

# Memorandum

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**Subject: RENEWAL APPLICATION  
ARANDIS POWER'S ENVIRONMENTAL CLEARANCE  
CERTIFICATE FOR THE AMENDMENT TO THE ARANDIS POWER  
THERMAL POWER GENERATION AND WASTE OIL RECYCLING  
PLANT, ERONGO REGION**

## **ENVIRONMENTAL MANAGEMENT PLAN**

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Arandis Power was originally issued an Environmental Clearance Certificate (ECC) in 2013 for a proposed Thermal Power Generation and Waste Oil Recycling Plants. This was amended in 2014 to include a Solar PV plant. The subsequent ECC was issued on the 9<sup>th</sup> of October 2014 after the successful completion of an Environmental Impact Assessment (EIA) amendment process and the submission of an EIA amendment Report and Environmental Management Plan (EMP) to the Ministry of Environment and Tourism (MET) (now Ministry of Environment, Forestry and Tourism [MEFT]). The ECC was renewed on 18 October 2017 (after a renewal application was submitted to MET). The current ECC therefore expires on the 18<sup>th</sup> of October 2020.

Arandis Power has not commenced with the implementation (i.e. construction and related activities), as per the above mentioned EIA (amendment) Report, yet.

As part of this renewal application, MEFT (DEA) requested the submission of the original / approved Environmental Management Plan (EMP). The EMP was amended as part of an EIA amendment application process in 2014 and approved by MET.

The Amended (2014) EMP is herewith attached. This renewal application does not necessitate any further amendments to the EMP.



global environmental solutions

Arandis Power

Environmental Management Plan (EMP) for the proposed Arandis  
Hybrid Thermal/Photovoltaic Power Plant

SLR Project No.: 734.14008.00001

May 2014



Arandis Power (Pty) Ltd

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Environmental Management Plan (EMP) for the proposed Arandis  
Hybrid Thermal/Photovoltaic Power Plant  
SLR Project No.: 734.14008.00001

May 2014

Arandis Power (Pty) Ltd

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## ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE PROPOSED ARANDIS HYBRID THERMAL/PHOTOVOLTAIC POWER PLANT

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**ACRONYMS AND ABBREVIATIONS**

Below a list of acronyms and abbreviations used in this report:

<b>Acronyms / Abbreviations</b>	<b>Definition</b>
ATC	Arandis Town Council
BME	Bulk Mining Explosives
CTAN	Coastal Tourism Association of Namibia
DEA	Department Environmental Affairs
EAPAN	Environmental Assessment Professionals' Association of Namibia
EIA	Environmental Impact Assessment
EMA	Environmental Management Act, No 7 of 2007
EMP	Environmental Management Plan
HFO	Heavy Fuel Oil
IAPs	Interested and Affected Party
IFC	International Finance Corporation
IUCN	International Union of Conservation of Nature
kV	Kilovolts
kW	Kilowatt
m/s	meters per second
MAWF	Ministry of Agriculture, Water and Forestry
MET	Ministry of Environment and Tourism
MW	Megawatt
PM	Particulate matter
PM <sub>10</sub>	Particulate matter smaller than 10 micrometres
PPP	Public Participation Process
PV	Photovoltaic
SEIA	Strategic Environmental Impact Assessment
TSP	Total Suspended Particulates



## ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE PROPOSED ARANDIS HYBRID THERMAL/PHOTOVOLTAIC POWER PLANT

### 1. INTRODUCTION

Arandis Power (Pty) Ltd (Arandis Power) has an Environmental Clearance for the development of the Arandis Thermal Power Generation and Waste Oil Recycling Plants within the area allocated for noxious industry to the east of Arandis. The Environmental Clearance was issued by the Ministry of Environment and Tourism (MET) following the Environmental Impact Assessment (EIA) process that was conducted in 2012. As part of this EIA, the “Environmental Management Plan (EMP) for the Arandis Thermal Power Generation and Waste Oil Recycling Plants” (SLR, 2012) was developed and approved by MET.

The proposed power station’s nominal output capacity was assessed/approved at 120 Megawatt (MW) which would be generated by engines utilising a residual fuel known as heavy fuel oil (HFO) and recycled oil from a waste oil recycling plant, adjacent to the power plant.

