APP-007402

50 MW ORYX ORANGE RIVER SOLARPARK PHOTOVOLTAIC PLANT IN AUSSENKEHR, //KHARAS REGION

ENVIRONMENTAL MANAGEMENT PLAN

Assessed by:

Assessed for:

Oryx Orange River Solarpark (Pty) Ltd

November 2025

Project:	**50 MW ORYX ORANGE RIVER SOLARPARK PHOTOVOLTAIC PLANT IN AUSSENKEHR, //KHARAS REGION: ENVIRONMENTAL MANAGEMENT PLAN**	
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1 BACKGROUND & INTRODUCTION

Geo Pollution Technologies (Pty) Ltd (GPT) was appointed by Oryx Orange River Solarpark (Pty) Ltd (the Proponent) to undertake an environmental assessment for the construction and operation of a 50 MW photovoltaic (PV) plant at Aussenkehr, //Kharas Region. The plant will be located on a 100 ha area of Farm 498 (Figure 1-1), which is a section of farm Aussenkjer (FMV/00147) and will be connected to the National power grid via the Aussenkehr substation. The Proponent has already established an existing and operational solar plant on a nearby property south of the proposed development. The project has proven to be feasible and serves to motivate the erection of an additional plant.

The proposed plant will feature advanced inverters/transformers that convert direct current (DC) from the PV panels into alternating current (AC), stepping up the voltage for efficient transmission. These inverters, each capable of a peak output of 630 kW, will be housed in prefabricated concrete containers approximately 7 m x 3 m x 3.5 m in size. Underground cabling will link these units to an existing substation (Aussenkehr Substation), which will host essential medium voltage circuit breakers and 22/132 kV power transformers to manage and dispatch the generated electricity.

The Proponent requested GPT, as an independent environmental consultant, to apply for an environmental clearance certificate (ECC) for the construction and operation of the proposed solar plant. As such, and in line with the current requirements of the Ministry of Environment, Forestry and Tourism (MEFT), an environmental assessment (EA) and environmental management plan (EMP) are proposed to be prepared for submission to the MEFT. The EA and EMP will be prepared in line with the Environmental Management Act No. 7 of 2007 (EMA) and its regulations as published in 2012.

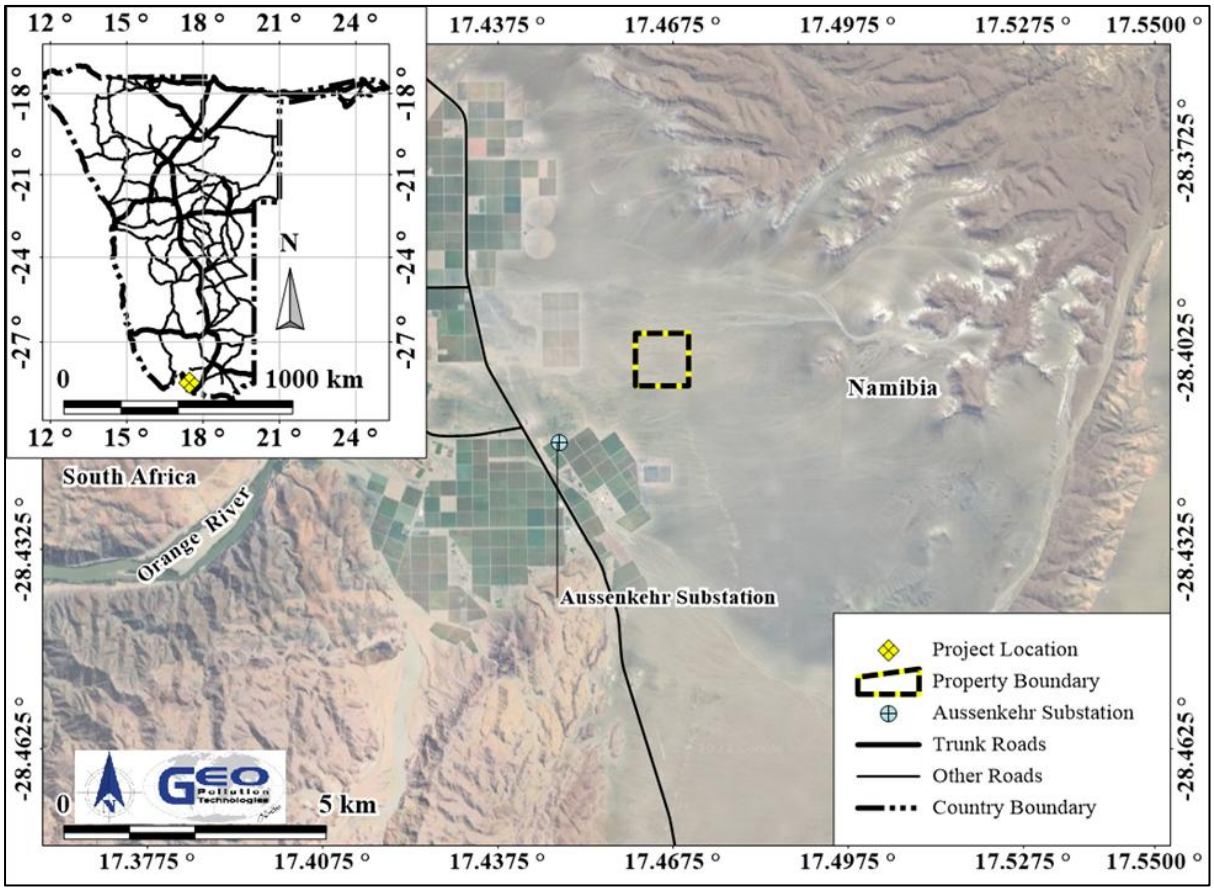

Figure 1-1 Project location

2 ENVIRONMENTAL MANAGEMENT PLAN

The EMP provides management options to ensure impacts of the project are minimised. An EMP is a tool used to take pro-active action by addressing potential problems before they occur. This should limit the corrective measures needed, although additional mitigation measures might be included if necessary. The environmental management measures are provided in the tables and descriptions below. These management measures should be adhered to during the various phases of the operation of the project. This section of the report can act as a stand-alone document. All personnel taking part in the operations of the project should be made aware of the contents in this section, so as to plan the project accordingly and in an environmentally sound manner.

The objectives of the EMP are:

- to include all components of construction activities (including future upgrades, maintenance, etc.) and operations of the project;
- to prescribe the best practicable control methods to lessen the environmental impacts associated with the project;
- to monitor and audit the performance of construction and operational personnel in applying such controls; and
- to ensure that appropriate environmental training is provided to responsible construction and operational personnel.

