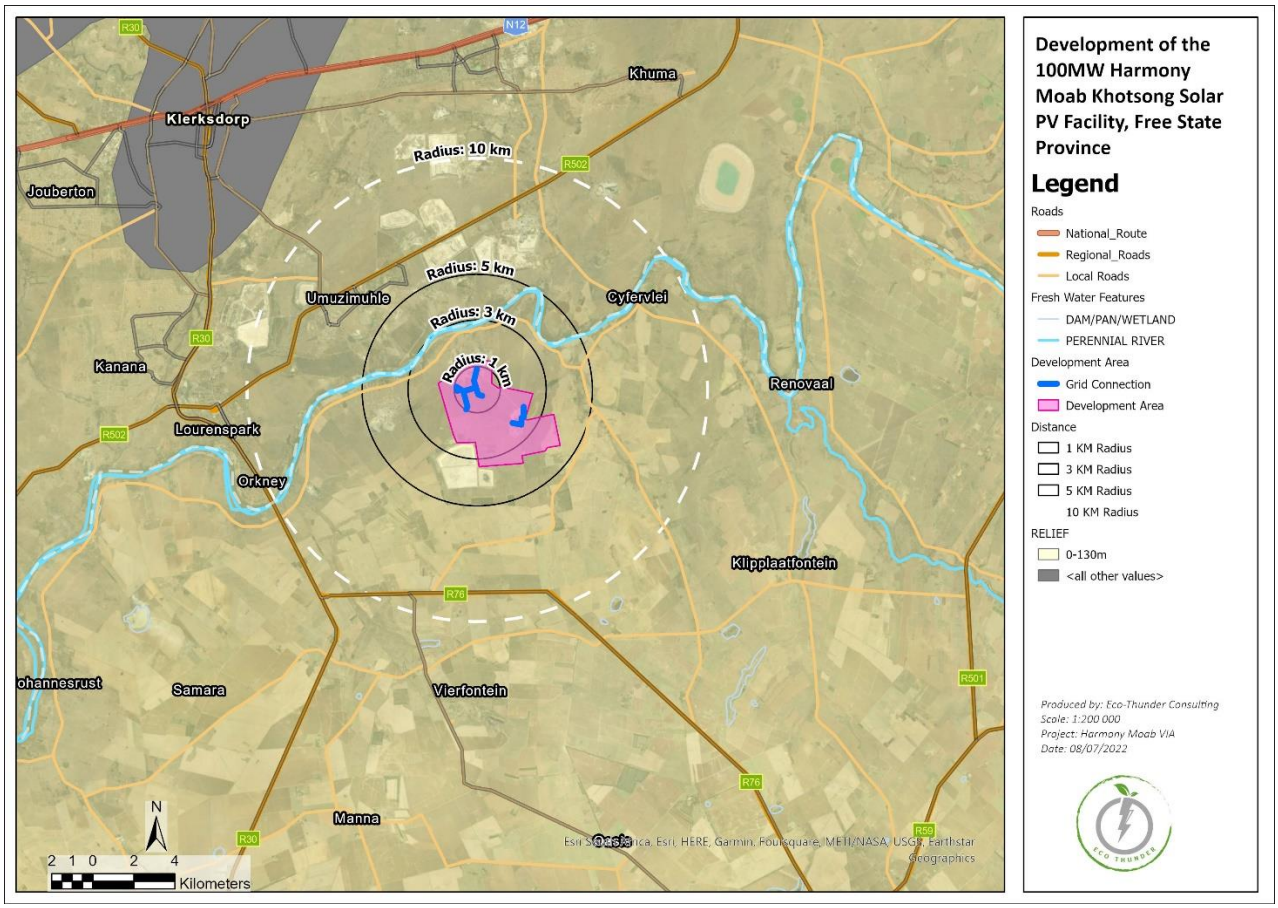

View of the Harmony Moab Khotsong Solar PV Facility
View of sections of the PV development with the traversing mine access road
Legend
Facility Section A
Facility Section B
Facility Section C
Facility Section D
Great Noligwa Mine OH Line
Moab Khotsong OHL Alternative 2
Google Earth
© 2022 Google
9.19 ft