The town of Arandis is located in the Erongo Region, about 60 km east of Swakopmund, off the main B2 road to Windhoek, and the national railway to Walvis Bay. The regional and local settings of the approved project are shown in Figures 1-1 and 1-2 respectively.

Since the project was conceptualised in 2007, solar (photovoltaic (PV)) power has reduced in price and has now become a feasible alternative to the waste oil generated power. Arandis Power is therefore proposing to construct and operate a ‘hybrid’ thermal/PV plant with the maximum output capacity remaining 120 MW.

The PV solar plant will have an installed capacity of up to 50.8 MWp and will be located north of the approved thermal power plant with its 8 HFO engines (refer to Figure 1-3). The combined PV/thermal plant can operate flexibly including in baseload. Whatever PV is available/required is dispatched first with the shortfall/gaps filled with thermal power. The PV is a fuel saving mechanism incorporated to reduce the cost of fuel; fuel is a significant pass-through operating cost.

Another EIA (scoping) process, which included the assessment of the hybrid thermal/PV plant, was conducted in 2014. This EMP (EMP for the proposed hybrid thermal/PV plant) takes the findings from the original EIA (2012 EIA) relating to the HFO thermal power plant, as well as the 2014 EIA into consideration.

This EMP documents a series of individual management programmes (MPs) which are designed to meet legal requirements and avoid or minimise the impacts associated with the hybrid thermal/PV plant. The management commitments from the 2012 EMP (SLR, 2012) relevant to the thermal power plant remain applicable and are included in the MPs. The 2012 EMP was therefore used as a basis for this new EMP for the hybrid thermal/ PV plant. Changes from the 2012 EMP are highlighted in **green** in this EMP.

A final decision regarding which alternative will ultimately be implemented (i.e. the already approved thermal plant utilising both HFO and waste oil from the onsite waste oil recycling plant, versus the

alternative hybrid thermal/ PV plant in which case only HFO will be used to power the thermal plant engines), still needs to be made and Arandis Power is in continuous discussions with NamPower and the National Energy Regulator in this regard.

**FIGURE 1-1: REGIONAL SETTING**

**FIGURE 1-2: LOCAL SETTING**

**FIGURE 1-3: LOCATION OF THE PROPOSED SOLAR POWER PLANT AND ARANDIS POWER SUBSTATION IN RELATION THE THE APPROVED ARANDIS THERMAL POWER GENERATION AND WASTE OIL RECYCLING PLANTS**

## 2. LEGAL FRAMEWORK

This section outlines Namibian legislation which is relevant to the Arandis Power Project. Table 2-1 provides a summary list of the relevant legislation.

**TABLE 2-1: LIST OF LEGISLATION RELEVANT TO THE ARANDIS POWER PROJECT**

YEAR	NAME
<b>Current Namibian legislation</b>	
1990	Petroleum Products and Energy Act No. 13 of 1990, as amended
1990	The Constitution of the Republic of Namibia of 1990
1992	The Labour Act, No. 6 of 1992
1992	The Regional Councils Act , No. 22 of 1992
1997	Regulations relating to the Health and Safety of Employees at Work (promulgated in terms of Section 101 of the Labour Act, No. 6 of 1992 (GN156, GG 1617 of 1 August 1997)
1998	Affirmative Action (Employment) Act No. 29 of 1998
1997	Namibian Water Corporation Act, No. 12 of 1997
1998	The Health Act No. 21 of 1998
1999	Road Traffic and Transport Act No. 22 of 1999
2000	Petroleum Products regulations
2007	Electricity Act No. 4 of 2007
2001	The Forestry Act No. 12 of 2001
2004	Water Resources Management Act, 2004
2004	National Heritage Act No. 27 of 2004
2007	Labour Act No. 11 of 2007
2007	Environmental Management Act No. 7 of 2007
2013	Water Resources Management Act 11 of 2013
<b>Former South African and South West Africa legislation still applicable in Namibia</b>	
1919	Public Health Act No. 36 of 1919
1969	Soil Conservation Act No. 76 of 1969
1974	Hazardous Substances Ordinance No. 14 of 1974
1975	Nature Conservation Ordinance No. 14 of 1975
1976	Atmospheric Pollution Prevention Ordinance No. 11 of 1976
<b>Namibian policy</b>	
1994	Policy for the Conservation of Biotic Diversity and Habitat Protection
1995	Namibia's Environmental Assessment Policy for Sustainable Development and Environmental Conservation
1998	Draft White Paper on the Energy Policy of Namibia

