

**Report
Version – Final**



April 2022

APP-00

PROJECT STATUS

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|-----------------------|--|------------------|-------------|
| Title | Updated Environmental Management Plan for the operation of the 5 MW Solar Photovoltaic Power Plant with 66 kV Powerline and Access Road next to the NamPower Substation at Okatope, in Engoyi Village, in the Oshikoto Region, Namibia. | | |
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ABBREVIATIONS

| | |
|----------|---|
| AIDS | Acquired Immuno-Deficiency Syndrome |
| DR | Developer's Representative |
| EA | Environmental Assessment |
| ECC | Environmental Clearance Certificate |
| ECO | Environmental Control Officer |
| EIA | Environmental Impact Assessment |
| EMA | Environmental Management Act |
| EMP | Environmental Management Plan |
| GG | Government Gazette |
| GIS | Geographic Information System |
| GN | Government Notice |
| GPS | Global Positioning System |
| HIV | Human Immuno-deficiency Virus |
| I&APs | Interested and Affected Parties |
| MEFT:DEA | Ministry of Environment, Forestry and Tourism: Department of Environmental Affairs |
| MHSS | Ministry of Health and Social Services |
| NHCN | National Heritage Council of Namibia |
| Reg. | Regulation |
| S | Section |
| TB | Tuberculosis |

1 INTRODUCTION

Tandii Investments (Pty) LTD and Independent Power Producer (IPP) operates a 5 MW Solar Photovoltaic Power Plant, in Engoyi village on 8 ha of land located over the railway line running from Tsumeb to Ondangwa and is diagonal to the NamPower substation situated in Okatope, in the Oshikoto region. This is in an effort to contribute to the Renewable Energy Feed In Tariff (REFIT) Programme which is jointly implemented by NamPower and the Electricity Control Board of Namibia. The proposed photovoltaic solar power plant will be serviced by the existing road access that was constructed by NamPower and is connected to the national grid via a single new 66 kV powerline to the nearby electricity substation.

The project involves the generation of electricity by an Independent Power Producer (IPP) directly by harnessing the clean and renewable energy from the sun using a photovoltaic system and then feeding this electricity harvested into the Okatope NamPower substation. The solar power plant is comprised of 36 288 PV modules/solar panels in total that are mounted on an elevated grid, 1 m above ground. In accordance with the provisions of the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007), the 5 MW PV solar plant exceeds the 1 MW energy project limit that can be undertaken without an Environmental Clearance Certificate.

Tandii Investments (Pty) LTD, hereafter referred to as the proponent is of the intention to continue with the following activity:

- **The operation of the 5 MW Solar Photovoltaic Power Plant with 66 kV Powerline and Access Road next to the NamPower Substation at Okatope, in Engoyi Village, in the Oshikoto Region, Namibia.**

Healthy Earth Environmental Consultants CC (HEEC) has been appointed to compile this updated Environmental Management Plan (EMP) as part of the ECC renewal (the expired ECC was issued in April 2016) process conducted for the ongoing operations at this development.

Regulation 8 of the Environmental Management Act's (EMA) (7 of 2007) Environmental Impact Assessment Regulations (2012) requires that an updated EMP should be included within an ECC renewal application.

An updated EMP is one of the most important outputs of the EA process as it synthesises all of the proposed mitigation and monitoring actions, set to a timeline and with specific assigned responsibilities. This updated EMP details the mitigation and monitoring actions to be implemented during the following phases of these developments:

- Operation and Maintenance – the period during which the services infrastructure are fully functional and maintained.

It should be noted that to date, all engineering designs have been approved and installed for the development and are functioning very well.

The decommissioning of these developments is not envisaged; however in the event that this should be considered some recommendations have been outlined in **Table 4-9**.

1.1 Rational for the Okatope 5 MW Solar PV Power Plant

Currently Namibia is importing almost half of its electricity from South Africa, Zimbabwe and other neighboring countries. However due to an increase in population and the accompanying demand, this historical relatively cheaper electricity from Eskom is just no longer available to satisfy the demands of Namibian consumers. South Africa is currently experiencing a decreasing supply capacity and this could be more severe in the very near future and Tandii Investments (PTY) LTD wants to gear itself towards supplementing and even substituting the NamPower supply, thus contributing to the Energy White Paper (EWP) that identifies: self-sufficiency, security of supply, inclusion of renewable energy sources, sustainability, cost effectiveness and efficiency as policy objectives on a national level.

With the mentioned policy objectives as a basis, the firm Tandii Investments (Pty) LTD in partnership with African Renewable Clean Power (PTY) LTD have constructed the 5MW solar power plant with the following motives:

- Engoyi village in Okatope, and the Northern regions in general, are subject to not very good power quality with frequent interruptions and power cuts affecting customers. A local source of generation will give the option to limit the effects of random power cuts and also be a backup option to power the whole Okatope area in emergency situations when NamPower' s capabilities are compromised.
- This will also aid in reducing the impacts and vulnerability of the Okatope community from the impacts of climate change, which will otherwise be caused by other unclean sources of energy that emit greenhouse gases.
- The Minister of Environment, Forestry and Tourism wishes to reduce greenhouse gases by up to 89% in the country as was resolved and agreed internationally at the recent Climate Change Summit held in Paris. So the Okatope community is already a step ahead in achieving this goal.

1.2 Summary of the Developed Process

Solar energy systems produce energy by converting solar irradiation into electricity or heat. Photovoltaic (PV) facilities use PV panels comprising modules. Modules comprise many individual PV cells which absorb solar energy. The absorbed solar energy excites electrons inside the cells and produces electrical energy.

The panels are joined together in rows to form PV arrays. Which produces electricity in Direct Current (DC). The feeding of electricity into the NamPower grid requires the transformation of DC (as produced) into Alternating Current (AC) by an inverter.

The construction of now operational Okatope 5MW Solar PV Park was implemented after Tandii Investments (Pty) LTD obtained the following documentations in accordance with the provisions of all the applicable the national regulations (See Chapter 3 of this EMP):

- (i) Generation License (GL) issued by the Electricity Control Board (ECB), as approved by the Ministry of Mines and Energy (MME)
- (ii) Power Purchase Agreement (PPA) between the Proponent and the consumer (NamPower) of the electricity to be generated by the Solar PV Power Plant,
- (iii) Land Lease Agreement between the Proponent and the Okatope Traditional Authority who are the legal custodians of the communal land parcel; and
- (iv) Environmental Clearance Certificate (ECC) issued by the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT).

The Okatope 5 MW PV Solar Power Plant was commissioned, the plant is operational & self-sustaining and readily feeds power into the national grid with an ongoing online monitoring and security surveillance. Permanent staff are employed to ensure consistency of yield and proper functioning.

1.3 PROJECT LOCATION

Tandii Investments (PTY) LTD and IPP operates a 5 MW Solar Photovoltaic Power Plant, in Engoyi village on 8 ha of land located over the railway line running from Tsumeb to Ondangwa and is diagonal to the NamPower substation situated in Okatope, in the Oshikoto region. (Figs. 1 and 2). The 5 MW solar power plant is connected to the national grid via a 66 kV overhead power line to the nearby Okatope electricity substation. Access to the site is gained through existing roads as shown in Fig. 2). The GPS coordinates of the 5 MW solar power plant for Tandii Investments (Pty) LTD are shown in the following table:

Table 1: GPS coordinates of the 5 MW Solar PV Power Plant- Tandii Investments (PTY) LTD IPP.

| GPS POINTS | LATITUDE | LONGITUDE |
|------------|-----------------|-----------------|
| 494 | S 18° 06' 26.7" | E 016°17'36.5" |
| 495 | S 18°06'20.6" | E 016° 17'38.5" |
| 496 | S 18°06'21.8" | E 016°17'43.3" |
| 497 | S 18°06'25.6" | E 016°17'44.0" |
| 498 | S 18°06' 26.2" | E 016°17'45.8" |
| 499 | S 18°06'31.7" | E 016° 17'42.5" |
| 500 | S 18°06'35.9" | E 016°17'47.7 " |
| 502 | S 18°06'36.4" | E 016°17'48.4" |
| 503 | S 18°06'33.9" | E 016°17'50.2" |