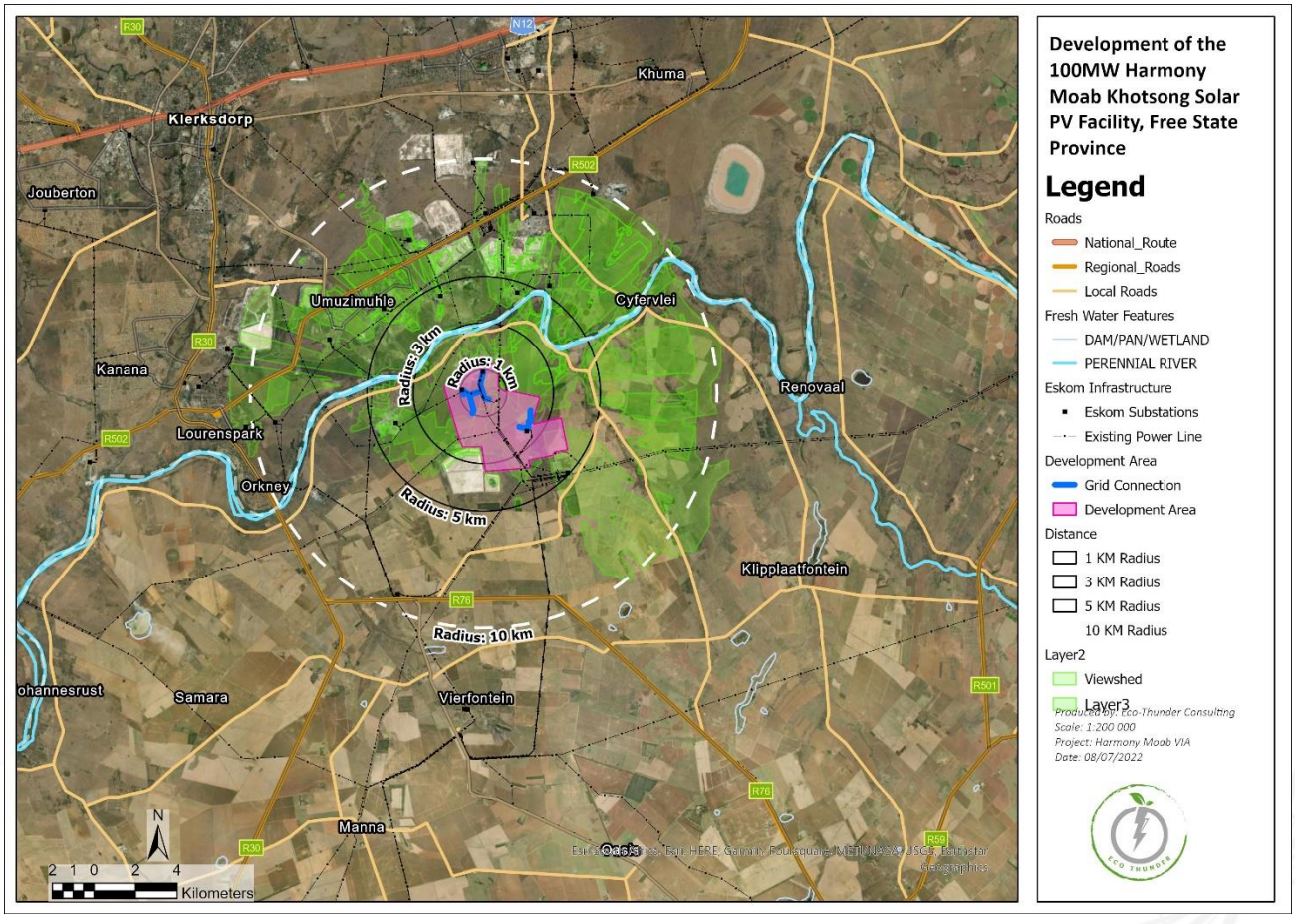

View of the Harmony Moab Khotsong Solar PV Facility
View of a section of the PV development ajacent to the mine access road
Legend
Facility Section A
Facility Section B
Facility Section C
Facility Section D
Great Noligwa Mine OH Line
Great Noligwa Mine OH Line
Moab Khotsong OHL Alternative 2
Moab Khotsong OHL Alternative 2
Uplant potential OHL
Google Earth
© 2022 Google
10 ft


It is anticipated that visual impacts will result from the activities and infrastructure in all Project phases i.e., construction, operational, and closure. Activities associated with the Project will be visible, to varying degrees from varying distances around the Project site. During the establishment phase, the Project's visibility will be influenced due to the preparatory activities, primarily earthworks and infrastructure establishment. During the operation phase, the visibility of the Project will be the result of the established PV arrays, the substation, and associated powerline infrastructure (grid connections).


Development of the 100MWac Harmony Moab Khotsong Solar PV Facility, Vierfontein, Free State Province
Legend
Eskom Substations
Existing Power Line
DAM/PAN/WETLAND
PERENNIAL RIVER
10 Km Radius
National_Route
Regional_Roads
Local Roads
SAPAD_OR_2022_Q1
Boskoppie Game Reserve
Bushybend Private Nature Reserve
Mispah Game Farm
Grid Connections
ENV permitting
Great Noligwa Mine PV Facility Priority
Great Noligwa Mine PV Facility Alternative 1
Great Noligwa Mine PV Facility Alternative 2
MOAB Priority 2
Moab Khotsong PV Priority 1
Noligwa Gold Plant - Priority 1
Noligwa Gold Plant - Alternative 1
Produced by: Eco-Thunder Consulting
Scale: 1:200 000
Project: Harmony Moab Khotsong VIA
Date: 16/07/2022
Study Area 10km Around the site
Doringkruin
Klerksdorp
Khuma
Umuzimuhle
Kanana
Lourenspark
Orkney
Klipplaatfontein
Samara
Vierfontein
Kilometers


Development of the 100MW Harmony Moab Khotsong Solar PV Facility, Free State Province
Legend
Roads
National_Route
Regional_Roads
Local Roads
Fresh Water Features
DAM/PAN/WETLAND
PERENNIAL RIVER
CUR_NME
Bushybend Private Nature Reserve
Mispah Game Farm
<all other values>
Development Area
Grid Connection
Development Area
Distance
1 KM Radius
3 KM Radius
5 KM Radius
10 KM Radius
Produced by: Eco-Thunder Consulting
Scale: 1:200 000
Project: Harmony Moab VIA
Date: 08/07/2022
Radius: 10 km
Radius: 5 km
Radius: 3 km
Radius: 1 km
Klerksdorp
Khuma
Jouberton
Umuzimuhle
Cyfervlei
Kanana
Renovaal
Lourenspark
Orkney
Klipplaatfontein
Samara
Vierfontein
Manna
Kilometers


Development of the 100MW Harmony Moab Khotsong Solar PV Facility, Free State Province
Legend
Roads
National_Route
Regional_Roads
Local Roads
Fresh Water Features
DAM/PAN/WETLAND
PERENNIAL RIVER
Development Area
Grid Connection
Development Area
Distance
1 KM Radius
3 KM Radius
5 KM Radius
10 KM Radius
RELIEF
0-130m
<all other values>
Produced by: Eco-Thunder Consulting
Scale: 1:200 000
Project: Harmony Moab VIA
Date: 08/07/2022
Klerksdorp
Khuma
Jouberton
Radius: 10 km
Radius: 5 km
Radius: 3 km
Radius: 1 km
Umuzimuhle
Cyfervlei
Kanana
Renovaal
Lourenspark
Orkney
Klipplaatfontein
Samara
Vierfontein
Manna
2 1 0 2 4
Kilometers