Various potential and definite impacts will emanate from the construction, operational and decommissioning phases. The majority of these impacts can be mitigated or prevented. The impacts, risk rating of impacts as well as prevention and mitigation measures are listed below.

As depicted in the tables below, impacts related to the operational phase are expected to mostly be of medium to low significance and can mostly be mitigated to have a low significance. The extent of impacts is mostly site specific to local and are not of a permanent nature. Due to the nature of the surrounding areas, cumulative impacts are possible.

2.1 PLANNING

During the phases of planning for construction, operations and decommissioning of the solar plant, it is the responsibility of the Proponent to ensure they are and remain compliant with all legal requirements. The Proponent must also ensure that all required management measures are in place prior to and during all phases, to ensure potential impacts and risks are minimised. The following actions are recommended for the planning phase and should continue during various other phases of the project:

- Ensure that all necessary permits from the various ministries, local authorities and any other bodies that governs the construction activities and operations of the project are in place and remains valid. This includes agreements with the Electricity Control Board.
- Ensure all appointed contractors and employees enter into an agreement which includes the EMP. Ensure that the contents of the EMP are understood by the contractors, sub-contractors, employees and all personnel present or who will be present on site.
- Make provisions to have a health, safety and environmental (HSE) coordinator to implement the EMP and oversee occupational health and safety as well as general environmental related compliance at the site. Provision should be made for monthly environmental performance audits and reports during the initial phases.
- Have the following emergency plans, equipment and personnel on site where reasonable to deal with all potential emergencies:
- Risk management / mitigation / EMP/ emergency response plan and HSE manuals
- Adequate protection and indemnity insurance cover for incidents;
- Comply with the provisions of all relevant safety standards;
- Procedures, equipment and materials required for emergencies.
- Establish and / or maintain a reporting system to report on aspects of construction activities, operations and decommissioning as outlined in the EMP.

- Submit bi-annual reports to the MEFT to allow for environmental clearance certificate renewal after three years, if required. This is a requirement by MEFT.
- Appoint a specialist environmental consultant to update the EIA and EMP and apply for renewal of the environmental clearance certificate prior to expiry, if required.

2.1.1 National Development Goals and National Planning Regarding Greenhouse Gas Emission Reduction

According to the National Climate Change Strategy and Action Plan (2013 – 2020), various governmental ministries (such as MIME, MEFT and MAFWLR), parastatals and the private sector, are urged to promote and invest in renewable energy sources as part of the policy target to explore and promote sustainable energy in Namibia. The overall project will contribute to the cumulative renewable energy sector and the climate adaption strategies set to achieve climate change target set for Namibia.

Desired Outcome: Making a significant contribution to the country's development goals.

Actions

Enhancement:

- The Proponent should ensure that all project information regarding the development and implementation is in line with government planning and further provided to government agencies to incorporate into future planning and reporting.
- Information sharing about the project's progress should be made available to governmental agencies and the IAPs. The Proponent and affected parties should use the information generated during the environmental assessment to realistically plan for future growth and optimisation of servicing efforts. Open communication regarding future development, if any, should be maintained.
- The Proponent must employ local Namibians where possible. Deviations from this practise should be justified appropriately.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Progress reports on implementation kept.

2.1.2 Ideals and Aspirations

During the environmental assessment, public consultation was conducted with adjacent land owners, key community services, Ausenkehr residents and interested and or affected parties. Knowledge about the proposed project can inform local business development plans, especially due to the nature of the project. The project was considered as a benefit to Aussenkehr. It was noted that the proposed plant may also contribute to the perception of Aussenkehr being a place where employment is provided and a place of growth and opportunity. In turn this may affect demographic processes such as migration (whether seasonal or permanent) to the area. Plans about the proposed development has mostly been well-received. Growth in the community is associated with additional pressure which may be exerted onto governmental agencies and services.

Desired Outcome: Continued sharing of activity plans with IAPs, especially adjacent land owners and governing agencies. Maintaining an open-door policy with neighbours and employees. To establish a grievance mechanism through which community members can voice their complaints as managed by a community liaison officer.

Actions

Enhancement:

- Information sharing about the project's progress should be made available to governmental agencies and the IAPs. The Proponent and affected parties should use the information generated during the environmental assessment to realistically plan for future growth and optimisation of the distribution system. Open communication regarding future development should be maintained.
- Contractors' tenders to include best practise requirements for construction safety, security and environmental management for any future development.
- The Proponent must employ Namibians where possible. Deviations from this practise should be justified appropriately.
- A community liaison officer should be appointed during the construction phase especially to facilitate community grievances and concerns and or enquiries about employment opportunities.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Records kept of all information shared with authorities, neighbours and employees,
- Complaints and enquiries register kept on file.

2.1.3 Revenue Generation and Employment

The initial construction phase requires a dedicated workforce which will be contracted by the Proponent. Semi-skilled and unskilled labour will make up the largest segment of the labour force. Such labour should easily be sourced from the Aussenkehr informal settlement. Through the remuneration of professional services, as well as the general labour force, revenue streams related to the construction industry will be boosted during the construction phase while additional permanent employment opportunities will be generated during the operations phase in especially the security and maintenance sectors. During this phase, employment will be limited but will include contract work related to maintenance, general upkeep and solar panel cleaning.

Desired Outcome: Contribution to national treasury and provision of employment to local Namibians.

Actions

Enhancement:

- The Proponent must employ local Namibians and contractors where possible.
- Develop an employment strategy to include how employees from the area will be made aware of any possible employment opportunities and how recruitment will be conducted. This should include contractors. All contractors should be made aware of the requirement to use local labour as far as possible.
- If the skills exist locally, employees must first be sourced from the town, then the region and then nationally.
- Deviations from this practice must be justified.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Summary report based on employee records.
- Employment strategy kept on file.

2.1.4 Demographic Profile and Community Health

The project is reliant on labour during the construction and operational phases. New developments always create the idea of opportunity and growth, especially in the employment sector. Development of the project may drive jobseekers, especially in the construction sector, to Aussenkehr. Such in-migration towards the area may be of a temporary or permanent nature. In addition, the construction phase will make use of some specialised labour not from Aussenkehr. The partly foreign workforce and or additional job seekers in the area is something that is known and well accommodated within the Aussenkehr community. Such in-migration is not considered to result in a significant change in the demographic profile or community health. The existing community has developed resilience and adapted to not only seasonal influxes of job seekers, but also seasonal employment. This is a strongly cumulative aspect considering all developing initiatives in Aussenkehr. It is further expected that the in-migration will be from other existing urban centres in Namibia, as well as partially from rural communities.