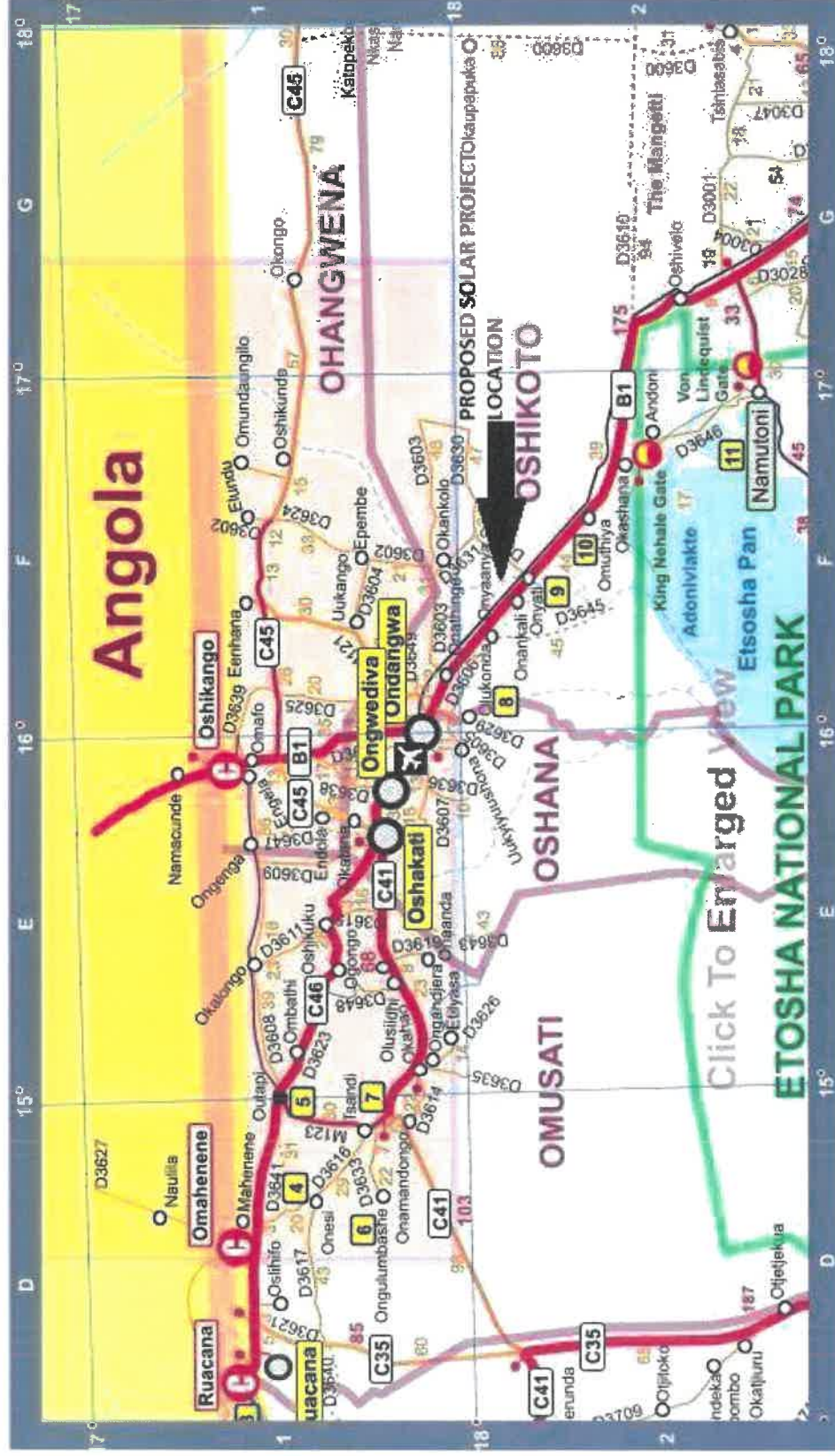


Figure 1: Regional location of the Tandii Investments Okatope 5MW PV Solar Power plant.



Figure 2: Detailed location of the Okatope 5MW Solar Power Plant for Tandii Investments (Source: Google Earth, 2022).

The site has a very high standard of all the necessary supporting infrastructures such as external and internal site road accesses covered in dust suppressing loose crushed gravel, high boundary fence, security cameras, onsite security personnel and related solar park infrastructures.

The following is the summary of the key components of the now operational Tandii Investments (Pty) LTD 5MW Solar PV Power plant as covered in this updated Environmental Management Plan (EMP) Report:

- 66 kV Overhead power line;
- Access roads and internal road network, and;
- Ancillary infrastructure.
- DC (direct current)-AC (alternating current) inverters and transformers;
- Guardhouse;
- New grid connection substation;
- Operations and maintenance building;
- PV module mountings;
- PV solar panels/modules (arranged in arrays);
- Underground cabling;



Figure 3: The operational Tandii Investment (Pty) LTD 5 MW Solar PV Power Plant in Engoyi Village, Okatope (HEEC,2022)

2 ROLES AND RESPONSIBILITIES

The proponent (the Developer) is ultimately responsible for the implementation of the EMP, from this current operational phase to the decommissioning phase (if these developments are in future decommissioned) of these developments. The proponent will delegate this responsibility as the project progresses through its life cycle. The delegated responsibility for the effective implementation of this EMP will rest on the following key individuals:

- Developer's Representative;
- Environmental Control Officer; and
- Contractor (Operations and Maintenance).

2.1 DEVELOPER'S REPRESENTATIVE

The Developer should assign the responsibility of managing all aspects of these developments for all development phases (including all contracts for work outsourced) to a designated member of staff, referred to in this EMP as the Developer's Representative (DR). The Developer may decide to assign this role to one person for the full duration of these developments, or may assign a different DR to each of the development phases – i.e. one for the operation and maintenance phase and one for the decommissioning phase. The DR's responsibilities are as follows:

Table 2 Responsibilities of DR

| Responsibility | Project Phase |
|--|---|
| Making sure that the necessary approvals and permissions laid out in Table 3 are obtained /adhered to. | Throughout the lifecycle of these developments |
| Making sure that the relevant provisions detailed in Error! Reference source not found. are addressed during planning and design phase. | Planning and design phase |
| Suspending/evicting individuals and/or equipment not complying with the EMP | <ul style="list-style-type: none"> • Operation and maintenance |
| Issuing fines for contravening EMP provisions | <ul style="list-style-type: none"> • Operation and maintenance |

2.2 ENVIRONMENTAL CONTROL OFFICER

The DR should assign the responsibility of overseeing the implementation of the whole EMP on the ground during the construction and operation and maintenance phases to a designated member of staff, referred to in this EMP as the Environmental Control Officer (ECO). The DR/Developer may decide to assign this role to one person for both phases, or may assign a different ECO for each phase. The ECO will have the following responsibilities during the construction and operation and maintenance phases of these developments:

- Management and facilitation of communication between the Developer, DR, the contractors, and Interested and Affected Parties (I&APs) with regard to this EMP;
- Conducting site inspections (recommended minimum frequency is monthly) of all construction and/or infrastructure maintenance areas with respect to the implementation of this EMP (monitor and audit the implementation of the EMP);
- Assisting the Contractor in finding solutions with respect to matters pertaining to the implementation of this EMP;
- Advising the DR on the removal of person(s) and/or equipment not complying with the provisions of this EMP;
- Making recommendations to the DR with respect to the issuing of fines for contraventions of the EMP; and
- Undertaking an annual review of the EMP and recommending additions and/or changes to this document.

2.3 CONTRACTOR

Contractors appointed by the Developer are automatically responsible for implementing all provisions contained within the relevant chapters of this EMP. Contractors will be responsible for the implementation of this EMP applicable to any work outsourced to subcontractors. **Error! Reference source not found.** applies to contractors appointed during the operation and maintenance phase. In order to ensure effective environmental management the aforementioned chapters should be included in the applicable contracts for outsourced operation and maintenance work.

The tables in the following chapter (**Chapter 3**) detail the management measures associated with the roles and responsibilities that have been laid out in this chapter.

3 MANAGEMENT ACTIONS

The aim of the management actions in this chapter of the EMP is to avoid potential impacts where possible. Where impacts cannot be avoided, measures are provided to reduce the significance of these impacts.

The following tables provide the management actions recommended to manage the potential impacts rated in the scoping-level EA conducted for these developments. These management actions have been organised temporally according to project phase:

- Applicable legislation (**Table 3**);
- Planning and design phase management actions (**Error! Reference source not found.**);
- Operation and maintenance phase management actions (**Error! Reference source not found.**); and
- Decommissioning phase management actions (**Table 4-**);

The proponent should assess these commitments in detail and should acknowledge their commitment to the specific management actions detailed in the tables below.

3.1 ASSUMPTIONS AND LIMITATIONS

This EMP has been updated with the acknowledgment of the following assumptions and limitations:

- This EMP has been updated based on the scoping-level Environmental Assessment (EA) conducted for the construction of the 5 MW solar photovoltaic plant as outlined in the initial of the Environmental Scoping Report. HEEC will not be held responsible for the potential consequences that may result from any alterations to the above mentioned layout.
- It is assumed that manual operators & labourers will be sourced mostly from the Engoyi village in the Okatope constituency area and that migrant labourers (if applicable) will be housed in established accommodation facilities within Okatope.

3.2 APPLICABLE LEGISLATION

Legal provisions that have relevance to various aspects of these developments are listed in **Table 3: Legal provisions relevant to the proposed development below**. The legal instrument, applicable corresponding provisions and project relevance details are provided.

Table 3: Legal provisions relevant to the proposed development

| LEGISLATION/POLICIES | RELEVANT PROVISIONS | RELEVANCE TO PROJECT |
|--|--|--|
| The Constitution of the Republic of Namibia as Amended | Article 91 (c) provides for duty to guard against “the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia.” Article 95(l) deals with the “maintenance of ecosystems, essential ecological processes and biological diversity” and sustainable use of the country’s natural resources. | Sustainable development should be at the forefront of the operation of this 5 MW solar PV Power plant. |

| LEGISLATION/POLICIES | RELEVANT PROVISIONS | RELEVANCE TO PROJECT |
|---|--|--|
| Environmental Management Act No. 7 of 2007 (EMA) | Section 2 outlines the objective of the Act and the means to achieve that. Section 3 details the principle of Environmental Management | The operation of this 5 MW solar PV Power plant should be informed by the EMA. |
| EIA Regulations GN 28, 29, and 30 of EMA (2012) | GN 29 Identifies and lists certain activities that cannot be undertaken without an environmental clearance certificate. GN 30 provides the regulations governing the environmental assessment (EA) process. | Activity 1 (Energy Generation, Transmission and Storage Activities) The construction of facilities for : a) The generation of electricity; b) The transmission and supply of electricity; The ongoing project includes the production of electricity for commercial purposes. |
| Convention on Biological Diversity (1992) | Article 1 lists the conservation of biological diversity amongst the objectives of the convention. | The project should consider the impact it will have on the biodiversity of the area. |
| Draft Procedures and Guidelines for conducting EIAs and compiling EMPs (2008) | Part 1, Stage 8 of the guidelines states that if a proposal is likely to affect people, certain guidelines should be considered by the proponent in the scoping process. | The EA process should incorporate the aspects outlined in the guidelines. |
| Namibia Vision 2030 | Vision 2030 states that the solitude, silence and natural beauty that many areas in Namibia provide are becoming sought after commodities and must be regarded as valuable natural assets. | Care should be taken that the operation of this 5 MW solar PV Power plant does not lead to the degradation of the natural beauty of the area. |
| Water Act No. 54 of 1956 | Section 23(1) deals with the prohibition of pollution of underground and surface water bodies. | The pollution of water resources should be avoided during the operation of this 5 MW solar PV Power plant. |
| The Ministry of Environment, Forestry and Tourism (MEFT) Policy on HIV & AIDS | MEFT has recently developed a policy on HIV and AIDS. In addition it has also initiated a programme aimed at mainstreaming HIV and gender issues into environmental impact assessments. | The proponent and its contractor have to adhere to the guidelines provided to manage the aspects of HIV/AIDS. Experience with construction projects has shown that a significant risk is created when construction workers interact with local communities. |