YEAR	NAME
2000	National Water Policy White Paper
2010	National Policy on Climate Change
<b>International law to which Namibia is a signatory</b>	
1985	Vienna Convention for the Protection of the Ozone Layer
1987	Montreal Protocol on substances that deplete the Ozone Layer
1989	The Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal
1989	The Rotterdam convention on the Prior Informed Consent Procedure for Certain Hazardous chemicals and Pesticides in International Trade
1992	The Rio de Janeiro Convention on Biological Diversity
1992	United Nations Framework Convention on Climate Change

## 2.1 PERMITS

Before the operations can commence, Arandis Power will need to acquire a number of permits and certificates as outlined in Table 2-2 below.

**TABLE 2-2: NOTIFICATION, REGISTRATION, APPROVAL AND PERMITS**

ISSUE	LEGISLATION	REQUIREMENT / PERMIT
Atmospheric pollution	<b>Atmospheric Pollution Prevention Ordinance, 1976</b>	Requires, in terms of section 5 (1), the registration of any premises authorising the holder to carry on the process in or on that premises, which results in so-called noxious or offensive gases.  It also requires a provisional registration certificate authorising the erection of any building or plant which is intended to be used for the purpose of carrying on any scheduled process.  The whole of Namibia has been declared a controlled area.  <b>Ministry of Health and Social Services / Ministry of Environment and Tourism</b>
Registration, selling, operating, installing of infrastructure related to Group I to III hazardous substances	<b>Hazardous Substances Ordinance, 1974</b> (section 5)	Licences required for the sale, use and storage of "hazardous substances", which are specified in certain groups.  <b>Ministry of Health and Social Services / Ministry of Environment and Tourism</b>

ISSUE	LEGISLATION	REQUIREMENT / PERMIT
Occupational health and safety issues, mostly compliance, some requiring permits or notification	<b>Labour Act, 2007</b>	<p>This law, under the Regulations relating to the Health and Safety of Employees at Work, 1997, stipulates various occupational health and safety requirements, some of which are compliance rather than related to prior approval, and some of which overlap or are related to environmental clearances. In this regard, we would like to refer to the following:</p> <ul style="list-style-type: none"> <li>• Registration of what is referred to as “factories”, which term is not defined. See section 19 of the Regulations.</li> <li>• Notification to the Chief Inspector (Ministry of Labour) 30 (thirty) days prior to the commencement of building or construction work. See section 20, Regulations.</li> <li>• Sections 176 to 183 of the Regulations deal, inter alia, with the transport, storage of hazardous substances. Again, this is more a compliance issue, but may be relevant from the onset.</li> <li>• Schedule 2.(2) of the Regulations contains Lead Regulations.</li> </ul>
Disturbance of archeological objects, paleontological sites or meteorites	<b>National Heritage Act, 2004</b>	Requirement to obtain consent in terms of section 55 before altering or developing any land in which an archaeological object or palaeontological site or a meteorite is believed to be located.
Protection of protected plants	<b>Nature Conservation Ordinance, 1975</b>	Section 73 of this Ordinance prohibits the picking of plants.
Consumer installation permits	<b>Petroleum Products and Energy Act, 1990</b>	<p>This law, through the Petroleum Products Regulations, 2000 (Government Notice 155 of 2000) makes provision for, inter alia, retail and wholesale licences for fuel and diesel, which must be licensed, but also for authorisations by certificate of a so-called “consumer installation”.</p> <p>A “consumer installation” means a petrol or diesel installation “for the purpose of dispensing fuel into own or hired petrol or diesel consuming equipment”.</p> <p>It is not clear whether the above also applies to sludges and HFO, “fuel” being defined as “petrol” and “diesel”, which in turn are defined with reference to their uses in spark ignition engines and compression ignition engines and their boiling temperatures.</p> <p>If these regulations are applicable, then Arandis Power</p>