Additional aspects related to the community health and safety include possible electrocution, electromagnetic interference, visual amenity, construction noise and dust. However, the proposed development is far-removed from the residential areas in Aussenkehr and the site will be strictly access controlled. The probability of such risks is considered unlikely.

Desired Outcome: To prevent the in-migration and growth in informal settlements and to prevent the spread of communicable diseases and prevent / discourage socially deviant behaviour.

Actions

Prevention / Mitigation:

- Training of local people should be considered from the start. These measures will reduce the influx of newcomers to the area and thereby reduce growth in the informal settlement.
- Construction workers should always be supervised.
- Workers' conduct should be guided by a code of conduct to be developed by the contractors.
- The construction areas should be fenced to avoid unauthorised entry.
- Employ only local people from the area, deviations from this practice should be justified appropriately.
- Consultations with and involvement of local communities in project planning and implementation.
- Mandatory and regular training for workers on required lawful conduct and legal consequences for failure to comply with laws.
- Adopt any by-laws relating to environmental health.
- All provisions of the Labour Act must be adhered to.
- Construction teams and related workforce to be easily identifiable and distinguishable.
- Educational programmes for employees on HIV/AIDS and general upliftment of employees' social status should be considered.
- Use of signs, barriers (e.g. locks on doors, use of gates).
- Grounding of electricity conducting objects.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Project inspection sheet for all areas which may present environmental health risks, kept on file.
- Summary report based on educational programmes and training conducted.
- Summary report based on any theft related incidents.
- Employment records kept on file.

2.1.5 Increased Electricity Supply to the National Grid

The proposed solar plant will be a renewable energy contributor to the National electricity grid. Not only will it be able to provide additional electricity in contributing to enhancing energy security, but it will also enable local and national economic development. However, it is planned to use an existing transmission line, which will have to be upgraded to accommodate the additional electricity load. The upgrading of this line may affect the existing solar plant and its connection to the Aussenkehr Substation, possibly resulting in a temporary loss of income and or interrupt electricity supply to the national grid from this plant. In addition, the project transmission line to be upgraded, crosses under an existing NamPower 132 kV transmission line. Upgrading of the project transmission line may present a risk to the NamPower Transmission line, due to possible breach of safety aspects. Resulting incidents may include compromising of both the power line as well as the Aussenkehr Substation, this could potentially lead to power supply interruptions for the area.

Desired Outcome: Increased power supply to the national grid and no power supply interruptions during the construction phase.

Actions

Preventative / Mitigation:

Construction Phase

- Timing of the transmission line upgrade to be confirmed during the planning phase with all stakeholders involved.
- All agreements related to the Electricity Control Board related to the supply of power to the National Grid, as well as all agreement with NamPower, to be finalised prior to the construction phase.
- All technical aspects related to the transmission line crossing with the existing NamPower 132 kV transmission line, should be agreed upon in writing, prior to the upgrading of the project transmission line.
- Any expected power supply interruptions, due to the proposed project, to communicated to surrounding land owners

Operational Phase

- Monitor and ensure the plant's operational efficiency to maximise its contribution to the national grid.
- Implement advanced technologies and continuous improvement strategies to increase plant productivity and reliability.
- Ensure servitude management of the project transmission line.

Responsible Body:

- Proponent.

Data Sources and Monitoring:

- Performance reports from the plant operations to assess the contribution to the national grid.

2.1.6 Traffic

The construction phase will increase traffic flow to the site. During the construction phase, traffic impacts and risks will be increased. Heavy motor vehicles will transport materials and equipment (PV panels, frames) to the site. It is anticipated that the following number of trips would be required:

- Delivery of panels: 84 loads consisting of 18.9 tons each on 12 m long trailers.
- Delivery of electrical equipment and components: eight loads of 20 tons each.
- Delivery of frames: six loads of 20 tons each.

An increase in traffic to and from the site during the construction phase, may increase the risk of incidents and accidents especially during the harvesting seasons. During this season the existing surrounding operations have a higher volume of tractors and carts. Increased HMV on the access road will increase dust. Dust aspects are covered in Section 2.1.10.

Desired Outcome: No traffic incidents and no transport or traffic related accidents.

Actions

Prevention / Mitigation:

- Ensure access agreements are in place where private land needs to be entered onto or moved over. Ensure access agreements address timing of traffic (considering the harvesting periods) and dust mitigation where required.
- All access agreements, where applicable, should be in place prior to the construction phase.
- Proper traffic management planning prior to construction.
- Diversion or management of traffic when required.
- Appropriate signage and warnings on roads and vehicles to be used. Vehicle signage should be appropriate for the area to ensure visibility.
- Existing tracks and access roads leading to the site should be used if possible and new tracks or roads should not be created.
- Sensitive environmental features should be demarcated and no off-road driving should be allowed around these sites. No construction vehicles should be allowed to enter any sensitive sites.
- Where relevant, erect clear signage, regarding parking and access and exit points around construction sites and at the construction camps.
- During the planning phase, all connections (if any new accesses are planned) to national roads must be approved by the Roads Authority.
- Road safety training to be provided to all construction staff and should be implemented by any contractors used (included in tender documentation).
- During any maintenance of infrastructure which may necessitate partial or complete road closure of traffic flow disruptions, clear communication should be available to the public and should include timing of maintenance.
- Measures should be in place to prevent (or repair) damage to road surfaces during the construction phase, especially during wet conditions.
- It must be ensured that a backlog of traffic does not develop at access points during peak hours, through the implementation of an efficient and effective access control system.
- Internal speed limits should be set for the construction and operational phases.
- Tender documentation to clearly specify the requirements of roadworthy vehicles to be used during the construction phase by contractors while also stipulating the requirements for the transport of employees etc.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Any complaints received regarding traffic issues should be recorded together with action taken to prevent impacts from repeating itself.
- A bi-annual report should be compiled of all incidents reported, complaints received, and action taken.

2.1.7 Health, Safety and Security

Activities associated with the construction and operational phases are reliant on human labour. As such, labourers are exposed to health and safety risks. Some activities, especially associated with the operation of heavy equipment, machines and heavy motor vehicles and or hazardous chemicals, poses the main risks to employees. In addition to these expected risks, severe climatic characteristics of the area (extreme heat conditions), may contribute to conditions such as sunstroke, fatigue, dehydration and related symptoms. Security breaches are another concern which relates to the development of properties, as well as any construction camp. A construction workforce presents the opportunity of ill-intending persons to pose as project team members for nefarious and criminal reasons. Construction sites are often targeted by criminal elements and the site will therefore increase the risk of crime within the immediate area. Theft or damage of construction materials and properties is an important local risk.