| LEGISLATION/POLICIES | RELEVANT PROVISIONS | RELEVANCE TO PROJECT |
|--------------------------------------|--|---|
| Local Authorities Act No. 23 of 1992 | The Local Authorities Act prescribes the manner in which a town or municipality should be managed by the Town or Municipal Council. | The operation of this 5 MW solar PV Power plant has to comply with provisions of the Local Authorities Act |
| Communal Land Reform Act 5 of 2002 | To provide for the allocation of rights in respect of communal land; to establish Communal Land Boards; to provide for the powers of Chiefs and Traditional Authorities and boards in relation to communal land; and to make provision for incidental matters. | The Traditional Authorities have given their consent for this project to be undertaken. |
| Labour Act no 11 of 2007 | <ul style="list-style-type: none"> • Chapter 2 details the fundamental rights and protections. • Chapter 3 deals with the basic conditions of employment. | Given the employment opportunities presented by the operation of this 5 MW solar PV Power plant, compliance with the labour law is essential. |
| | Occupational Health and Safety Regulations | <p>Construction safety is regulated under the Health and Safety Regulations under the Labour Act. The health and safety framework in Namibia regulates the following aspects:</p> <ul style="list-style-type: none"> • Construction safety; • Electrical safety; • Machinery safety; • Hazardous substances; • Physical hazards and general provisions; • Medical examinations and emergency arrangements; • Rights and duties of employees. |
| National Heritage Act No. 27 of 2004 | The Act is aimed at protecting, conserving and registering places and objects of heritage significance. | All protected heritage resources (e.g. human remains etc.) discovered, need to be reported immediately to the National Heritage Council of Namibia (NHCN) and require a permit from the NHCN before they may be relocated |

| LEGISLATION/POLICIES | RELEVANT PROVISIONS | RELEVANCE TO PROJECT |
|---|--|---|
| Roads Ordinance 17 of 1972 | <ul style="list-style-type: none"> • Section 3.1 deals with width of proclaimed roads and road reserve boundaries • Section 27.1 is concerned with the control of traffic on urban trunk and main roads • Section 36.1 regulates rails, tracks, bridges, wires, cables, subways or culverts across or under proclaimed roads • Section 37.1 deals with Infringements and obstructions on and interference with proclaimed roads. | Adhere to all applicable provisions of the Roads Ordinance. |
| Public and Environmental Health Act of 2015 | This Act (GG 5740) provides a framework for a structured uniform public and environmental health system in Namibia. It covers notification, prevention and control of diseases and sexually-transmitted infections; maternal, ante-natal and neo-natal care; water and food supplies; infant nutrition; waste management; health nuisances; public and environmental health planning and reporting. It repeals the Public Health Act 36 of 1919 (SA GG 979). | Contractors and users of the operational 5 MW solar PV Power plant are to comply with these legal requirements. |
| Nature Conservation Ordinance no 4 of 1975 | Chapter 6 provides for legislation regarding the protection of indigenous plants | Indigenous and protected plants have to be managed within the legal confines. |
| Water Quality Guidelines for Drinking Water and Waste Water Treatment | Details specific quantities in terms of water quality determinants, which waste water should be treated to before being discharged into the environment (see Appendix B). | These guidelines are to be applied when dealing with water and waste treatment |

| LEGISLATION/POLICIES | RELEVANT PROVISIONS | RELEVANCE TO PROJECT |
|--|--|--|
| Petroleum Products and Energy Act, 1990 (Act No. 13 of 1990)) | The Act makes provision for impact assessment for new proposed fuel facilities and petroleum products known to have detrimental effects on the environment. | The project involves the use and management of fuel facilities and petroleum products. |
| Pollution Control and Waste Management Bill | This Bill serves to regulate and prevent the discharge of pollutants to air and water as well as providing for general waste management. The Bill will repeal the Atmospheric Pollution Prevention Ordinance (11 of 1976) (below) when it comes into force. | The operation of this 5 MW solar PV Power plant would not entail the discharge to air and or water, but might result in the generation of noise and dust during the construction phase. The potential risk of hazardous substance leakages does occur and should be manage accordingly. |
| Atmospheric Pollution Prevention Ordinance (Act No.11 of 1976) | This Ordinance serves to control air pollution from point sources, but it does not consider ambient air quality. Any person carrying out a 'scheduled process' which are processes resulting in noxious or offensive gases typically pertaining to point source emissions have to obtain a registration certificate from the Department of Health. | Although we do not anticipate the development to generate noxious or offensive gasses, the proponent will ensure that a registration certificate (air pollution permit) is obtained, if required. As duty of care, the proponent should implement the necessary mitigation measures set out in in order to limit emissions to air in the form of dust during operation of this 5 MW solar PV Power plant. Emissions could occur during the event of a fire or explosion and then risk mitigation and management measures should be in place. |

Table 2: Permit / authorisation requirements for the operational Tandii Investment (Pty) LTD 5MW Solar PV Power Plant, in Engoyi village, Okatope.

| ACTIVITY | APPLICABLE LEGISLATION | PERMITTING AUTHORITY | CURRENT STATUS |
|--|---|--|--|
| Generation Licence (GL) | Electricity Act 2007 (Act No. 4 of 2007) | Electricity Control Board through approval by MME Ministry of Mines and Energy (MME) | GL issued and valid for twenty-five (25) years |
| Environmental Clearance Certificate (ECC) | Management Act, 2007, (Act No. 7 of 2007) | Ministry of Environment, Forestry and Tourism (MEFT) | ECC issued in April 2016 and valid for three (3) years. Current ECC expired and hence the preparation of this Updated EMP to support the renewal |
| Land Rights covering the operational Solar Power plant Area | None | Private Land | Lease Agreement in place |
| Construction, alteration of water works with capacity to hold in excess of 20, 000 L | Water Resources Management Act, 2004 (No. 284 of 2004). | Ministry of Agriculture, Water and Land Reform | No Permits Required |
| Abstraction of water other than that provided by NamWater. | | | |
| Discharge of effluents or construction of effluent facility | | | |
| Protection of archaeological and heritage resources | National Heritage Act (27 of 2004) | National Heritage Council | No known archaeological, cultural, historical, scientific and social significance resources onsite |
| Removal, disturbances or destruction of bird eggs. | Nature Conservation Ordinance 4, 1975. | Ministry of Environment, Forestry & Tourism (MEFT) | No removals |
| Removal, disturbance of protected Parks. | | | |
| Removal, destruction of indigenous trees, bushes or Parks within 100 yards of stream or watercourse. | Forestry Act, 12 of 2001. | Ministry of Water Affairs and Land Reform (MWA&LR) | |
| Scheduled processes in controlled area. | Atmospheric Pollution Prevention Ordinance 11 of 1976 | Ministry of Health & Social Services. | No Permits Required |
| Discarding or disposing of used oil. | Petroleum (Exploration and Production) Act 1991 (Act 2 of 1991) | Ministry of Mines and Energy (MME). | Not required |
| Operating a petroleum consumer installation. | Regulation 16 (2001) Petroleum Regulations. | | |

4 UPDATED OPERATIONAL ENVIRONMENTAL MANAGEMENT PLAN

4.1 Introduction

The following is the summary of the key activities associated with the operational and decommissioning stages of the now operational Tandii Investment (Pty) LTD 5MW Solar PV Power plant at Engoyi village in Okatope that have been considered in the impact assessment as potential sources of impacts:

Since the preconstruction and construction phases have been completed the updated EMP will be focused on the two phases namely:

1. Operational and environmental auditing;
2. Decommissioning and restoration.

Unless otherwise stated, all potential impacts will remain valid for the 25-year lifespan of the operational Okatope 5MW Solar PV Power Plant, however some impacts are specific to certain phases during project implementation. Impact factors (activities) identified at each of these phases of the solar power plant (operational and restoration) have been summarized below:

- ✓ Existing access road maintenance;
- ✓ Overhead cable - A single 66 kV power line servitude linking the proposed PV solar power plant to the Okatope substation and running next to the existing infrastructure;
- ✓ Underground cable trenching;
- ✓ Site clearing and preparation ;
- ✓ Secured fencing;
- ✓ Structure mounting;
- ✓ Module clamping
- ✓ DC wiring and electrical equipment maintenance;
- ✓ AC electrical works;
- ✓ Installation of Communication Monitoring;
- ✓ Testing;
- ✓ Commissioning;
- ✓ PV Solar Energy Generation and Maintenance (for 25 Years); Decommissioning (After 25 Years) / Upgrade of Facility.

The environmental site evaluation include land use/disturbance impacts; dust; impacts to flora and fauna; visual impacts; cultural; hazardous material impacts; noise; health and safety and socioeconomic impacts.

4.2 Impact Assessment

To ensure uniformity in the evaluation of environmental impacts associated with activities of Tandii Investment (Pty) Ltd, the rating criteria for the impact assessment have been standardised to include set definitions applied in the risk assessment (Table 7).

Table 3: The criteria used to determine the significance rating of the impact(s)

| Rating | Definition of rating |
|------------------------|--|
| Status (+ or -) | What causes the effect, what will be affected and how it will be affected |
| <i>Positive:</i> | Environment overall will benefit from the impact |
| <i>Negative:</i> | Environment overall will be adversely affected by the impact |
| <i>Neutral:</i> | Environment overall will not be affected |
| Extent | The area over which the impact will be experienced |
| | 1-Site specific: Confined to the immediate vicinity of the project 2-Local: Impact extends to the site and its surroundings limited to within 15 km of the project area 3-Regional: Confined to the region 4-National: limited to within the borders of Namibia 5-International: Beyond the borders of Namibia |
| Duration: | The time frame for which the impact will be experienced |
| | 1-Very short (Up to 2 years) 2-Short-term (2 to 5 years) 3-Medium-term (5 to 15 years) 4-Long-term (> 15 years) 5-Permanent (Generations) |
| Intensity: | The magnitude of the impact |
| | 1-No lasting effect (No environmental functions and processes are affected) 2-Minor effects (The environment functions, but in a modified manner) 3-Moderate effects (Environmental functions and processes continue albeit in a modified way that does appear to have a noticeable disruptive effect) 4-High effects (Environmental functions and processes are altered to such extent that they temporarily cease resulting in severe deterioration of the impacted environment) 5-Serious effects (where environmental functions and processes are altered such that they permanently cease and/or exceed legal standards/requirements) |

| | |
|-------------------------|--|
| Significance | |
| | <p>Insignificant: (A concern or potential impact that, upon evaluation, is found to have no significant impact at all.)</p> <p>Minor: (Any magnitude, impacts will be localised and temporary. Accordingly the impact is not expected to require amendment to the project design.)</p> <p>Moderate:(Impacts of moderate magnitude locally to regionally in the short term. Accordingly the impact is expected to require modification of the project design or alternative mitigation.)</p> <p>High:(Impacts of high magnitude locally and in the long term and/or regionally and beyond. Accordingly the impact could have a 'no go zone' implication for the project unless mitigation or re-design is practically achievable.) Mitigation</p> |
| Confidence Level | The degree of confidence in the predictions, based on the availability of information and specialist knowledge |
| | <p>Low:(Assessment based on extrapolated data)</p> <p>Medium:(Information base available but lacking)</p> <p>High:(Information base comparatively reliable)</p> |