Development of the 100MW Harmony Moab Khotsong Solar PV Facility, Free State Province
Legend
Roads
National_Route
Regional_Roads
Local Roads
Fresh Water Features
DAM/PAN/WETLAND
PERENNIAL RIVER
Eskom Infrastructure
Eskom Substations
Existing Power Line
Development Area
Grid Connection
Development Area
Distance
1 KM Radius
3 KM Radius
5 KM Radius
10 KM Radius
Layer2
Viewshed
Layer3
Produced by: Eco-Thunder Consulting
Scale: 1:200 000
Project: Harmony Moab VIA
Date: 08/07/2022
Klerksdorp
Khuma
Jouberton
Umuzimuhle
Cyfervlei
Kanana
Renovaal
Lourenspark
Orkney
Klipplaatfontein
Samara
Vierfontein
Manna
Radius: 3 km
Radius: 1 km
Radius: 5 km
Radius: 10 km
2 1 0 2 4
Kilometers

## 5.1. Impact Assessment Tables

| ***Nature:*** It is possible that buried archaeological resources may be impacted by the proposed development in the preferred location | | |
|---|---|---|
| | **Without mitigation** | **With mitigation** |
| ***Magnitude*** | Low (2) | Low (2) |
| ***Duration*** | Permanent (5) | Permanent (5) |
| ***Extent*** | Low (1) | Low (1) |
| ***Probability*** | Very improbable (1) | Very improbable (1) |
| ***Significance*** | **Low (16)** | **Low (8)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Not likely | Not likely |
| ***Can impacts be mitigated?*** | NA | |
| ***Mitigation:***<br>» Should any previously unrecorded archaeological resources or possible burials be identified during the course of construction activities, work must cease in the immediate vicinity of the find, and SAHRA must be contacted regarding an appropriate way forward. | | |
| ***Residual Impacts:***<br>None | | |

| ***Nature:*** It is possible that buried palaeontological resources may be impacted by the project in the project area | | |
|---|---|---|
| | **Without mitigation** | **With mitigation** |
| ***Magnitude*** | Medium (5) | Medium (5) |
| ***Duration*** | Permanent (5) | Permanent (5) |
| ***Extent*** | Low (1) | Low (1) |
| ***Probability*** | Very improbable (1) | Very improbable (1) |
| ***Significance*** | **Low (11)** | **Low (11)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Low | Low |
| ***Irreplaceable loss of resources?*** | Not likely | Not likely |
| ***Can impacts be mitigated?*** | Yes | |
| ***Mitigation:***<br>» The attached Chance Fossil Finds Procedure must be implemented for the duration of construction activities. Should any previously unrecorded palaeontological resources be identified during the course of construction activities, work must cease in the immediate vicinity of the find, and SAHRA must be contacted regarding an appropriate way forward. | | |
| ***Residual Impacts:***<br>None | | |

## 5.2. Cumulative Impact Assessment

This application is for the proposed development of a solar energy facility and associated grid connection to facilitate activities at the Harmony Moab Khotsong PV Facility. The location of the proposed PV facility within an area with existing mining activities may lend itself to cumulative impacts. However, in terms of cumulative impacts to heritage resources, it is preferable that industrial-type infrastructure is clustered within an area in order to prevent the sprawl of industrial development across otherwise sensitive cultural landscapes. As such, it is not anticipated that the proposed development will have a negative cumulative impact on significant heritage resources.

## 5.3. Conclusion

The areas surveyed as part of this assessment have been transformed through agricultural interventions and/or mining activity. No archaeological resources of scientific cultural value were identified within the area proposed for the Harmony Moab Khotsong PV Facility and its grid connection and as such, no impact to significant archaeological heritage resources is anticipated.

Furthermore, no impacts to significant palaeontological heritage is anticipated on condition that the attached. Chance Fossil Finds Process is implemented and no impacts to the cultural landscape are anticipated.

## 6. SOCIAL IMPACT ASSESSMENT

The proposed development is located in the Free State Province in the central interior of South-Africa. The town of Viljoenskroon to the southeast and Orkney is located approximately 6.5km northwest of the proposed development. The site is located in the Free State Province which is the landlocked core of the country. It is centrally placed, with good transport corridors to the north and the coast. It is the third biggest of South Africa's nine provinces in terms of size, and primary agriculture is a key economic sector. The Moab Khotsong Solar PV facility is however located in a agricultural and mining region.

The development of the Moab Khotsong Solar Facility and its associated infrastructure may have an impact on some vulnerable communities within the project area. Traditionally, the majority of social impacts are associated with the construction phase of a PV solar development. Many of the social consequences are unavoidable and will occur to some extent, but they can be managed through careful planning and implementation of appropriate mitigation measures.

The site is within the existing mining development area and thus within the mine's social and economic processes and structures; things like socio-economic development and local economic development plans will take the development of the PV facilities into account.

As per the mines Social labour plan, the Human Resources Development interventions aims to address the abovementioned challenges through a variety of initiatives such as:

(i) Management Trainee Programmes
(ii) Bursary Schemes
(iii) Trainee Programmes
(iv) Learnerships

Mining companies are required to design and implement programmes to ensure mineral wealth is used for the development of communities and workers. It is within this context that the existing processes and procedures being implemented be incorporated into the development of the Solar PV facility to act as a vehicle for creating and maintain a relationship between companies on the one hand and communities and workers on the other.

The Developer should be committed to the sustainable socio-economic development and well-being of the communities in which they operate and from which they draw their employees. Both Solar PV Facilities and mining operations have a limited lifespan, therefore strategic objective should focus on contributing to community development that is sustainable long after such operations have ceased.