During construction and operations, the facility will carry the risk of electric shocks and arc flashes which is an explosion of energy that can occur in a short circuit situation. This explosive release of energy causes a flash of heat and a shockwave, both of which can cause serious injury or death.

Desired Outcome: To prevent injury, health impacts and theft.

Actions

Prevention/ Mitigation:

- The site should be access restricted and warning signs related to the dangers of electrocution erected along the perimeter as well as at the entrance to the plant.
- All personnel or contractors should be suitably trained during the installation and maintenance of any component of the solar plant.
- All health and safety standards specified in the Labour Act should be complied with. The responsible contractor must ensure that all staff members are briefed about the potential risks of injuries on site. The Contractor should be obliged to adhere to the following:
    - Adhere to health and safety regulations pertaining to personal protective clothing, first aid kits, warning signs, etc.;
    - Ensure that adequate emergency facilities, including first aid kits, are available on site;
    - Equipment that must be locked away on site and must be placed in a way that does not encourage criminal activities;
    - Induction training for all who enter the site is required;
    - Security personnel to prevent unauthorised entry of the construction site; and
    - Ensure all workers are issued with protective eyewear when working with photovoltaic panels.
- All staff members to be briefed about the potential risks of injuries on site.
- Security measures on site to prevent theft of solar panels or cables.
- Clearly label dangerous and restricted areas as well as dangerous equipment and products during the construction phase as well as during maintenance of infrastructure.
- Equipment that will be locked away on site (during the construction phase) must be placed in a way that does not encourage criminal activities (e.g. theft).
- Ensure that all personnel receive adequate training on operation of equipment / handling of equipment and/or hazardous substances.
- Implementation of a maintenance register for all equipment and hazardous substance storage areas.
- Adopt local policies and procedures for dealing with all forms of waste, including possible effluent as well as community health aspects such as noise etc.

Responsible Body:

- Health and safety officers for implementing and monitoring safety protocols.
- Security managers to oversee site security.
- The Proponent to ensure overall compliance and funding for health, safety, and security measures.

Data Sources and Monitoring:

- Regular safety audits and inspection reports.
- Security logs and surveillance footage to assess security measures.
- A monthly report should be compiled of all incidents reported during the construction and operational phase. The report should contain dates when training was conducted and when safety equipment and structures were inspected and maintained.

2.1.8 Fire

Fires outside of designated areas, especially near laydown and material storage areas, may increase the risk of the occurrence of uncontrolled fires. Chemicals and fuels stored and used for general construction activities may be flammable. Improper waste burning or discarding of cigarette butts around accumulated waste, or in the vicinity of hazardous chemicals, further increases fire risks. Currently, if there is a fire in Aussenkehr, the local business responds with mobile firefighters and water tankers to assist the community in extinguishing the fire. The provision and maintenance of fire extinguishers throughout the facility as well as training on the use thereof, remains paramount.

The risk of fire related to the PV panels themselves are low. Only a small portion of materials in the panels are flammable, and those components cannot self-support a significant fire. However, heat from an intense fire or energy from an electrical fault can ignite a PV panel. The possibility of fire due to an electrical fault is however, very unlikely.

Desired Outcome: Minimise the risk of fire and ensure rapid response capabilities to protect life, property, and the environment.

Actions

Prevention/Mitigation:

- Firefighting measures as per the Material Safety Data Sheet (MSDS) of the product should be adhered to.
- In addition to this, all personnel have to be sensitised about responsible fire protection measures and good housekeeping, such as the removal of flammable materials including rubbish, dry vegetation, and hydrocarbon-soaked soil from the vicinity of the construction. Regular inspections should be carried out to check for these materials at the site.
- It must be assured that sufficient firefighting resources are available. A holistic fire protection and prevention plan is needed. This holistic plan must include an emergency response plan and firefighting plan. Regular surveys of the fire-fighting equipment and water supply should be carried out.
- An integrated fire prevention plan should be drafted before construction commence.
- All fire precautions and fire control at the site must be in accordance with relevant SANS regulations or better. Firefighting measures as per the MSDS of the products should be adhered to.
- Personnel training (safe operational procedures, firefighting, fire prevention and responsible housekeeping practices) should form part of all contractors' tender requirements for further construction work.
- Establish a maintenance schedule for all fire related infrastructure as constructed and or managed by the Proponent.
- Maintain regular site, mechanical and electrical inspections and maintenance.
- No open and unattended fires should be allowed during the construction phase.
- The Proponent should liaise with the nearest fire brigade / local fire responders, to ensure that all fire requirements are met and that contractors adhere to all requirements related to fuel storage and handling during the construction phase.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Supervision of work is required and reports of safe and unsafe practice to be brought to the attention of the health safety and environmental officer.
- Any incidents reported must be recorded together with steps taken to mitigate the impacts.
- Continuation of training and fire safety practices established during the construction phase.
- Record when fire drills were conducted and when firefighting equipment were tested and training given.

- A register of all incidents must be maintained. This should include measures taken to ensure that such incidents do not repeat themselves.
- A bi-annual report should be compiled of all incidents reported. The report should contain dates when fire drills were conducted and when fire equipment was tested and when training was given.

2.1.9 Electromagnetic Fields

Electromagnetic fields (EMF), also referred to as radiation and is generated by solar plants as well as power lines. However, these EMF's, generated due to electricity is non-ionizing. This means that the radiation can *move* atoms in a molecule around, but cannot *remove* any atoms (such in the case of ionising radiation). In other words, the radiation as related to electrical installations, could create heat, for example, but not cause molecule damage to for instance to DNA.

The proposed project is not located close to any residential areas or close to offices or places of business. The relatively low voltages in a solar facility, and the fact that electric fields are easily shielded (i.e., blocked) by common materials, such as plastic, metal, or soil, means that there is no concern of negative health impacts from the electric fields generated by the solar plant (Cleveland, 2017). Therefore, effects of EMFs related are mostly related to the fauna and flora under or close to the power line. According to Levitt *et al.,* (2022), non-ionising EMFs result in biological effects at both high and low-intensity man-made exposures, many with implications for wildlife health and viability Sensitive magnetoreception allows living organisms, including plants, to detect small variations in environmental EMF and react immediately as well as over the long term, but it can also make some organisms exquisitely vulnerable to man-made fields. The existing power line servitude is void of vegetation; however, the line is located next to cultivated areas.