4.2.1 Summary Review of Key Issues and Significant Impact

The following is the summary of the key issues that have been considered in the EIA processes with respect to the likely impacts (without mitigations) that the Tandii Investment (Pty) LTD 5MW Solar PV Power plant at Engoyi village in Okatope activities will have on the receiving environment during the operation and decommissioning stages:

- Landscape and Visual Change (Impact: *Localised low*, Significant: *Negligible*);
- Light Reflection (Impact: *Very low*, Significant: *Negligible*);
- Ground Conditions Contamination (Impact: *Localised low*, Significant: *Negligible*);
- Noise and Vibration (Impact: *Localised low*, Significant: *Negligible*);
- Air Quality (Impact: *Localised low*, Significant: *Negligible*);
- Cultural and Paleontological Resources (Impact: *Very low*, Significant: *Negligible*);
- Socioeconomic (Impact: *High*, Significant: *High*);
- Electrical Safety (Impact: *Localised low*, Significant: *Negligible*);

- Occupational Health and Safety (Impact: Localised low, Significant: Negligible);
- Public Access (Impact: Localised low, Significant: Negligible);
- Waste Management (Impact: Localised low, Significant: Negligible) during the preconstruction, constructions and operational stage and (Impact: Localised low, Significant:medium) during the decommissioning stage.

Table 4: Dust impact and mitigation

| | | |
|--------------------|----------------------|---|
| Dust Impact | Nature of the impact | Prospecting work on site is likely to create very little dust. This may be an unwanted change to the community of the area. |
| | Status | Negative |
| | Extent | Site Specific and possibly local depending on mobility of particles and prevailing weather conditions. |
| | Duration | Short term |
| | Intensity | Minor |
| | Prevention | Dust creation cannot be completely prevented. |
| | Significance | Minor. Natural weather conditions can create very dusty atmospheric conditions. The small scale and site specific activities contribute very little to the widespread conditions. Little or no additional atmospheric dust is expected from this activity. |
| | Mitigation | Dust suppression techniques should be employed if the specific activity is likely to create dusty atmospheric conditions in excess of the periodic extremes. Avoid activities that create excessive dust on extremely windy days. Personnel are required to wear personal protection equipment (PPE) such as dust masks if excessive dust is created for prolonged working periods. Using water to suppress dust is not an option since the country is experiencing a severe drought. |
| | Confidence level | High |

Table 5: Noise impact and mitigation

| | | |
|--------------|--------------------|---|
| Noise Impact | Impact Description | Potential noise sources originate from vehicles, working machinery, replacement of PV arrays and various project components. The nuisance factor of these noise sources will depend on the proximity of the activities to the nearby homesteads and the national road/railway. |
| | Status | Negative |
| | Extent | Site Specific |
| | Duration | Short term |
| | Intensity | Minor during the scheduled maintenance period (adhoc) |
| | Prevention | Noise creation cannot be completely prevented |
| | Significance | Minor |
| | Mitigation | The activities are to take place during normal working (daylight) hours only. It is recommended that any complaints regarding noise be recorded in the reports. There are industry standards to which the noise sources (i.e. machinery) must comply. Protective gear such as ear muffers should be provided to employees. |
| | Confidence level | High |

Table 6: Light reflection and visual impact and mitigation

| | | |
|---------------|----------------------|---|
| Visual Impact | Nature of the Impact | Temporary impact on the landscape and visual quality of the site would be created during the project activities. Given the height of the PV arrays not exceeding 3-4m and the low-lying of the PV Plant, the Project is only visible within the immediate vicinity and up to some kilometres around the Project site only, and thus is likely to create visual impacts. |
| | Status | Negative |
| | Extent | Local |
| | Duration | Long-term. Due to the created visual environment. |
| | Intensity | Moderate |
| | Prevention | Cannot be completely prevented |
| | Significance | Minor. No key sensitive visual receptors within the surrounding vicinity of the project site. |
| | Mitigation | Removal of all waste on a daily basis and dispose of it in the appropriate manner. Maintenance machinery, equipment and vehicles not currently in use should always be removed in a timely manner. |
| | Confidence level | High |

Table 7: Health and safety and mitigation

| | | |
|----------------------------|--------------------|--|
| Health & safety | Impact Description | The potential impacts on human health and safety resulting from project activities include occupational accidents and injuries, vehicle accidents, exposure to weather extremes, adverse health effects from dust generation and emissions, contact with hazardous materials and electrocution. |
| | Status | Negative |
| | Extent | Site specific |
| | Duration | Very short to long term |
| | Intensity | Minor to Serious Effects |
| | Prevention | Adequate measures must be enforced to ensure health and safety of staff on site etc. Personal Protective Equipment (PPE). |
| | Significance | Minor |
| | Mitigation | Procedures for dealing with injuries or accidents must be enforced and all contact details for emergency personnel available and known to all staff. There is a compulsory safety induction programme for all employees in place and rigorous awareness campaign to the community (restricted site access) so that they avoid live wires or hard hat areas to avoid injury or death. |
| Confidence level | High | |

Table 8: Solid and hazardous waste impact and mitigation

| | | |
|---|----------------------|--|
| Solid and Hazardous Waste Impact | Nature of the Impact | Potential impacts from improper housekeeping practices during operation & maintenance (such as illegal disposal of waste to land) could contaminate and pollute soil which in turn could pollute groundwater resources. Solid (lumber, steel scrap, plastics, general rubbish, domestic waste etc) and Hazardous (used oil, paint cans etc.) waste will be generated during the operation and maintenance. |
| | Status | Negative |
| | Extent | Site specific |
| | Duration | Long term |
| | Intensity | Medium |
| | Prevention | Implementation of general best practice housekeeping measures |
| | Significance | Minor (waste is controlled through the implementation of best practice housekeeping measures). |
| | Mitigation Measures | Solid Waste Management Plan developed Collection and disposal of solid waste is done by a competent contractor to the approved landfill. Fly-dumping of any solid waste to the land is prohibited. Prohibited illegal disposal of hazardous waste |

| | | |
|--|------------------|--|
| | | Ensure that there are sufficient clearly labelled bins/containers in designated areas for waste with sorting of recyclables, organics and plastic wastes. Avoid or minimize the generation of waste materials, as far as practicable; |
| | Confidence level | High |

Table 9: Ecological and biodiversity impact and mitigation

| | | |
|------------------------------------|--------------------|---|
| Ecological and biodiversity Impact | Impact Description | Site preparation activities which are to take place onsite by the Tandii Investment (Pty) Ltd Contractor for installation of PV arrays and the various Project components which include land clearing activities, levelling, grading, etc. will cause direct and indirect disturbance to the flora and fauna within the site and the loss of the existing habitat. |
| | Status | Negative |
| | Extent | Local |
| | Duration | Long term (resulting in permanent change in the natural biodiversity on site) |
| | Intensity | Medium (Given that the change in the natural ecology will be noticeable) |
| | Prevention | None |
| | Significance | Moderate |
| | Mitigation | Avoid unnecessary clearing of vegetation. A fauna and flora survey was conducted to identify the presence of any key flora and fauna species of importance onsite and along the overhead transmission line route. A replacement programme should be constantly undertaken by the proponent by planting indigenous trees at suitable places. The lay down areas are within the site boundary, not affecting adjacent land uses. |
| Confidence level | High | |

Table 10: Socioeconomic impact and mitigation

| | | |
|--|--------------------|--|
| | Impact Description | Impacts relating to the welfare, health and safety of the local communities may arise as a result of traffic, noise, air quality, pollution issues, etc. The leasing of land for the project has |
|--|--------------------|--|

| | | |
|-----------------------|------------------|--|
| Socio-Economic Impact | | resulted in the availability of financial resources to the local community. |
| | Status | Positive |
| | Extent | Local |
| | Duration | Long term |
| | Intensity | Minor |
| | Prevention | None |
| | Significance | Minor |
| | Mitigation | No strict mitigation measures have been identified. However it is critical that Tandii Investment (Pty) Ltd should timely and continuously communicate and disseminate information with the local community to alleviate potential sense of social marginalisation, drive gender quality and enhance their understanding and perception of the benefits associated with the project. |
| | Confidence level | High |

4.2.2 Recommended Mitigation Measures for the Decommissioning Phase

Even though as stipulated by the environmental legislation of Namibia that a separate EIA be carried out prior to decommissioning, it is important to take heed of the following mitigation measures which are recommended from an ecological point of view as part of the decommissioning phase after 25 years.

- Rehabilitate all areas impacted on by the infrastructure;
- Remove all maintenance waste; rip temporary tracks, if feasible, and replace the topsoil;
- Re-introduce indigenous vegetation such as *Peltophorum africanum*, *Terminalia sericea*, *Ficus sycomorus subsp. gnaphalocarpa*, *Colophospermum mopane* and *Sclerocarya birrea* as part of the rehabilitation process;
- Re-introduce agricultural activities once the vegetation has been rehabilitated and established.
- Monitor and manage invasive alien plants as well as erosion of the site after activities are completed.

4.3 OPERATION AND MAINTENANCE PHASE

The management actions included in **Table 3-3** below apply during the operation and maintenance phase of these developments.