» Potential positive impacts
- Creation of employment and business opportunities
- Skills Development
- Growth of the local communities

» Potential negative impacts
- Impacts associated with the presence of construction workers on site
- Threat to safety and security
- Impact of heavy vehicles, including damage to roads, safety, noise and dust

» The development will only yield significant positive **economic** impacts.

» The development will have both positive and negative **social** impacts. It will create employment and business opportunities for locals during both the construction and operational phases and represent an investment in clean, renewable energy infrastructure.

## 6.1. Impact Assessment Tables

***Nature:***
Employment opportunities and skills development

**Impact description:** Harmony Gold currently have social labour plans in place which meet the requirements of employment in terms of local employment and skills development act. As per their current SLP the Moab Khotsong mining operations will provide employment for 6 636 employees in mining, construction, management or other related activities.

According to the SLP, the Moab Khotsong Human Resources Development (HRD) Strategy supports the company's business strategy and objectives, as well as the South African legislative and regulatory framework that seeks to address the country's general skills shortage while also ensuring equitable workplace representation.

Part of these strategies include:

- Adult Basic Education Training
- Portable Skills Training Plans
- Trainee Programmes and Learnerships for Employees
- Management Development Programmes
- Talent Pool Development
- Community Human Resource Development Programme
- Learnerships for the Community

The mine intends to develop the Moab Khotsong Solar PV facility using the same principles outlined in the SLP, albeit on a smaller scale than the development of a 100MW solar PV facility.

| | Rating | Motivation | Significance |
|---|---|---|---|
| ***Prior to Enhancement*** | | | |
| **Duration** | Short-term (1) | The construction period will last less than one year | **Low Positive (30)** |
| **Extent** | Local – Regional (5) | The impact will occur at a local, regional and national level | |
| **Magnitude** | Low (4) | The creation of employment opportunities will assist to an extent in alleviating unemployment levels within the area | |
| **Probability** | Probable (3) | Construction of the project will result in the creation of a number of direct and indirect employment opportunities, which will assist in addressing unemployment levels within the area and aid in skills development of communities in the area | |

***Enhancement measures:***

To enhance the local employment, skills development and business opportunities associated with the construction phase, the following measures should be implemented:

- It is recommended that the development be incorporated into the mine's SLP, and that the current skills development processes and policies at the mine or associated infrastructure be incorporated into the development and operation of the Solar energy facility
- The SLP strategies (Adult Basic Education Training, Management Development Programs, Community Human Resource Development Programs, and so on) are specifically targeted at the mining and renewable energy development sectors
- Be committed to involving and benefiting the communities surrounding mines, contributing to their development and growth; thus, it is recommended that special attention be paid to the needs of people living near mines in the Free State Province
- It is recommended to conduct structured and proactive engagement sessions within the municipal district, to expose local small, micro and medium enterprises which will benefit from the proposed development
- According to MPRDA REGULATION 46 (b) (v), "the contents of a Social and Labour Plan must include a human resources development programme that must include employment equity statistics that must be completed in the form of "Form S" contained in Annexure II and the mines plan to achieve 10% women participation in mining and 40% historically disadvantaged South Africans (HDSA) participation in management within 5 years from the grantie's grant."
- Training and skills development programmes should be initiated prior to the commencement of the construction phase

***Post Enhancement***

| | | | |
|---|---|---|---|
| **Duration** | Short-term (1) | The construction period will last for less than one year | **Medium Positive (55)** |
| **Extent** | Regional (4) | The impact will occur at a local, regional and national level | |
| **Magnitude** | Moderate(6) | The creation of employment opportunities will assist to an extent in alleviating unemployment levels within the area | |
| **Probability** | Definite (5) | Construction of the project will result in the creation of a number of direct and indirect employment opportunities, which will assist in addressing unemployment levels within the area and aid in the skills development of communities in the area | |

***Residual Risks:***

- Initiatives to eliminate unfair discrimination in employment
- Recruit and select suitably qualified individuals from the designated groups
- Employees from designated groups who have been identified in the talent pool should be advanced and accelerated through targeted training and development programs
- Assist individuals in obtaining an initial vocational education and pre-qualification, as well as additional education and training that refreshes knowledge, skills, work and life competencies that are critical for overall development
- Provide portable skills training to employees who express an interest in obtaining such training, with a special emphasis on employees who have been incapacitated or retrenched, in order for them to remain economically active, employable, or self-sustaining in their communities
- Growth of talent is facilitated, thereby providing opportunities for all employees to contribute to their full potential

***Nature:***
Contributions to the local economy

**Impact description:** According to Harmony Gold Mine Moab Khotsong Operations, they are committed to the long-term socioeconomic development and well-being of the communities in which they operate by contributing to community development that will last long after mining operations have ended.

Harmony's corporate social responsibility (CSR) policy for their South African operations acknowledges the country's need for socio-economic development. This policy includes initiatives for local economic development (LED) that are carried out in accordance with the Mining Charter, MPRDA regulations, and codes of good practice for the minerals and mining industry.

| | Rating | Motivation | Significance |
|---|---|---|---|
| ***Prior to Enhancement*** | | | |
| **Duration** | Long-term (4) | Will continue for the duration of the project due to legal obligation to pay taxes | **Medium Positive (36)** |
| **Extent** | Local – Regional (4) | Will include mostly local and some regional impacts | |
| **Magnitude** | Low (4) | Will derive from increased cash flow from wages, local procurement, economic growth, taxes and LED and HRD initiatives | |
| **Probability** | Probable (3) | Will depend on; proportion of local spending by employees, capacity of local enterprises to supply; effectiveness of LED and HRD initiatives, contributions to local government | |

***Enhancement measures:***
It has to be noted that there currently are measures in place that speaks to economic development in terms of the mining operations:

- The Harmony tender policy was amended to give preference to BEE entity suppliers
- BEE entities can win tenders even when their price is higher than that of non-BEE entity suppliers
- Certain commodities are set aside and may only be purchased from BEE-entity suppliers and certain commodities may only be acquired from 100% black owned suppliers through the Harmony business development centres
- BEE-entities get a second chance to revise their tender price, should they not win a tender
- Preference is given to suppliers that are local to the operation where the service will be consumed

The following measures must also be considered when constructing the solar PV facility

- Establishing liaison and communication structures with the district and local government structures
- Liaises with the local governmental structures and municipal authorities in the labour- sending communities to ensure that group development initiatives are integrated into the economic and development plans of those areas
- The continuous review of the economic development of the project during the implementation process will ensure that the project does not become static but is revised in terms of changing needs and also to ensure sustainability
- It is recommended that a local procurement policy be adopted by the developer to maximise the benefit to the local economy, where feasible
- Create job opportunities, boost local economies by supporting business activities, and contribute to government tax revenues through the development of the Solar Facility
- Prior to the start of the construction contractor procurement, the Developer of the Solar Facility should create a database of local companies, specifically Historically Disadvantaged (HD) companies, that qualify as potential service providers (e.g., construction companies, catering companies, waste collection

companies, security companies, etc.). These businesses should be informed about the tender process and invited to bid on project-related work, if applicable
- Engage with local authorities and business organisations to investigate the feasibility of obtaining construction materials, goods, and products from local suppliers, where possible

***Post Enhancement***

| | | | |
|---|---|---|---|
| **Duration** | Long-term (4) | As for pre-enhancement | **Medium Positive (60)** |
| **Extent** | Local – Regional (4) | SMME capacity building will limit procurement from outside the local municipality | |
| **Magnitude** | Low (4) | Mitigation will likely increase intensity of multiplier effects as it will concentrate impact to local area, sustainability of initiatives will also be increased if aligned with other those of other institutions | |
| **Probability** | Definite (5) | Increased local employment and procurement as well as skilled SMME's skill enhance likelihood of benefits to local economy | |

***Residual Risks:***
- Improved local service sector, growth in local business
- Community development and stimulation of the local economy
- Growth in the local markets

***Nature:***
Safety and security

**Impact description:** Temporary increase in safety and security concerns associated with the influx of people during the construction phase.

The Solar PV Development will be in accordance with Moab Khotsong's occupational safety and health policies and related management frameworks, which are in accordance with South Africa's Mine Health and Safety Act. A collaborative approach is taken, involving all stakeholders and ensuring that the necessary infrastructure and systems, including relevant planning, communication, and training, are in place.

| | **Rating** | **Motivation** | **Significance** |
|---|---|---|---|
| ***Prior to Mitigation*** | | | |
| **Duration** | Short-term (2) | Will be limited to the construction phase which is less than one year | **Low Negative (27)** |
| **Extent** | Local – Regional (3) | Safety concerns will affect nearby communities | |
| **Magnitude** | Low (4) | Could place the lives of neighbouring community members at risk | |
| **Probability** | Probable (3) | Traffic would need to be considered in the area | |

***Mitigation:***

- Stopping significant unwanted events by focusing on critical control management
- Safety awareness and training as well as positive behaviour reinforcement
- Improving system monitoring and analysis to improve risk management
- Encourage employees to stop working when a workplace is considered unsafe and/or to prevent unsafe actions
- Focus on critical control management (as per International Council on Mining and Metals guidelines)
- Education, Training and Development Services must be implemented
- Access in and out of the construction area should be strictly controlled by a security company
- The contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff
- Have clear rules and regulations for access to the proposed site to control loitering
- A comprehensive employee induction programme would cover land access protocols, fire management and road safety must be prepared
- A Community Liaison Officer should be appointed
- A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process

| ***Post Mitigation*** | | | |
|---|---|---|---|
| **Duration** | Short-term (2) | As for pre-mitigation | **Low Negative (16)** |
| **Extent** | Local (2) | Safety measures will likely restrict impacts on nearby communities | |
| **Magnitude** | Low (4) | Appropriate mitigation will reduce the risk of this project | |
| **Probability** | Improbable (2) | As for pre-mitigation | |

***Residual Risks:***

- **None anticipated**

***Nature:***
Disruption of daily living and movement patterns

**Impact description:** Temporary increase in traffic disruptions and movement patterns during the construction phase, Transport of equipment, material and staff to site will lead to congestion.

| | **Rating** | **Motivation** | **Significance** |
|---|---|---|---|
| ***Prior to Mitigation*** | | | |
| **Duration** | Short-term (2) | Will be limited to the construction phase which is less than one year | **Medium Negative (40)** |
| **Extent** | Local (2) | Will affect road users from nearby communities | |
| **Magnitude** | Moderate (6) | Will affect the quality of life of neighbouring communities | |
| **Probability** | Highly probable (4) | Traffic would need to be considered in the area | |

***Mitigation:***

- Implement standard dust control measures on gravel roads, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation
- Stagger component delivery to site
- Reduce the construction period
- Make use of mobile batch plants and quarries in close proximity to the site
- All vehicles must be road worthy, and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues
- Heavy vehicles should be inspected regularly to ensure their road worthiness
- Provision of adequate and strategically placed traffic warning signs, which must be maintained throughout the construction phase, as well as control measures along the R30 and Stokkiesdraai roads to warn road users of construction activities taking place throughout the construction phase. Warning signs must be always visible, especially at night.
- Implement penalties for reckless driving to enforce compliance to traffic rules
- Avoid heavy vehicle activity during "peak" hours (when children are taken to school, or people are driving to work)
- Ensure that all fencing along access roads is maintained in the present condition or repaired if disturbed due to construction activities
- The Contractor must ensure that damage/wear and tear caused by construction related traffic to the access roads is repaired before the completion of the construction phase
- Method of communication must be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process