Desired Outcome: Minimise exposure and cumulative effects form electric and magnetic fields.

Actions

Prevention:

- Evaluating potential exposure to the public against the reference levels developed according to the Non-Ionising Radiation Regulations - exposure limits for general public exposure to o time-varying electric and magnetic fields (unperturbed rms values) Average and peak exposure levels should remain below the recommendation for General Public Exposure.
- Should EMF levels be confirmed or expected to be above the recommended exposure limits, application of engineering techniques should be considered to reduce the EMF produced by power lines, substations, or transformers. Examples of these techniques include:
    - Shielding with specific metal alloys
    - Burying transmission lines
    - Increasing height of transmission towers
    - Modifications to size, spacing, and configuration of conductors
- Identification of potential exposure levels in the workplace, including surveys of exposure levels in new projects and the use of personal monitors during working activities.
- Training of workers in the identification of occupational EMF levels and hazards.
- Implementation of action plans to address potential or confirmed exposure levels that exceed reference occupational exposure levels. Personal exposure monitoring equipment should be set to warn of exposure levels that are exceeding occupational exposure reference levels. Action plans to address occupational exposure may include limiting exposure time through work rotation, increasing the distance between the source and the worker, when feasible, or the use of shielding materials.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Record any complaints and / or incidents regarding electric and magnetic fields.

2.1.10 Air quality

Particulate matter is a known health concern related to air quality. Specific parameters were developed by the World Health Organisation (WHO) relating to the safe limits of particulate matter in ambient air. Future construction and or maintenance activities could entail earth moving activities which may temporarily suspend material in the air. Frequent travelling of HMV over un-surfaced areas may increase soil disturbance, resulting in finer particles which are more easily suspended in the air. An increase of dust settling on adjacent properties may impact the table grape sector, however the proposed solar plant is far removed from residential areas. Furthermore, the construction period will be of short duration and, considering prevailing south-westerly wind conditions, the impact has a lower significance rating related to human impacts. Effects on surrounding activities, mainly the cultivation of table grapes and dates, will vary in significance, depending on the timing of the construction period, and especially earth moving activities. During the harvesting periods, the impact may be much more severe than during the vineyard's resting periods.

It is not foreseen that the greenhouse gas emissions (GHG) from construction related activities, will have a significant impact. The project in its entirety aims at contributing positively to the National Climate Change Strategy.

Desired Outcome: To prevent health impacts and minimise dust generated.

Actions

Prevention / Mitigation:

- Erect a barrier (such as shade netting) around the construction site to act as a dust shield between the site operations and neighbouring agricultural activities. Additional dust mitigation measures should be discussed as related to the access road and related farming operators.
- Personnel are to be issued with dust masks when needed.
- Excavations and earthworks during strong wind conditions should be avoided to prevent dust from being a nuisance if dust suppression is not adequate.
- Excavations and earthworks should ideally not be conducted during harvesting seasons.
- Personnel issued with appropriate masks where excessive dust are present.
- A complaints register should be kept for any dust related issues and mitigation steps taken to address complaints where necessary.
- Notice to be given to nearby receptors prior to activities generating excessive dust which cannot be mitigated, if any.
- If feasible, consider covering the road with a natural dust suppressant or wetting it as required.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Any complaints received regarding dust should be recorded with notes on action taken.
- Photos of shade netting be kept on file along with maintenance record of the construction perimeter fence.
- All information and reporting to be included in a bi-annual report.

2.1.11 Noise and Vibration

Construction or maintenance noise, which may constitute high volume and repetitive noises, are known to impact human health. Excessive noise may result in a nuisance to nearby receptors and possible hearing loss in staff.

Noise standards have been developed by the Health and Safety Regulations of the Labour Act and WHO, to protect workers and communities against the health impacts and nuisances of noise. The project construction phase could cause periods of elevated noise with mechanical excavations increasing the intensity of such noise. However, there are no nearby residential areas or sensitive receptors. The impact therefore, is considered to have a reduced significance rating. During the operational phase, little to no noise impact is expected.

Desired Outcome: To prevent any nuisance and hearing loss due to noise and vibrations generated.

Actions

Prevention / Mitigation:

- The World Health Organisation (WHO) guideline on maximum noise levels (Guidelines for Community Noise, 1999) to prevent hearing impairment can be followed during the construction phase. This limits noise levels to an average of 70 dB over a 24-hour period with maximum noise levels not exceeding 110 dB during the period. It is recommended that a survey of the noise levels be carried out if complaints are received.
- Construction workers to be issued with hearing protection where needed.
- Follow the Health and Safety Regulations of the Labour Act for limits on noise in the workplace to prevent hearing impairment.
- All machinery must be regularly serviced to ensure minimal noise production.
- Notification to nearby receptors (through a community liaison officer) of construction commencement.
- To reduce vibration levels, it is recommended that all machinery and vehicles be maintained in a good condition and that a maintenance record be kept.
- Unnecessary vibrations can be minimised by ensuring that no machinery or vehicles are left idling when not in use.
- The appropriate and correct placement of specific work activities can ensure the reduction of handling of machinery that cause heavy vibrations.
- Ensure personnel running the equipment are trained accordingly so that machinery is used properly.
- Pre assessment to allow for mitigation measures for any elevated levels of vibrations should take place if there is any suspicion that there may be excessive vibration levels on site during construction. These mitigation measures should then be in accordance with local regulations and standards.
- Should any blasting be conducted, a related survey of all properties will have to be conducted and an amendment to the environmental assessment and related environmental management plan will have to be submitted to MEFT.
- Hearing protectors as standard Personal Protective Equipment for workers in situations with elevated noise levels.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Health and Safety Regulations of the Labour Act and WHO Guidelines.
- Maintain complaints register.
- Report on complaints and actions taken to address complaints and prevent future occurrences.

2.1.12 Waste Production

Waste production during the construction and operational phases are very different and require unique waste management measures to address related impacts and prevent contamination. Construction waste may have a greater component of building rubble, discarded materials and hydrocarbon-contaminated materials, with less general and domestic waste in comparison. Waste should be managed by the contracting agent responsible for construction within a specific area. Wind may blow waste, such as old cement bags (which is a hazardous waste), plastic bags and polystyrene, from the site to beyond the site boundaries. Construction waste may present physical pollution as well as chemical contamination. Any soil polluted by hydrocarbons that may be encountered during the construction phase should be treated as hazardous waste.