Table 4-3: Operation and maintenance management actions

| Environmental Feature | Impact | Management Actions |
|-----------------------|--|--|
| EMP training | Lack of EMP awareness and the implications thereof | All contractors appointed for maintenance work on the respective services infrastructure must ensure that all personnel are aware of necessary health, safety and environmental considerations applicable to their respective work. |
| Monitoring | EMP non-compliance | The ECO should monitor the implementation of the EMP: <ul style="list-style-type: none"> • The ECO should inspect the site before construction starts; and • The ECO should inspect the site at the end of the construction period. |
| Water | Surface and groundwater contamination | <ul style="list-style-type: none"> • Ensure that all properties are connected to a professionally designed and constructed water and wastewater infrastructure. • A no-go buffer area of at least 15 m should be allocated to any water bodies in the area. • No dumping of waste products of any kind in or in close proximity to any surface water bodies. • Contaminated runoff from the various operational activities should be prevented from entering any surface or ground water bodies. • Ensure that surface water accumulating on-site are channeled and captured through a proper storm water management system to be treated in an appropriate manner before disposal into the environment. • Disposal of waste from the various activities should be properly managed. |
| Aesthetics | Visual impacts | The proponent should consult with a view to incorporate the relevant local/national/international development guidelines which addresses the following: <ul style="list-style-type: none"> • The use of 'green' technologies within the architectural designs and building materials of the development. • The incorporation of indigenous vegetation, natural colours and building materials such as wood and stone into property development. |
| Energy efficiency | Waste of scarce resources | The proponent should consult, with the view to incorporate the relevant local/national/international development guidelines which addresses the following: <ul style="list-style-type: none"> • The use of solar geysers and solar panels for the general lighting and heating of water for buildings. |

| Environmental Feature | Impact | Management Actions |
|-----------------------|-----------------------|--|
| | | <ul style="list-style-type: none"> • Use of designs and building materials, which reduce dependency on artificial heating and cooling. • The incorporation of water saving initiatives within the development's design and plans in order to reduce water demands. |
| Noise | Noise nuisance impact | The proponent should consult with the view to incorporate the relevant local/national/international guidelines to manage the generation of noise in the development area. |
| Waste management | | <ul style="list-style-type: none"> • Sufficient waste storage containers are available on site. • Waste should be removed from new properties on a regular basis by an authorised waste management company. • All waste should be disposed of at a municipal approved waste disposal site. • Hazardous waste is separated from non-hazardous waste. • Hazardous waste should be disposed of at a registered hazardous waste disposal site. |
| Hazardous Substances | | <ul style="list-style-type: none"> • Storage of the hazardous substances in a bunded area, with a volume of 120 % of the largest single storage container or 25 % of the total storage containers whichever is greater. • Refuel vehicles in designated areas that have a protective surface covering and utilise drip trays for stationary plant. • All fuel storage and handling facilities in Namibia must also comply with strict safety distances as prescribed by SANS 10089. SANS 10089 is adopted by the Ministry of Mines and Energy as the national standard. • All staff be trained with regards to the proper handling of these substances as well as First Aid in the case of spillage or intoxication. • Storage areas for all substances should be bunded and capable to hold 120% of the total volume of a given substance stored on site • Underground fuel tankers should be stored in proper containers and include appropriate risk control measures in the case of leakages or pollution. • Specific safety features and protocols should be implemented in the case of a fire or explosion. • Proper licensed and updated fire-fighting equipment should be installed and easily implemented. • It must further be assured that sufficient water and sand is available for fire-fighting purposes. • Regular inspections should be carried out to inspect and test fire-fighting equipment and pollution control |

| Environmental Feature | Impact | Management Actions |
|-----------------------|--------|---|
| | | materials at the Tandii Investment (Pty) LTD 5MW Solar PV Power plant at Engoyi village in Okatope. |

4.4 DECOMMISSIONING PHASE

The decommissioning of these developments is not foreseen. In the event that these developments are decommissioned the following management actions should apply.

Table 4-9: Decommissioning phase management actions

| Environmental Feature | Management Actions |
|-------------------------|--|
| Deconstruction activity | Many of the mitigation measures prescribed for construction activity for these developments (Error! Reference source not found. above) would be applicable to some of the decommissioning activities. These should be adhered to where applicable. |
| Rehabilitation | In the event that decommissioning is deemed necessary, excavations need to be rehabilitated according to the management actions laid out in Error! Reference source not found. above. |

Appendix A – Water Quality Guidelines

THE WATER ACT, 1956 (ACT 54 OF 1956) AND ITS REQUIREMENTS IN TERMS OF WATER SUPPLIES FOR DRINKING WATER AND FOR WASTE WATER TREATMENT AND DISCHARGE INTO THE ENVIRONMENT

1. INTRODUCTION

The provisions of the Water Act are intended, amongst other things, to promote the maximum beneficial use of the country's water supplies and to safeguard water supplies from avoidable pollution.

The drinking water guidelines are not standards as no publication in the Government Gazette of Namibia exists to that effect. However the Cabinet of the Transitional Government for National Unity adopted the existing South African Guidelines (461/85) and the guidelines took effect from 1 April 1988 under the signature of the then Secretary for Water Affairs.

The sections of the Water Act that relate to the discharge of industrial effluents are: - Section 21(1) which states that

- The purification of waste water shall form an integral part of water usage and
- that purified effluents shall comply with the General Standard Quality restrictions as laid out in Government Gazette R553 of 5 April 1962 and
- Section 21(2) which further stipulate that this purified effluent be returned as close as possible to the point of abstraction of the original water.

Where a local authority has undertaken the duty of disposing of all effluents from an industrial process the provisions of Section 21(1) and 21(2) apply to the local authority and not the producer of the effluents. If there is difficulty in complying with these provisions then the applicant may apply for an exemption from the conditions in terms of Section 21(5) and 22(2) of the Water Act. The Permanent Secretary after consultation with the Minister may grant the issuance of a Waste Water Discharge Permit under Sections 21(5) and 22(2) subject to such conditions as he may deem fit to impose.

After independence, the Government of the Republic of Namibia decided that for the interim the existing guidelines will continue to be valid and to remain in use until a proper study has been conducted and new standards have been formulated (Article 140 of Act 1 of 1990).



2. GUIDELINES FOR THE EVALUATION OF DRINKING-WATER QUALITY FOR HUMAN CONSUMPTION WITH REGARD TO CHEMICAL, PHYSICAL AND BACTERIOLOGICAL QUALITY

Water supplied for human consumption must comply with the officially approved guidelines for drinking-water quality. For practical reasons the approved guidelines have been divided into three basic groups of determinants, namely:

- Determinants with aesthetic / physical implications: TABLE 1.
- Inorganic determinants: TABLE 2.
- Bacteriological determinants: TABLE 3.

2.1 CLASSIFICATION OF WATER QUALITY

The concentration of and limits for the aesthetic, physical and inorganic determinants define the group into which water will be classified. See TABLES 1 and 2 for these limits. The water quality has been grouped into 4 quality classes:

- 2.1 Group A: Water with an excellent quality
- 2.2 Group B: Water with acceptable quality
- 2.3 Group C: Water with low health risk
- Group D: Water with a high health risk, or water unsuitable for human consumption.

Water should ideally be of excellent quality (Group A) or acceptable quality (Group B), however in practice many of the determinants may fall outside the limits for these groups.

If water is classified as having a low health risk (Group C), attention should be given to this problem, although the situation is often not critical as yet.

If water is classified as having a higher health risk (Group D), urgent and immediate attention should be given to this matter.

Since the limits are defined on the basis of average lifelong consumption, short-term exposure to determinants exceeding their limits is not necessarily critical, but in the case of toxic substances, such as cyanide, remedial measures should immediately be taken.

The overall quality group, into which water is classified, is determined by the determinant that complies the least with the guidelines for the quality of drinking water.

TABLE 1: DETERMINANTS WITH AESTHETIC / PHYSICAL IMPLICATIONS

| DETERMINANTS | UNITS* | LIMITS FOR GROUPS | | | |
|-------------------|---------------------------|-------------------|-----------|------------|------------|
| | | A | B | C | D** |
| Colour | mg/l Pt*** | 20 | | | |
| Conductivity | mS/m at 25 °C | 150 | 300 | 400 | 400 |
| Total hardness | mg/l CaCO ₃ | 300 | 650 | 1300 | 1300 |
| Turbidity | N.T.U**** | 1 | 5 | 10 | 10 |
| Chloride | mg/l Cl | 250 | 600 | 1200 | 1200 |
| Chlorine (free) | mg/l Cl | 0,1- 5,0 | 0,1 – 5,0 | 0,1 – 5,0 | 5,0 |
| Fluoride | mg/l F | 1,5 | 2,0 | 3,0 | 3,0 |
| Sulphate | mg/l SO ₄ | 200 | 600 | 1200 | 1200 |
| Copper | µg/l Cu | 500 | 1000 | 2000 | 2000 |
| Nitrate | mg/l N | 10 | 20 | 40 | 40 |
| Hydrogen Sulphide | µg/l H ₂ S | 100 | 300 | 600 | 600 |
| Iron | µg/l Fe | 100 | 1000 | 2000 | 2000 |
| Manganese | µg/l Mn | 50 | 1000 | 2000 | 2000 |
| Zink | mg/l Zn | 1 | 5 | 10 | 10 |
| pH***** | pH-unit | 6,0 – 9,0 | 5,5 – 9,5 | 4,0 – 11,0 | 4,0 – 11,0 |

- * In this and all following tables "l" (lower case L in ARIAL) is used to denote dm³ or litre
 2.3 All values greater than the figure indicated.
 2.2 Pt = Platinum Units
 3.0 Nephelometric Turbidity Units
 ***** The pH limits of each group exclude the limits of the previous group