***Post Mitigation***

| | | | |
|---|---|---|---|
| **Duration** | Short-term (2) | As for pre-mitigation | **Low Negative (16)** |
| **Extent** | Local (2) | Safety measures will likely restrict impacts on road users | |
| **Magnitude** | Low (4) | Appropriate mitigation will reduce the risk of this project | |
| **Probability** | Improbable (2) | As for pre-mitigation | |

***Residual Risks:***

- **None anticipated**

***Nature:***
Increased pressure on local services/resources

**Impact description: Added pressure on economic and social infrastructure during construction as a result of in-migration of people.**

| | Rating | Motivation | Significance |
|---|---|---|---|
| ***Prior to Mitigation*** | | | |
| **Duration** | Short-term (2) | Influx related pressure on services will start during construction and continue during the operational phase | **Medium Negative (30)** |
| **Extent** | Local (2) | May affect resource management on local district municipal level | |
| **Magnitude** | Moderate (6) | Intensify existing service delivery and resource problems and backlogs, especially sewerage and road networks | |

| | | | |
|---|---|---|---|
| **Probability** | Probable (3) | Population influx will affect the ability of the local municipality to meet increased demand | |

***Mitigation:***

- It is necessary to appoint a Community Liaison Officer. A method of communication should be implemented, with procedures for filing complaints outlined, so that the local community can express any complaints or grievances about the construction process
- Current procurement channels set up by the mine should be utilized to reduce any complications which may arise from the development

***Post Mitigation***

| | | | |
|---|---|---|---|
| **Duration** | Short-term (2) | As for pre-mitigation | **Low Negative (16)** |
| **Extent** | Local (2) | Safety measures will likely restrict impacts on road users | |
| **Magnitude** | Low (4) | Appropriate mitigation will reduce the risk of this project | |
| **Probability** | Improbable (2) | As for pre-mitigation | |

***Residual Risks:***

- Possibility of outside workers remaining in the area after construction is completed and subsequent pressures on local infrastructure

***Nature:***
Nuisance impacts (noise& dust)

**Impact description:** Construction activities will result in the generation of noise and dust over a period of months. However, the development is located directly adjacent to mining sites. The noise and dust impact is therefore insignificant in comparison to the noise and dust generated by the mine and will only be temporary in nature.

| | **Rating** | **Motivation** | **Significance** |
|---|---|---|---|
| ***Prior to Mitigation*** | | | |
| **Duration** | Short-term (2) | Nuisance impacts will only be limited to the construction phase | **Medium Negative (44)** |
| **Extent** | Local (1) | This will remain within the project extent from construction activities | |
| **Magnitude** | High (8) | Dust impacts and noise nuisance from construction activities | |
| **Probability** | Highly Probable (4) | Movement of heavy construction vehicles during the construction phase has a potential to create noise, damage to roads and dust | |

***Mitigation:***

- The development of the Solar PV facility will be on owned and operated by the Moab Khotsong mine, the employees of the mine are subjected to:
  - Annual audiometric testing at occupational health hubs during medical examinations
  - Awareness drives to ensure employees are aware of the benefits of wearing personalized hearing protection
  - Monitoring programs to measure actual compliance in the workplace
  - Compliance monitoring is undertaken during routine occupational hygiene inspections and ad hoc audits are also conducted
- It is furthermore predicted that the current dust levels generated by the mining activities in the area far exceed that which will be generated by the construction of the PV facility. The Moab Khotsong mine currently has standardized dust control measures in place which will allow the monitoring of the dust generation by the PV facility, these include:

- leading practices as advocated by the Mining Industry Occupational Safety and Health (MOSH)
- Multi-stage dust filtration systems
- Training and awareness programmes address dust control in stopes and all development ends are equipped with water blasts to settle dust directly after a blast

The following ''Generic'' Noise and Dust suppression must be implemented where not covered by current mining processes:

- During construction, care should be taken to ensure that noise from construction vehicles and plant equipment does not intrude on the residential areas nearby. Plant equipment such as generators, compressors, concrete mixers, and vehicles should be kept in good working order and, where possible, equipped with effective exhaust mufflers
- The movement of construction vehicles on the site should be confined to agreed access road/s
- Heavy vehicle movement during the construction phase should be timed (where possible) to avoid times of the week, such as weekends, when the volume of traffic on the access roads may be higher
- Dust suppression measures should be implemented, such as wetting on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers

***Post Mitigation***

| | | | |
|---|---|---|---|
| **Duration** | Short-term (2) | As per pre-mitigation | **Low Negative (18)** |
| **Extent** | Local (1) | Mitigation measures will assist with increasing the impact | |
| **Magnitude** | Moderate (6) | Appropriate mitigation will reduce the risk of this project | |
| **Probability** | Improbable (2) | As per pre-mitigation | |

***Residual Risks:***

- **Noise and Dust generation will remain an issue irrespective of the Solar PV development**

Social Issues Associated with the Operation Phase

***Nature:***
Job creation during operation

Impact description: Harmony Gold currently have social labour plans in place which meet the requirements of employment in terms of local employment and skills development, act. As per their current SLP the Moab Khotsong mining operations will provide employment for 6 636 employees in mining, construction, management, or other related activities.

According to the SLP, the Moab Khotsong Human Resources Development (HRD) Strategy supports the company's business strategy and objectives, as well as the South African legislative and regulatory framework that seeks to address the country's general skills shortage while also ensuring equitable workplace representation.