Although solar modules may last up to 30 years, maintenance may require the removal of damaged or broken panels. In addition, a significant quantity of material needs to be disposed of at the end of the life of the modules. Because modules can contain potentially hazardous materials, consideration should be given at the start of a solar project as to how units will be disposed of at the end of their useful life. Indiscriminate and unplanned disposal of panels or any construction waste will have a local, negative impact.

Desired Outcome: To reduce the amount of waste produced, and prevent pollution and littering as well as safety risks associated with accumulated waste and sound waste disposal practices.

Actions

Prevention / Mitigation:

- A waste management system should be adopted and presented for the construction phase and should include measures related to construction waste handling and management.
- All construction related tender documentation should include the waste management system and should include contractual penalties for failing to adhere to the waste management requirements.
- Products that can be re-used or re-cycled should be kept separate.
- Waste should be disposed of regularly and at appropriate disposal facilities.
- Hazardous materials should be disposed of in an appropriate way at an appropriately classified waste disposal facility (follow MSDS).
- Adequate temporary ablution facilities must be erected at the construction site if no alternative facilities exist.
- Temporary waste disposal facilities should be present on site. This should include separate containers for products that can be re-used or recycled.
- Removal of waste should be at regular (weekly) intervals to maintain visual orderliness, but more so to not give time for liquid waste to enter the soil substrate. Dry waste is at risk of increasing the dust / litter impact so should be removed regularly.
- Contaminated soils can be remediated in accordance with accepted procedures at a site dedicated for this purpose.
- Develop a waste management plan for the discarding of broken or old solar panels, many components of photovoltaic modules are recyclable and some solar module manufacturers provide recycling of the panels with purchase. Recycling will greatly reduce potential adverse impacts associated with panel disposal and should be included in the waste management plan.
- Ensure waste cannot be blown away by wind during all phases of the project.
- Prevent scavenging (human and non-human) of waste.
- Weekly site inspections should be conducted by a representative of the Proponent to ensure implementation of the waste management plan and compliance to the EMP.
- An independent waste and EMP management audit should be conducted on a monthly basis for the duration of construction contracts.
- Liaise with the regional council regarding waste and handling of hazardous waste.

- Empty chemical containers that may present a contamination/health risk must be treated as hazardous waste. Workers should not be allowed to collect such containers for purposes of storing water or food. This can be achieved by puncturing or crushing such containers prior to disposal.
- Report all fuel spills greater than 200 litres to the Ministry of Industries, Mines and Energy and enact emergency response plans for fuel spills.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- A register of hazardous waste disposal should be kept. This should include type of waste, volume as well as disposal method/project.
- Waste management plan, weekly and monthly audit reports kept on site.
- Any complaints received regarding waste should be recorded with notes on action taken.
- All information and reporting to be included in a bi-annual report.

2.1.13 Flora

Construction related activities presents the greatest risk to habitats within the area associated with the Orange River. However, this site is located far removed from the Orange River and therefore is highly unlikely to affect the flora associated with the river. Vegetation on site is very sparse and only located in the drainage washes within the area. Removal of limited vegetation, and an increase in the human footprint to the area could result in habitat destruction, illegal collection of plant materials and poaching by construction workers etc.

Construction and operational activities can create habitat for flora species to establish, e.g. disturbed soil is favourable for the establishment of weeds and invader species. Washing of panels result in additional moisture on disturbed soil, which may prove favourable for the establishment of alien vegetation. Illegal collection of plant materials may occur. Employees should not be allowed to harvest any flora without the required permission. Although the operational phase is not expected to have direct physically altering activities on or around sensitive habitat areas, deviant or criminal social behaviour may result in damage to flora resources or vineyards.

Desired Outcome: To avoid pollution and negative impacts on sensitive habitats and related flora.

Actions

Prevention / Mitigation:

- Restrict construction activities and land clearing to the construction site to prevent unnecessary habitat loss. This should include the area between the existing plant and the proposed plant. Care should be taken to avoid any movement especially in the drainage wash of this area.
- All employees and contractors should be educated about the value of biodiversity.
- Strict conditions prohibiting harvesting and poaching of flora should be part of employment contracts and contractor conditions.
- If ever required after exceptionally high rainfall for the area, use only herbicides approved by the MAFWLR during site and power line servitude management.
- All dumping of waste material in the environment, especially contaminated materials or soils, must be prevented.
- No storage of vehicles or equipment will be allowed outside of the designated area.
- Mitigation measures related to waste handling and the prevention of groundwater, surface water and soil contamination should limit ecosystem and biodiversity impacts.
- For construction activities, contain construction material to a designated laydown area and prevent movement out of areas earmarked for clearing and construction.
- Take disciplinary action against any employees failing to comply with contractual conditions related to harvesting of flora.
- Implementation of an alien vegetation management plan for the site is required. This is especially in areas that have been disturbed.

Responsible Body:

- Contractor
- Proponent

Data Sources and Monitoring:

- All information and reporting to be included in a bi-annual report.

2.1.14 Fauna and Avifauna

Before any construction activities may commence, a bird study must be conducted to assess collision risks, habitat disruption, and behavioural changes to assess any impacts of the proposed new grid connection line. Proper planning of such activities is required inclusive of various approvals and negotiations

Construction activities could lead to the displacement of faunal communities due to habitat loss and disturbance (noise, dust and vibration) and/or direct mortalities. However, the site is mostly void of vegetation and related habitats with very little fauna species present. These are mostly confined to the drainage washes across the site. These areas are active corridors linking the conservation areas east of the site, with the rest of the Aussenkehr Valley and Orange River. Establishment of the plant will destroy these habitats and corridors as located within the site boundaries and could disturb possible resident bird species (although the likelihood of such occurrence is low). However, the Proponent has reduced the site significantly to accommodate an existing NamPower servitude, south of the site. South of the servitude, there is another significant drainage wash as wildlife corridor. This drainage wash has also been excluded from the site to allow for its corridor function between the existing and proposed plant.

This provision has been allowed for as per the specialist requirement of Dr J Irish, who stated that an ecological corridor should be retained in providing access to the Orange River for wildlife. It is proposed that the corridor be retained along the main washes where there is more vegetation since these areas have a richer biodiversity. The ecological corridor will serve to connect the conservation areas with the river and it should allow for animal passage.

Since it is proposed that an existing power line be used, albeit after it is upgraded, no additional impacts are expected on especially avifauna. No additional line will be constructed. However, the additional solar plant will have a strongly cumulative effect. Reflective surfaces may cause disorientation of flying birds, resulting in injury or death as part of the operational phase. However, PV panels are less reflective than other solar systems. In addition, should panels be kept in a fixed position, they may be attractive roosting sites. Although the operational phase is not planned to have direct physically altering activities on or around habitat areas, deviant or criminal social behaviour may result in damage to protected fauna species.