TABLE 2: INORGANIC DETERMINANTS

| DETERMINANTS | UNITS | LIMITS FOR GROUPS | | | |
|----------------|------------------------|-------------------|----------------|----------------|----------------|
| | | A | B | C | D* |
| Aluminium | µg/l Al | 150 | 500 | 1000 | 1000 |
| Ammonia | mg/l N | 1 | 2 | 4 | 4 |
| Antimonia | µg/l Sb | 50 | 100 | 200 | 200 |
| Arsenic | µg/l As | 100 | 300 | 600 | 600 |
| Barium | µg/l Ba | 500 | 1000 | 2000 | 2000 |
| Beryllium | µg/l Be | 2 | 5 | 10 | 10 |
| Bismuth | µg/l Bi | 250 | 500 | 1000 | 1000 |
| Boron | µg/l B | 500 | 2000 | 4000 | 4000 |
| Bromine | µg/l Br | 1000 | 3000 | 6000 | 6000 |
| Cadmium | µg/l Cd | 10 | 20 | 40 | 40 |
| Calcium | mg/l Ca | 150 | 200 | 400 | 400 |
| Calcium | mg/l CaCO ₃ | 375 | 500 | 1000 | 1000 |
| Cerium | µg/l Ce | 1000 | 2000 | 4000 | 4000 |
| Chromium | µg/l Cr | 100 | 200 | 400 | 400 |
| Cobalt | µg/l Co | 250 | 500 | 1000 | 1000 |
| Cyanide (free) | µg/l CN | 200 | 300 | 600 | 600 |
| Gold | µg/l Au | 2 | 5 | 10 | 10 |
| Iodine | µg/l I | 500 | 1000 | 2000 | 2000 |
| Lead | µg/l Pb | 50 | 100 | 200 | 200 |
| Lithium | µg/l Li | 2500 | 5000 | 10000 | 10000 |
| Magnesium | mg/l Mg | 70 | 100 | 200 | 200 |
| Magnesium | mg/l CaCO ₃ | 290 | 420 | 840 | 840 |
| Mercury | µg/l Hg | 5 | 10 | 20 | 20 |
| Molybdenum | µg/l Mo | 50 | 100 | 200 | 200 |
| Nickel | µg/l Ni | 250 | 500 | 1000 | 1000 |
| Phosphate | mg/l P | 1 | See note below | See note below | See note below |
| Potassium | mg/l K | 200 | 400 | 800 | 800 |
| Selenium | µg/l Se | 20 | 50 | 100 | 100 |
| Silver | µg/l Ag | 20 | 50 | 100 | 100 |
| Sodium | mg/l Na | 100 | 400 | 800 | 800 |
| Tellurium | µg/l Te | 2 | 5 | 10 | 10 |
| Thallium | µg/l Tl | 5 | 10 | 20 | 20 |
| Tin | µg/l Sn | 100 | 200 | 400 | 400 |
| Titanium | µg/l Ti | 100 | 500 | 1000 | 1000 |
| Tungsten | µg/l W | 100 | 500 | 1000 | 1000 |
| Uranium | µg/l U | 1000 | 4000 | 8000 | 8000 |
| Vanadium | µg/l V | 250 | 500 | 1000 | 1000 |

All values greater than the figure indicated.

Note FOR Table 2 on phosphate: Phosphates are not toxic and essential for all life-forms. Natural water will, however, seldom contain phosphate; it is generally seen as an indicator of pollution and is usually accompanied by other pollutants. Wherever drinking water is combined with or consists wholly of reclaimed or recycled water, it may be expected to contain phosphate. The general guideline for a concentration level to be aimed at is 1 mg/l as P. But in many cases this may be difficult to achieve technically. For this reason the Department will allow a phosphate concentration level of up to 5 mg/l as P in water intended for human consumption. Please refer also to the "Note on Phosphate" under Section 3: General Standards for Waste/Effluent.

2.2 BACTERIOLOGICAL DETERMINANTS

The bacteriological quality of drinking water is also divided into four groups, namely:

- Group A: Water which is bacteriological very safe;
- Group B: Water which is bacteriological still suitable for human consumption;
- Group C: Water which is bacteriological risk for human consumption, which requires immediate action for rectification;
- Group D: Water, which is bacteriological unsuitable for human consumption.

TABLE 3: BACTERIOLOGICAL DETERMINANTS

| DETERMINANTS | LIMITS FOR GROUPS | | | |
|-----------------------------------|-------------------|------|-------|-------|
| | A** | B** | C | D* |
| Standard plate counts per 1 ml | 100 | 1000 | 10000 | 10000 |
| Total coliform counts per 100 ml | 0 | 10 | 100 | 100 |
| Faecal coliform counts per 100 ml | 0 | 5 | 50 | 50 |
| E. coli counts per 100 ml | 0 | 0 | 10 | 10 |

□ All values greater than the figure indicated.
** In 95% of the samples.

NB If the guidelines in group A are exceeded, a follow-up sample should be analysed as soon as possible.

2.3 FREQUENCY FOR BACTERIOLOGICAL ANALYSIS OF DRINKING-WATER SUPPLIES

The recommended frequency for bacteriological analysis of drinking water is given in Table 4.

TABLE 4: FREQUENCY FOR BACTERIOLOGICAL ANALYSIS

| POPULATION SERVED | MINIMUM FREQUENCY OF SAMPLING |
|-------------------|-------------------------------|
| More than 100 000 | Twice a week |
| 50 000 – 100 000 | Once a week |
| 10 000 – 50 000 | Once a month |
| Minimum analysis | Once every three months |



3 GENERAL STANDARDS FOR WASTE / EFFLUENT WATER DISCHARGE INTO THE ENVIRONMENT

All applications in terms of Section 21(5) and 22(2), for compliance with the requirements of Section 21(1) and 21(2) of the Water Act (Act 54 of 1956) that purified water shall comply with the General Standard as laid out in Government Gazette Regulation R553 of 5 April 1962.

TABLE 5 GENERAL STANDARDS FOR ARTICLE 21 PERMITS (EFFLUENTS)

| DETERMINANTS | MAXIMUM ALLOWABLE LEVELS |
|-----------------------------------|--|
| Arsenic | 0,5 mg/l as As |
| Biological Oxygen Demand (BOD) | no value given |
| Boron | 1,0 mg/l as B |
| Chemical Oxygen Demand (COD) | 75 mg / l as O |
| Chlorine, residual | 0,1 mg/l as Cl ₂ |
| Chromium, hexavalent | 50 Ng/l as Cr(VI) |
| Chromium, total | 500 Ng/l as Cr |
| Copper | 1,0 mg/l as Cu |
| Cyanide | 500 Ng/l as CN |
| Oxygen, Dissolved (DO) | at least 75% saturation** |
| Detergents, Surfactants, Tensides | 0,5 mg/l as MBAS – See also Note 2 |
| Fats, Oil & Grease (FOG) | 2,5 mg/l (Igravimetric method) |
| Fluoride | 1,0 mg/l as F |
| Free & Saline Ammonia | 10 mg/l as N |
| Lead | 1,0 mg/l as Pb |
| Oxygen, Absorbed (OA) | 10 mg / l as O* |
| pH | 5,5 – 9,5 |
| Phenolic Compounds | 100 Ng/l as phenol |
| Phosphate | 1,0 mg/l as P - See also Note 1 |
| Sodium | not more than 90 mg/l Na more than influent |
| Sulphide | 1,0 mg/l as S |
| Temperature | 35°C |
| Total Dissolved Solids (TDS) | not more than 500 mg / l more than influent |
| Total Suspended Solids (TSS) | 25 mg/l |
| Typical faecal Coli. | no typical coli should be counted per 100 ml |
| Zinc | 5,0 mg/l as Zn |

* Also known as Permanganate Value (or PV).

** In Windhoek the saturation level is at approx. 9 mg/l O₂.

Note (1) on phosphate: Phosphates are not toxic and essential for all life forms. Natural water will seldom contain phosphate; it is generally seen as an indicator of pollution and is usually accompanied by other pollutants. Wherever drinking water is combined with or consists wholly of reclaimed or recycled water, it may be expected to contain phosphate. There is no general guideline for phosphate contained in the Regulation 553. But generally it is assumed that eutrophication or algal bloom in dams is promoted by nutrient concentrations as low as 0,01 mg/l as P; generally a phosphate concentration limit for dams of 0,1 mg/l is recommended. All water that is consumed and subsequently discharged, will eventually end up in rivers, dams or

groundwater – that is why for potable water, a concentration level of 1 mg/l as P is aimed at.

But, again, in many cases of waste and effluent treatment, this may be difficult to achieve technically, or the required waste and effluent treatment infrastructure is not available; as the required infrastructure is sophisticated and expensive. The current situation calls for a compromise and for this reason, this Department will judge each application individually on its merits and allow, in certain cases, a phosphate concentration level of up to 15 mg/l as P in any effluent or waste stream to be discharged into the environment. This regulation is subject to be reviewed every two years, calculated from the date of approval of this document.

Note (2) on detergents, surfactants and ten sides: The MBAS (or methylene blue active substances) – test does not encompass all surface active compounds currently, commercially available. The limit given is therefore only a guideline. Many of the cleaning agents are toxic to biological life-forms in rivers and dams. It should be taken into consideration that some commercial products interfere with the effective removal of oil, fat and grease by grease and fat traps, by breaking up such long-chain molecules into shorter ones. These cleaning agents thus effectively allow such components to pass through the traps and land into sections of a treatment plant further down the line and interfere with the process there.

Many cleaning agents contain very powerful disinfectants, and/or biocides. Such substances may interact with biological treatment processes. They may reduce the effectiveness of such treatment or 'kill' it completely, if they land in septic tanks, biofilters or even activate-sludge plants. Their activity may be attenuated by dilution.

4. AUTHORIZATION

Herewith, the Guidelines for the Evaluation of Drinking Water for Human Consumption with regard to Chemical, Physical and Bacteriological Quality, as well as the General Standards for Article 21* Permits, amended for detergents, surfactants, ten sides, as well as phosphates, are confirmed and remain in force until further notice.

Issued under my hand with the authority vested in my office, within the Ministry for Agriculture, Water and Rural Development,