Part of these strategies include:

- Adult Basic Education Training
- Portable Skills Training plans
- Trainee Programmes and Learnerships for Employees
- Management Development Programmes
- Talent Pool Development
- Community Human Resource Development Programme
- Learnerships for the Community

The mine intends to incorporate the development of the Moab Khotsong Solar PV facility under the same principles as outlined in the SLP, albeit on a smaller scale in comparison to the development of a 100MW solar PV facility.

| | Rating | Motivation | Significance |
|---|---|---|---|
| ***Prior to Enhancement*** | | | |
| **Duration** | Long term (4) | Project will be operational up to 30 years | **Medium Positive (33)** |
| **Extent** | Regional (3) | Any new positions are likely to be filled by persons living in the local municipal area | |
| **Magnitude** | Low (4) | It is anticipated that ~10 jobs will be generated during the operation phase. A number of highly skilled personnel may need to be recruited from outside the local municipal area | |
| **Probability** | Probable (3) | Employment opportunities will be created during the operation phase | |

***Enhancement measures:***

To enhance the local employment, skills development and business opportunities associated with the construction phase, the following measures should be implemented:

- It is recommended that the development be incorporated into the mine's SLP, and that the current skills development processes and policies at the mine or associated infrastructure be incorporated into the development and operation of the Solar energy facility
- The SLP strategies (Adult Basic Education Training, Management Development Programs, Community Human Resource Development Programs, and so on) are specifically targeted at the mining and renewable energy development sectors
- Be commitment to involving and benefing the communities neighbouring the mines, contributing to their development and growth, therefore it is recommended that particular attention be given to the needs of the people living near the mine in the Free State Province
- It is recommended to conduct structured and proactive engagement sessions within the municipal district, to expose local small, micro and medium enterprises which will benefit from the proposed development
- According to REGULATION 46 (b) (v) of the MPRDA, "the contents of a Social and Labour Plan must include a human resources development programme which must include employment equity statistics which must be completed in the form of "Form S" contained in Annexure II and the mines plan to achieve the 10% women participation in mining and 40% historically disadvantaged South Africans (HDSA) participation in management within 5 years from the grantie's grant." It is recommended that the development of a solar facility be undertaken with the same equity goals in mind, with women and previously disadvantaged individuals given special consideration during the requirement process
- Training and skills development programmes should be initiated prior to the commencement of the construction phase

| | | | |
|---|---|---|---|
| ***Post Enhancement*** | | | |
| **Duration** | Long-term (4) | As per pre-enhancement | **Medium Positive (44)** |
| **Extent** | Local - regional (3) | As per pre-enhancement | |
| **Magnitude** | Low (4) | Mitigation will maximise local job creation | |
| **Probability** | High Probable (4) | Mitigation will maximise probability that any local recruitment targets are achieved and local benefits optimised | |

***Residual Risks:***

- Improved pool of skills and experience in the local area
- Recruit and select suitably qualified individuals from the designated groups
- Advance employees from designated groups who have been identified in the talent pool and to fast track them through focused training and development programmes
- Assist individual to acquire an initial vocational education and pre-qualification, in addition to further education and training, and which refreshes knowledge, skills, work and life competencies that are crucial for overall development

- Provide portable skills training to employees who show an interest in obtaining such training and with a special emphasis on employees who are incapacitated or retrenched to remain economically active, employable, or self-sustaining within their communities

***Nature:***
Development of clean, renewable energy infrastructure

**Impact description:** Development of clean, renewable energy infrastructure

The primary goal of the proposed project is to improve energy security in South Africa by generating additional energy. The proposed Solar PV Facility also reduces the carbon footprint associated with energy generation. The project should therefore be viewed within the context of the South Africa's current reliance on coal powered energy to meet the majority of its energy needs

| | Rating | Motivation | Significance |
|---|---|---|---|
| ***Prior to Enhancement*** | | | |
| **Duration** | Long term (4) | Adding a renewable energy sector to the Fezile Dabi District economy may contribute to the diversification of the local economy and provide greater economic stability | **Medium Positive (48)** |
| **Extent** | Local – Regional - National (4) | The generation of renewable energy will contribute to South Africa's electricity market. The mine will be the private off-taker of the power generated by the facility the proposed development will indirectly relieve the national grid | |
| **Magnitude** | Low (4) | The proposed facility will only generate up to 100MW | |
| **Probability** | Highly Probable (4) | Facility will help contribute to the total carbon emissions associated with non-renewable energy generation | |
| ***Enhancement measures:*** **None anticipated** | | | |
| ***Post Enhancement*** | | | |
| **Duration** | Long term (4) | As per pre-enhancement | **Medium Positive (48)** |
| **Extent** | National (4) | As per pre-enhancement | |
| **Magnitude** | Low (4) | As per pre-enhancement | |
| **Probability** | Highly Probable (4) | As per pre-enhancement | |

***Residual Risks:***

- Reduce carbon emissions through the use of renewable energy and contribute to reducing global warming
- The renewable energy infrastructure places this project at the heart of the national strategy to increase power supply as well as reduce power generation impacts on climate.
- The power plant's location also uniquely connects the local community to skills for this sector, thus improving their employability

***Nature:***
Visual impacts and impacts on sense of place

**Impact description:** Visual impacts and sense of place impacts associated with the operation phase of the project

Due to the number of mines in the area, the scenic quality of the region is low, further construction and operation of the Solar PV Facility in the area is likely to have a negative impact.

| | Rating | Motivation | Significance |
|---|---|---|---|
| ***Prior to Mitigation*** | | | |
| **Duration** | Long term (4) | Impact on sense of place relates to the change in the landscape character and visual impact of the proposed solar energy facility | **Low Negative (18)** |
| **Extent** | Local (1) | Dependent on the demographics of the population that resides in the area and their perceptions | |
| **Magnitude** | Low (4) | There are industrial/mining operations and formal residential areas located in proximity to the site | |
| **Probability** | Improbable (2) | There are no tourist attractions located adjacent to the property and therefore the anticipated impact on the area's visual quality and sense of place is low | |
| ***Mitigation:*** • None anticipated | | | |
| ***Post Mitigation*** | | | |
| **Duration** | N.A. – Mitigation not possible | | **N.A. – Mitigation not possible.** |
| **Extent** | N.A. – Mitigation not possible | | |
| **Magnitude** | N.A. – Mitigation not possible | | |
| **Probability** | N.A. – Mitigation not possible | | |
| ***Residual Risks:*** • None anticipated if the visual impact will be removed after decommissioning, provided the solar energy facility infrastructure is removed and the site is rehabilitated to its original (current) status | | | |