Desired Outcome: Minimise impacts on fauna and loss of biodiversity by reducing risks of habitat disruption and fragmentation, collision, and electrocution. Promoting biodiversity and compliance with wildlife conservation regulations.

Actions

Prevention / Mitigation:

- It is proposed that an ecological buffer zone be allowed for, along the southern boundary of the site. This area should not be fenced to allow for wildlife passage.
- Preconstruction monitoring needed to determine the presence of threatened, rare, endemic or range restricted bird species.
- All unnecessary destruction of nests should be avoided during the construction phase.
- Create awareness on the negative impacts of poaching and the importance of recording all incidents.
- Ensure the entire length of the power line, when upgraded, is marked with anti-collision marking devices & upgrade with bird friendly designs to prevent electrocution. Upgrading of the line should consider:
    - Marking should be on the top conductor at 10 – 15 metre intervals in alternating black and white devices.
    - Power line poles:
        - Each wire on the pole should be “gapped” (an air space safety gap)
        - Stay wire should all be “gapped” by insulators.

- Offset jumpers where possible
- T- Piece perch must be placed on top of the pole at each bend point and above the transformer structures.

o Power line transformers: Ensure the design does not attract birds for perching etc.

- It is important to note that habitats can be created inadvertently by the panels, especially when situated in a slanted, fixed position. Regular inspection must be performed to monitor for bird impacts and mitigation measures investigated if required.
- Report any extraordinary animal sightings, conflict or incidents to the MEFT.
- Take disciplinary action against any employees failing to comply with contractual conditions related to poaching and the environment.

Responsible Body:

- Contractor
- Proponent

Data Sources and Monitoring:

- All information and reporting to be included in a bi-annual report.
- Report any extraordinary animal sightings to the MEFT.
- Regular monitoring of the power line as well as the plant should be conducted to determine bird mortalities. This data should be kept and made available for conservation purposes.

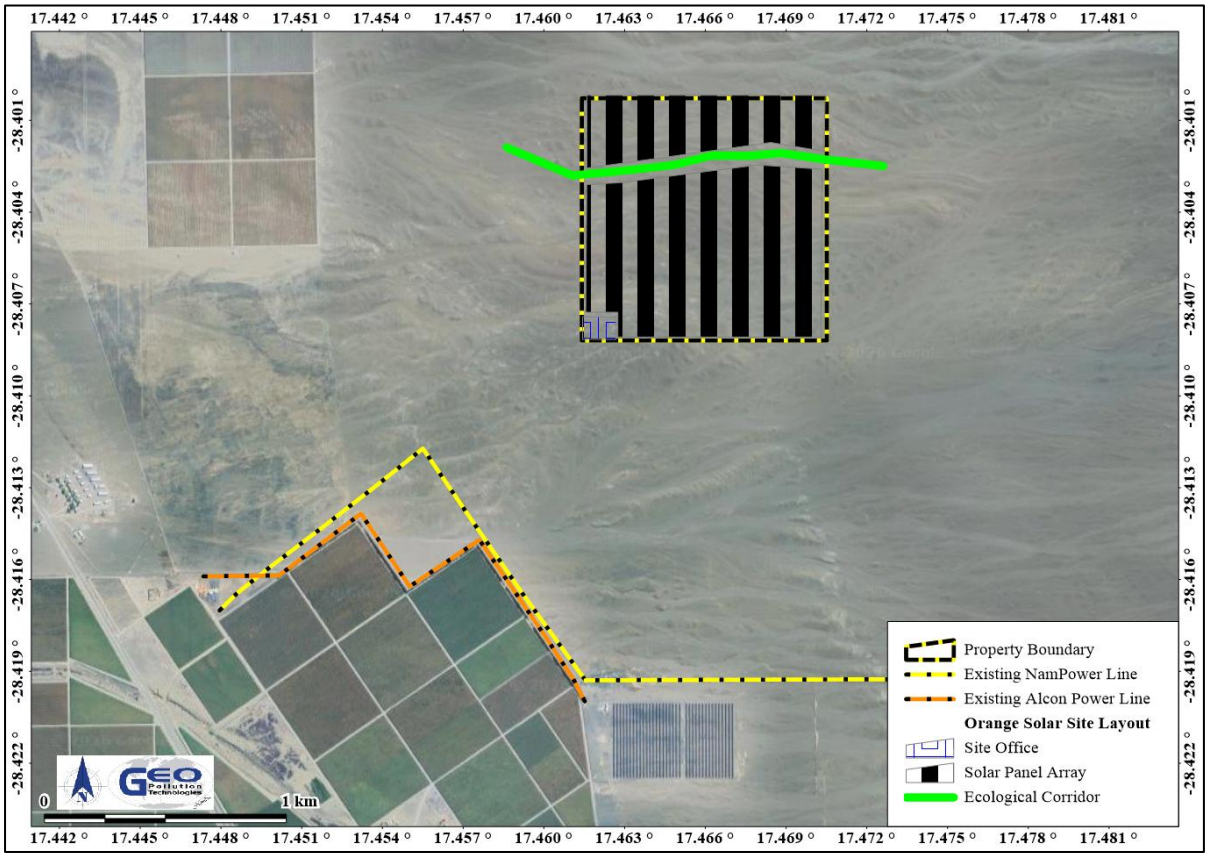

Figure 2-1 Wildlife corridor

2.1.15 Groundwater, Surface Water and Soil Contamination

Contamination risks may be linked to the construction and operational phases. Sources of contamination can be spills and leaks from construction vehicles, chemicals used during construction such as paints and sewage. Elevated groundwater may lead to rapid dispersion of pollutants, and may potentially negatively impact surrounding underground utilities and / or infrastructure (considering the phased approach). Changes in the soil structure due to site excavation, clearance and especially ground breaking may lead to trenches along which contamination may travel.

Porous surface substrate can allow unwanted hazardous and ecologically detrimental substances to seep down to the water table either at the site of spill or after being washed away by surface flow. Leakages from construction vehicles, accidental spills of fuel or transformer oils, paints and other chemicals might occur.

Dust abatement measures may include wetting surfaces with water. Concrete may further react with the water and soil combination which will result in corrosion.

Desired Outcome: Prevent contamination of soil, groundwater, and surface water to protect the local ecosystem and comply with environmental regulations.