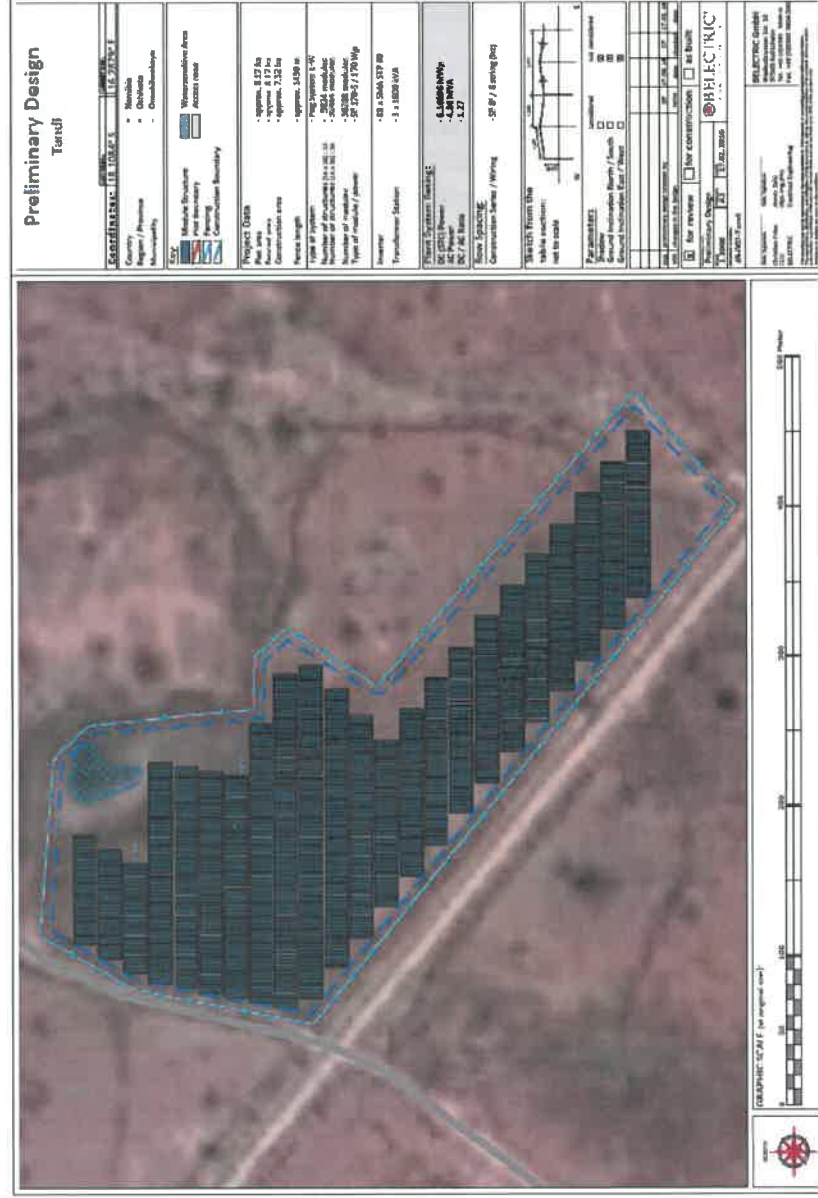
PERMANENT SECRETARY
Dr V Shivute

WINDHOEK,

DATE STAMP



Appendix B: General Site Layout Schematic



Appendix C: Site Photos

NCF Energy (Pty) LTD site for the operational 5 MW Solar Power Plant at Engoyi Village, Okatope site photos.