## 6.2. Cumulative Impact Assessment

This energy plant has cumulative impacts; especially, the installation of several Solar energy facilities in the Local Municipality will offer socio-economic prospects for the area, resulting in a positive social benefit. Job creation, skill development, and downstream business opportunities are good cumulative effects. Local, regional, and national economies could profit from job creation and service procurement if many renewable energy installations are established. This value will be considerably increased if a critical mass is reached that allows local enterprises to develop the capabilities to support building and maintenance activities and to manufacture renewable energy facility components in South Africa. The cumulative impact at the municipal level could be good, encouraging O&M companies to focus on education and training.

***Nature:***
An increase in employment opportunities, skills development, and business opportunities with the establishment of a solar energy facility.

| | Overall impact of the proposed project considered in isolation | Cumulative impact of the project and other projects in the area |
|---|---|---|
| ***Extent*** | Local -regional (3) | Local-regional (3) |
| ***Duration*** | Long-term (4) | Long-term (4) |

| | | |
|---|---|---|
| ***Magnitude*** | Low (4) | Moderate (6) |
| ***Probability*** | Probable (3) | Probable (3) |
| ***Significance*** | **Medium (33)** | **Medium (52)** |
| ***Status (positive or negative)*** | Positive | Positive |
| ***Reversibility*** | N/A | N/A |
| ***Irreplaceable loss of resources?*** | N/A | N/A |
| ***Can impacts be mitigated?*** | Yes | Yes |
| ***Confidence in findings:*** **High.** | | |
| ***Mitigation:***<br>The establishment of a number of solar energy facilities in the area does have the potential to have a positive cumulative impact on the area in the form of employment opportunities, skills development and business opportunities. The positive benefits will be enhanced if local employment policies are adopted, and local services providers are utilised by the developers to maximise the project opportunities available to the local community. | | |

| | | |
|---|---|---|
| ***Nature:***<br>Negative impacts and change to the local economy with an in-migration of labourers, businesses, and jobseekers to the area. | | |
| | **Overall impact of the proposed project considered in isolation** | **Cumulative impact of the project and other projects in the area** |
| ***Extent*** | Local (1) | Local-regional (3) |
| ***Duration*** | Long-term (4) | Long-term (4) |
| ***Magnitude*** | Minor (2) | Low (4) |
| ***Probability*** | Very improbable (1) | Improbable (2) |
| ***Significance*** | **Low (7)** | **Low (22)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Yes | |
| ***Irreplaceable loss of resources?*** | No | |
| ***Can impacts be mitigated?*** | Yes | |
| ***Confidence in findings:*** **High.** | | |
| ***Mitigation:***<br>• Develop a recruitment policy / process (to be implemented by contractors), which will ensure the sourcing of labour locally, where available<br>• Work together with government agencies to ensure that service provision is in line with the development needs of the local area<br>• Form joint ventures with community organisations, through Trusts, which can provide local communities with benefits, such as employment opportunities and services<br>• Develop and implement a recruitment protocol in consultation with the municipality and local community leaders. Ensure that the procedures for applications for employment are clearly communicated | | |

## 6.3. Conclusion

The project represents an important development opportunity for the communities surrounding Harmony Moab Khotsong PV. Should it be approved, it will not only supply the mine with much needed clean power, but will also achieve the following for social upliftment:

- Increase educational attainment of local youth through a bursary programme funded through SED.
- Improved renewable energy presence in the country
- Elevation of the national energy crisis
- Increase the number of job-creating enterprises funded through ED.

- Improve key infrastructure identified by the community such as housing and roads
- Increase the skills levels of local community
- Lead to lasting economic development gains for the local community and province

The development of the Solar Pv Facility will ensure that (if in line with the Moab Khotsong Mining Operation) skills development and employment equity strategies are aimed at achieving a demographically representative workforce. It is recommended that the Moab Khotsong Solar PV Facility is guided by the provisions of the Skills Development and Employment Equity Acts in terms of both planning and reporting, including with respect to "Core and Critical skills" whilst intensive attempts are made to improve all core and critical skills occupations which is still lagging due to the skills challenges faced by the industry in this respect.

As per the mines Social labout plan, the Human Resources Development interventions aims to address the abovementioned challenges through a variety of initiatives such as:

(v) Management Trainee Programmes
(vi) Bursary Schemes
(vii) Trainee Programmes
(viii) Learnerships

The Developer should be committed to the sustainable socio-economic development and well-being of the communities in which they operate and from which they draw their employees. Both Solar PV Facilities and mining operations have a limited lifespan, therefore strategic objective should focus on contributing to community development that is sustainable long after such operations have ceased.

The No Development option does not have any impact. However, given the developmental agenda of both the country and the local area, failure to develop is to deny improvements in the wellbeing of households and the growth of the economy. The No Development option is particularly undesirable because the project's potentially negative impacts are largely small and are all manageable. Therefore, because the project's positive impacts heavily outweigh the negative impacts, it is recommended that it be permitted.

This SIA has focused on the collection of primary data to identify and assess social issues and potential social impacts. Secondary data was collected and presented in a literature review and primary data was collected through the public participation process and telephonic consultation with key stakeholders. The environmental assessment framework for assessment of impacts and the relevant criteria were applied to evaluate the significance of the potential impacts.