Actions

Prevention:

- All precautions are to be taken to prevent contamination of the soil as this could enter the ecosystem.
- Appointing qualified and reputable contractors is essential.
- Any fuel spills must be reported and remediation action taken.
- Polluted soil and building rubble must be transported away from the site to an approved, appropriately classified waste disposal site. Polluted soil can be remediated.
- Leaking equipment shall be repaired immediately or be removed from site to facilitate repair.
- Due to the nature of some hazardous materials, they should be disposed of in an appropriate way at an appropriately classified waste disposal facility. See the MSDS available from suppliers if the user is not sure how to dispose of the substance.
- Proper training of operators of construction machinery and vehicles and employees must be conducted on a regular basis (fuel and chemical handling, spill detection, spill control).
- All construction machines should be maintained to be in a good working condition during operations.
- Employ drip trays and spill kits when servicing / repairs of equipment are needed (such as transformer oils etc).
- Prevent off-road driving or movement of earthmoving equipment outside of areas designated for clearing.
- No dumping of rocks and removed soil in environmentally sensitive areas. Where possible it can be used to fill erosion ditches or old quarries, if any are present.
- Use landscaping and other natural barriers to reduce surface runoff that could carry potential contaminants.

Mitigation:

- Any fuel spillage of more than 200 litre must be reported to the Ministry of Industries, Mines and Energy.
- Spill clean-up means must be readily available on site as per the relevant MSDS and any spill must be cleaned up immediately.
- Continue monitoring soil and water quality to detect any signs of contamination.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- A report should be compiled bi-annually of all spills or leakages reported. The report should contain the following information: date and duration of spill, product spilled, volume of spill, remedial action taken, and a copy of documentation in which spill was reported to Ministry of Industries, Mines and Energy. The latter is only for fuel spills of 200 litres or more.
- Servicing records of vehicles / equipment and infrastructure, to be kept on file.
- Records kept of any old or used hydrocarbon and or other hazardous waste removed from site.

2.1.16 Archaeological and Historical Resources

The general Aussenkehr area is known to have harboured historical and or archaeological resources. These have been documented and were located in areas far removed from the site. However, due to the historical and archaeological significance of the area, and in particular the Orange River, the site has the possibility to have some resources as well as possible paleontological resources. Sites with archaeologically or culturally important significance might be uncovered during excavations.

Desired Outcome: To avoid any destruction, disturbance or damage to archaeological, paleontological or historical resources.

Actions

Prevention / Mitigation:

- If such a site or any other archaeologically important artefact is found during the development phase any work in that area must be halted and the relevant authorities must be informed. Firstly, the Namibian Police must be informed. Secondly, the National Monuments Council dealing with heritage should be informed.
- Should any resources be discovered, all prevention and mitigation measures to be identified by a registered Archaeologist, should be adhered to according to the provisions of the National Heritage Act. Such measures should be included in the EMP once determined.
- Construction may only continue at that location once permission has been granted.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Record any discoveries and proof of notifications to authorities on file.

2.1.17 Visual Impact and Landscape Character

Changes in the landscape character will occur during the construction phase and subsequently also during the operational phase. However, the proposed plant is not a new component of the landscape and will contribute to the cumulative aspects of the solar plants. The existing solar plant and related power line is mostly shielded from public view by the surrounding vineyards and natural topography. The proposed plant will, however, be located at a slightly higher elevation which increases its visibility, especially during the construction phase. However, the panels are not foreseen to will have an impact due to reflection on either motorists or aircraft.

Desired Outcome: To minimise aesthetic impacts associated with the establishment.

Actions

Mitigation:

- Regular maintenance and general upkeep of the plant will ensure continuous low visual impact and maintain the general integrity of the solar plant.
- Construction activities must be restricted to the construction site to minimise the impacts of the construction phase.
- Stormwater discharge points should be designed to minimise erosion.
- Regular waste disposal, good housekeeping and routine maintenance on infrastructure will ensure that the longevity of structures are maximised and a low visual impact is maintained.
- All contractors' camps to be clearly demarcated, fenced off and kept neat.
- Active construction areas to be clearly indicated, demarcated and kept neat.
- Construction to be approached in a systematic manner to ensure uniform and methodical completion of construction areas.
- Construction planning to be shared with IAPs.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- A maintenance record should be kept.
- A bi-annual report should be compiled of all complaints received and actions taken.

2.2 IMPACT SUMMARY

Construction phase activities will mostly be restricted in terms of the project footprint and planned construction duration. Negative impacts such as dust generation may be reduced in significance when adopting mitigation measures and adhering to international best practises. Site specific mitigation related to the unique operations of the area need to be adopted, especially considering the export produce being cultivated in the area. The most significant biophysical impacts relate to habitat fragmentation and disturbance as well as possible bird collisions associated with the existing power line to be upgraded. The project will, however, generate revenue and provide employment for a large number of employees, especially during the construction phase, thereby contributing significantly to the economy and related development set for the //Kharas Region. In addition, the operations of the solar plant will, in itself, be a positive contribution to the renewable energy sector in Namibia.

2.3 DECOMMISSIONING AND REHABILITATION

Closure and decommissioning of the solar plant, as a whole, is not foreseen during the validity of the environmental clearance certificate, or in the near future. However, it is possible that certain components of the project may be decommissioned or replaced at a later stage. Decommissioning is therefore included for this purpose as well as the fact that construction activities may also include modification and decommissioning of infrastructure. Future land use after decommissioning should be assessed prior to decommissioning and rehabilitation should be initiated if the land will not be used for similar future purposes. Should decommissioning occur at any stage, rehabilitation of the area may be required. Decommissioning will entail the complete removal of all infrastructure including buildings and support infrastructure. Any pollution present on the site must be remediated. The impacts associated with this phase include noise and waste production as structures are dismantled. Noise must be kept within Health and Safety Regulations of the Labour Act and/or WHO standards. Waste should be contained and disposed of at a dedicated waste disposal site and not dumped in the surrounding areas. Implementation of the waste management plan for especially the disposal of the modular panels will be paramount. The EMP and waste management plan for the project will have to be reviewed at the time of full decommissioning to cater for changes made to the site and to implement any update guidelines and mitigation measures.

3 CONCLUSION

The EMP should serve as an on-site reference throughout all phases of the project. Those responsible for violations of the EMP must be accountable for any necessary rehabilitation efforts. Should an ECC be granted, it should specifically pertain to the project areas outlined in the initial proposal. Any expansions or additional operational areas should be clearly demarcated and addressed either as amendments to the current document or through a separate environmental assessment.