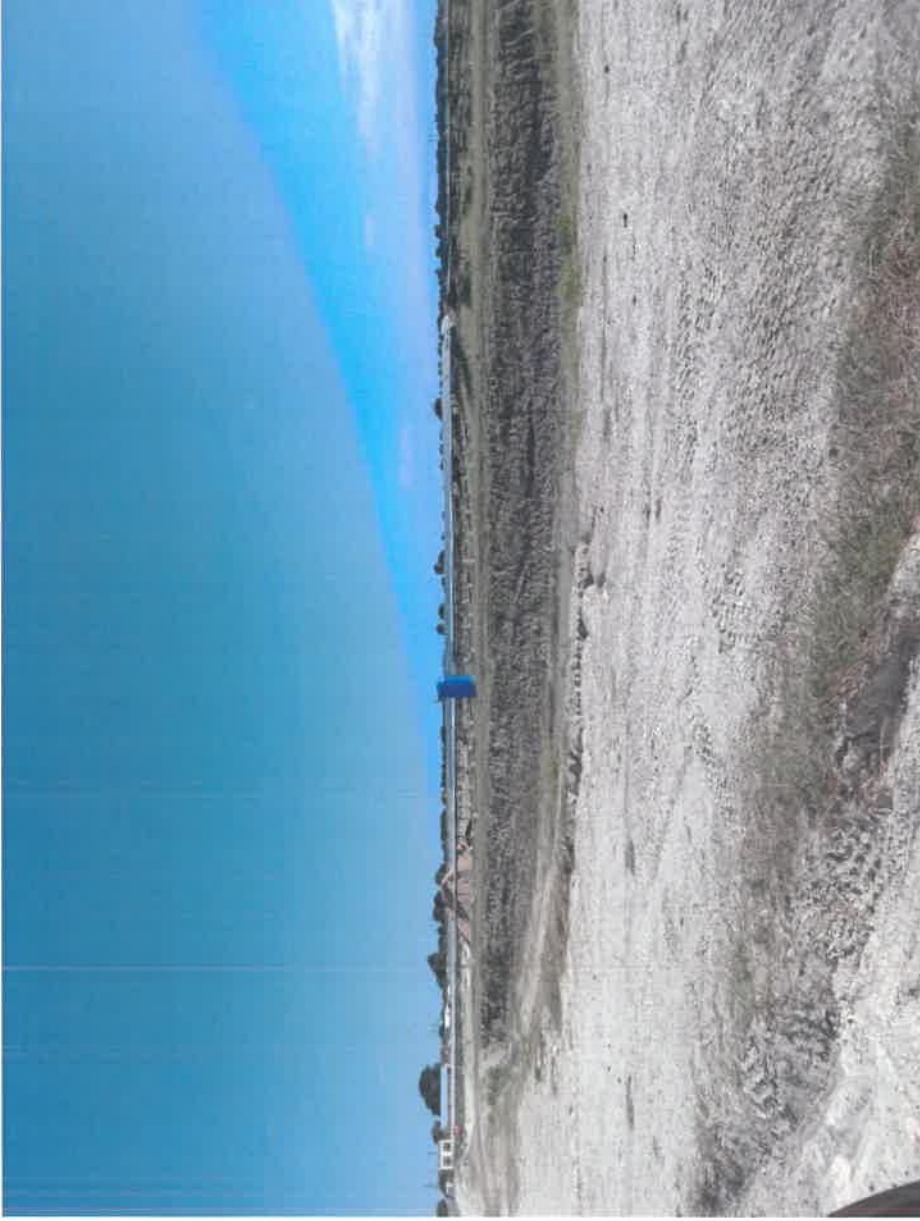














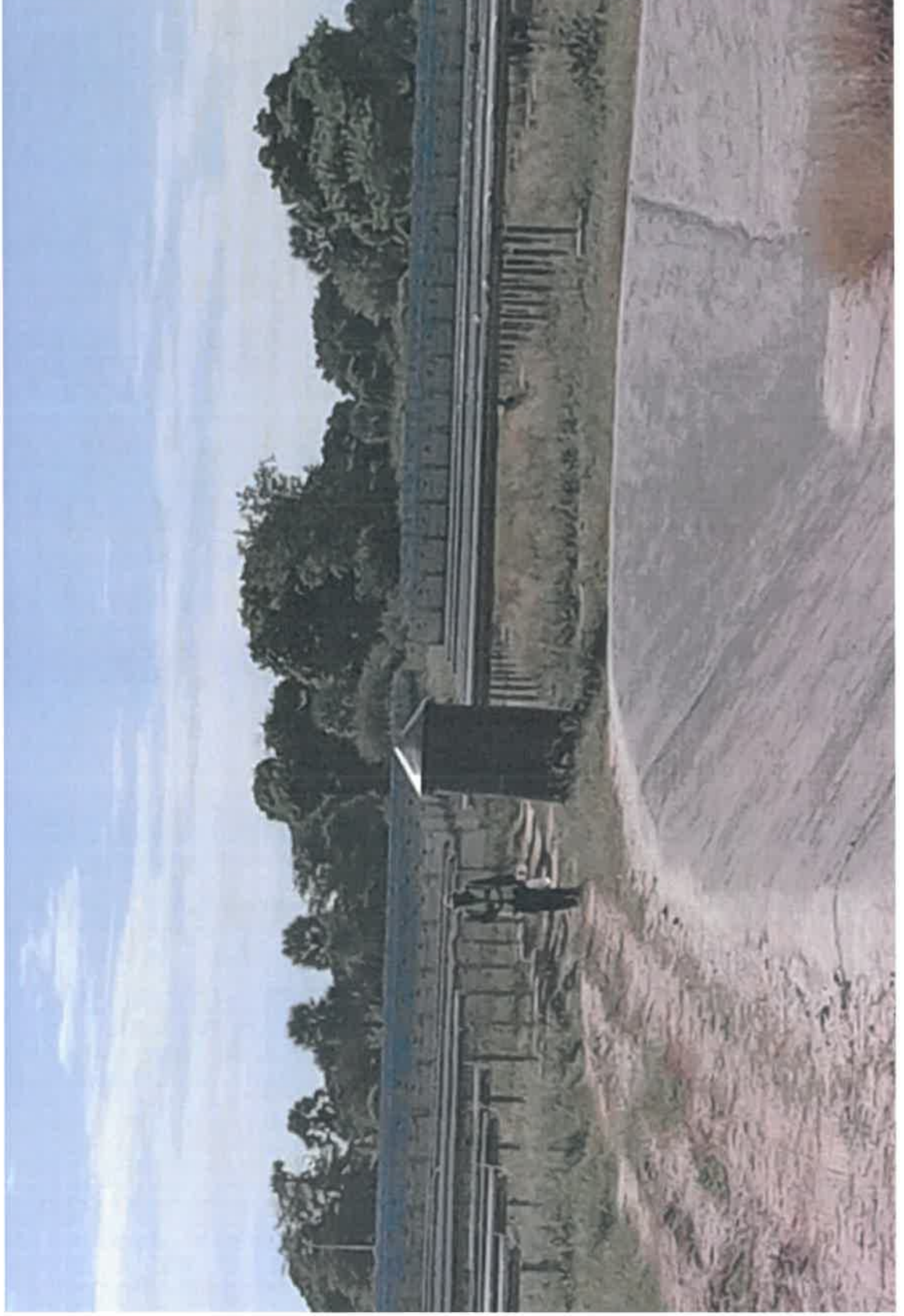


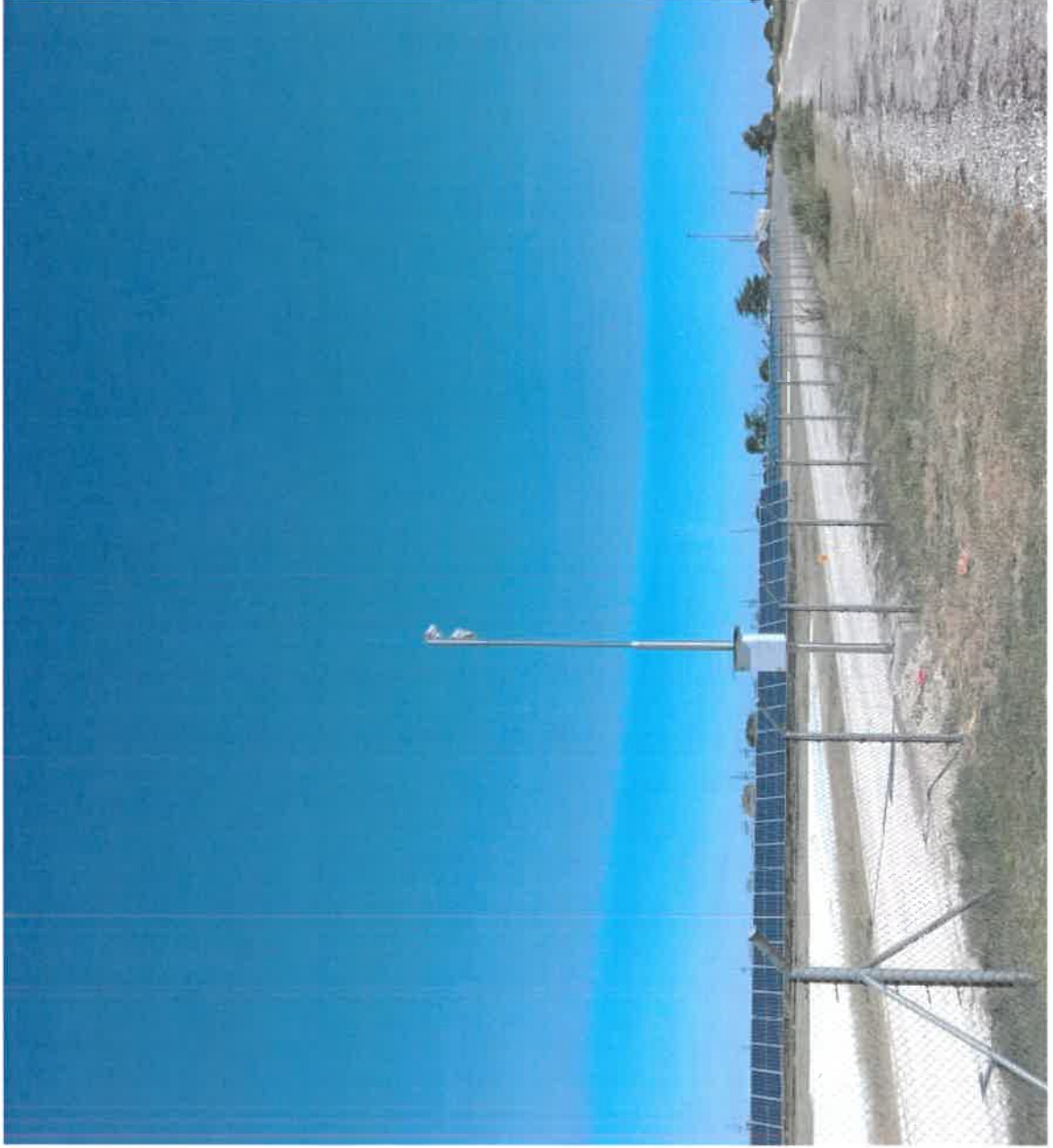








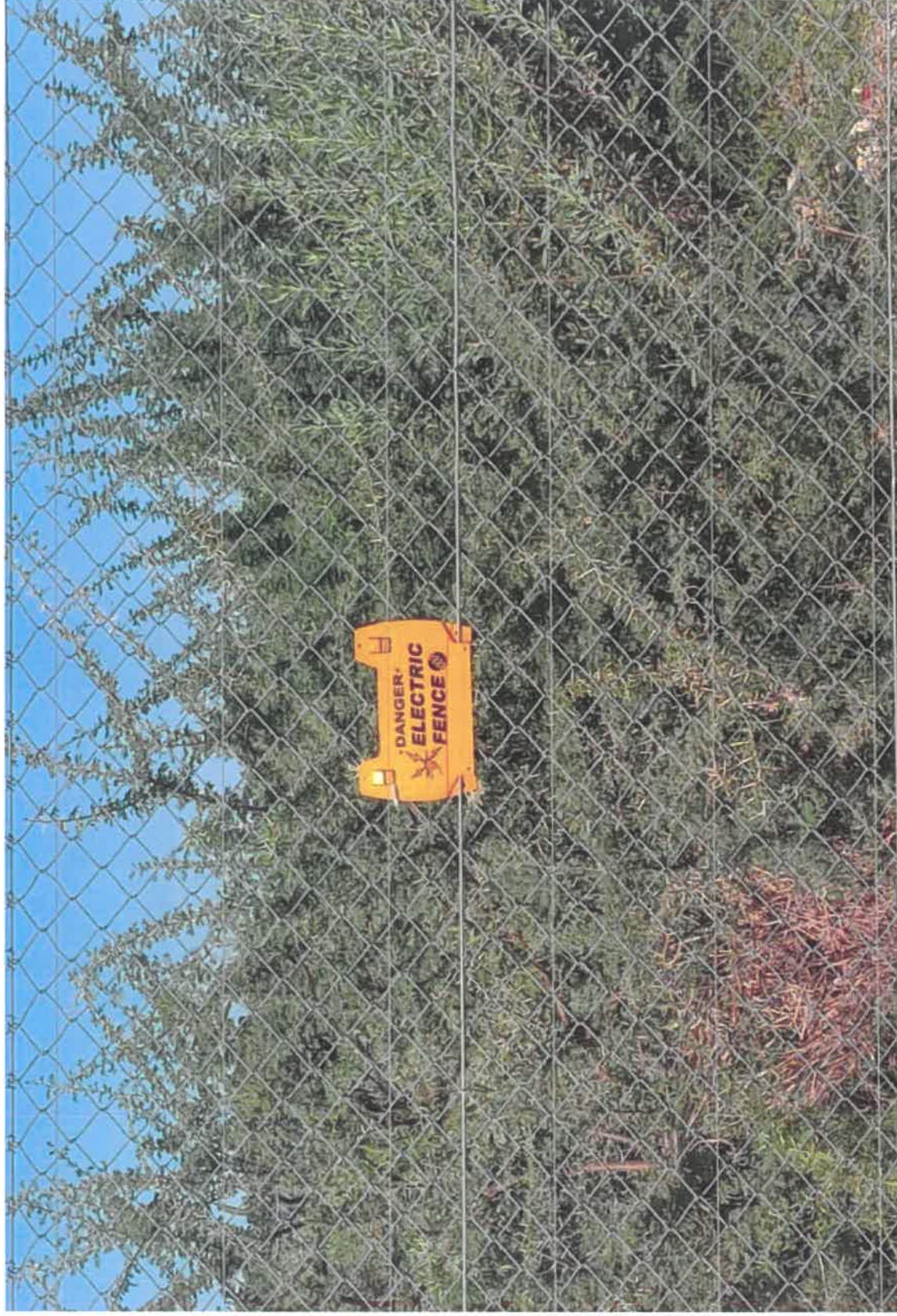


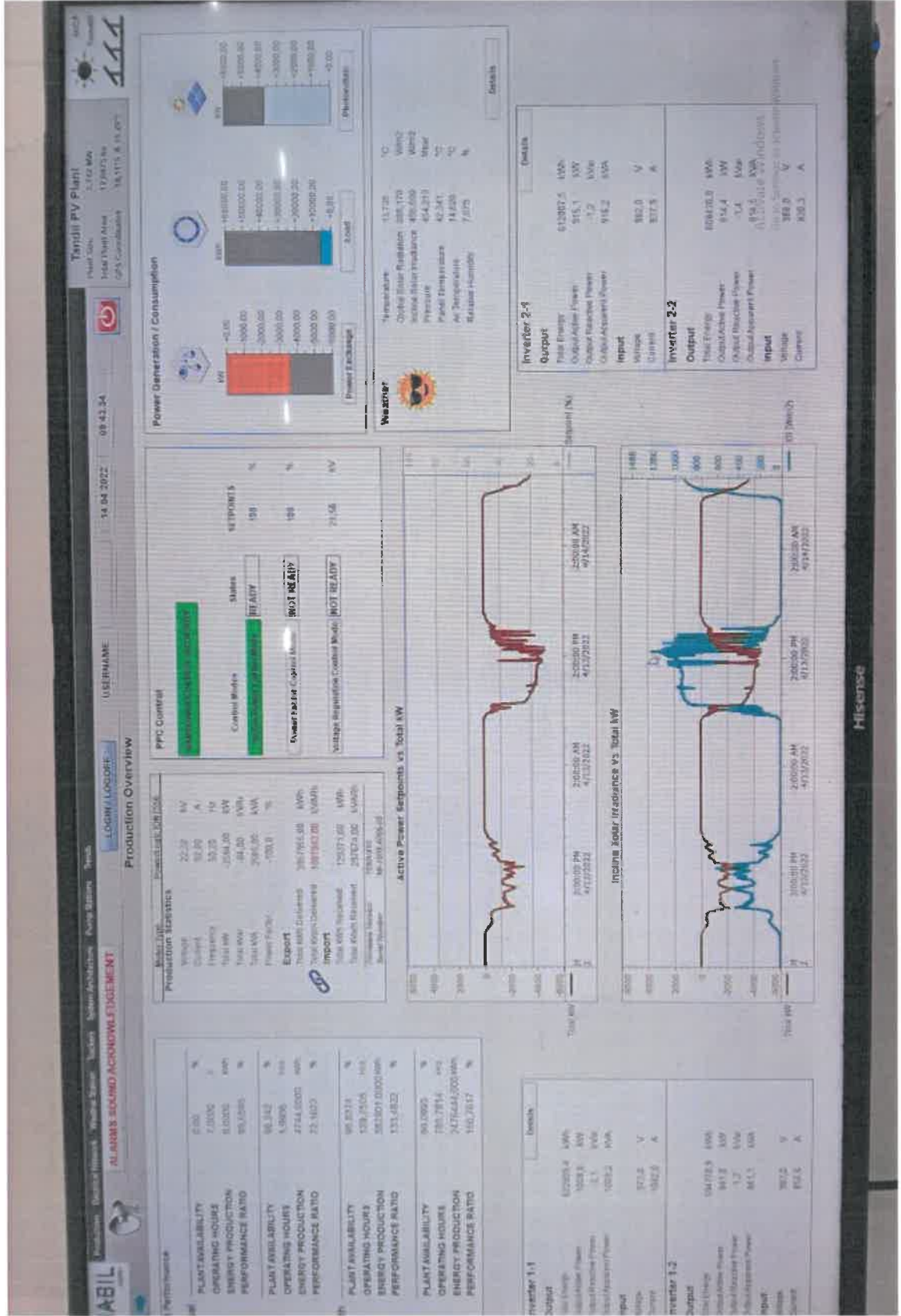
















Appendix D: Previously issued Environmental Clearance Certificate