ISSUE	LEGISLATION	REQUIREMENT / PERMIT
		<p>may need a consumer installation certificate in terms of section 16 of the Petroleum Products Regulations, 2000.</p> <p>This law also contains regulations regarding spillages and construction requirements (bundling walls, etc.) for storage tanks and consumer installations. (Compliance)</p>
Conveyance of so-called "dangerous goods".	<b>Road Traffic and Transport Act, 1999</b>	<p>This law, through the Road Traffic and Transport Regulations, 2001, provides for various compliance issues in relation to the conveyance of "dangerous goods".</p> <p>There are no particular permitting requirements, but more a compliance issue, since various (SABS) standards and operational requirements are set out herein.</p>
Waste water permit	<b>Water Act, 1956</b>	Permits required for the purification of waste water and discharge. See section 21 and 22

### 3. DETAILS OF PERSONS WHO PREPARED THIS EMP

SLR Environmental Consulting (Namibia) (Pty) Ltd (SLR) is the independent firm of consultants that has been appointed by Arandis Power to undertake the environmental impact assessment and related processes. The SLR team that conducted the 2014 EIA comprises Werner Petrick (Project Manager), Brandon Stobart (Project Reviewer) and Liezel Swan (Project Administration). Werner has sixteen years of relevant experience in conducting / managing EIAs, compiling EMPs and implementing EMPs and Environmental Management Systems. Brandon has 15 years of relevant experience. Both Werner and Brandon are certified as lead environmental practitioners and a reviewers under the Environmental Assessment Professionals of Namibia.

The EMP was additionally reviewed and approved by the client Senior Project Manager, Annitta Attieh.

#### 4. SCOPE OF THE ARANDIS POWER EMP

This EMP contains a series of management and mitigation plans designed to meet legal requirements and to minimise the negative impacts associated with the **hybrid thermal/PV power plant** during the construction, operational, decommissioning and closure phases.

The commitments contained in this EMP will, if an environmental clearance has been obtained for the proposed project as outlined in the EIA, be Arandis Power's overarching contractual agreement with the Namibian authorities for sound environmental management. All employees, contractors and sub-contractors and any visitors to site will be expected to comply with the commitments contained herein. **With reference to section 1, it is further dependent on which one of the two alternatives (i.e. the already approved thermal plant utilising both HFO and waste oil from the onsite waste oil recycling plant, versus the alternative hybrid thermal/ PV plant in which case only HFO will be used to power the thermal plant engines) will ultimately be implemented whether this EMP or the approved "Environmental Management Plan (EMP) for the Arandis Thermal Power Generation and Waste Oil Recycling Plants" (SLR, 2012) be implemented.**

The EMP provides an outline of the overall management objectives for the various environmental and social aspects which have been identified in the environmental impact assessment processes, followed by the detailed management and mitigation plans as well as monitoring and auditing requirements.

The table below provides a list of the main environmental and social issues identified during **the 2012 and 2014 EIA processes**. Management and mitigation plans have been developed to address these issues and are listed below. The detailed management plans are described in Section 7. The various management and mitigation measures for the proposed **hybrid thermal/PV power plant** is outlined in Table 4-1.

**TABLE 4-1: SUMMARY OF ISSUES IDENTIFIED IN THE 2012 AND 2014 EIAs WITH RELEVANT MANAGEMENT AND MITIGATION PLANS**

ENVIRONMENTAL COMPONENT	ISSUE	RELEVANT MANAGEMENT AND MITIGATION PLAN
STAKEHOLDERS	Stakeholder consultation	Stakeholder management and mitigation plan (section 7.1)
TOPOGRAPHY	Hazardous excavations and infrastructure	Safety and security management and mitigation plan (section 7.2)
SOIL AND LAND CAPABILITY	Loss of soil resources from pollution	Soil management and mitigation plan (section 7.3)
	Loss of soil resources from physical disturbance	
BIODIVERSITY – NATURAL VEGETATION AND ANIMAL LIFE	Physical destruction of biodiversity	Biodiversity management and mitigation plan (section 7.4)
	General disturbance of biodiversity	
	Interruption of drainage and inference with water flow	
SURFACE WATER	Altering drainage patterns	Surface water and stormwater

<b>ENVIRONMENTAL COMPONENT</b>	<b>ISSUE</b>	<b>RELEVANT MANAGEMENT AND MITIGATION PLAN</b>
	Pollution of surface water	management and mitigation plan (section 0)
<b>GROUNDWATER</b>	Contamination of groundwater	Groundwater management and mitigation plan (section 7.6)
<b>AIR QUALITY (INCLUDING GREENHOUSE GAS EMISSIONS)</b>	Air pollution	Air quality management and mitigation plan (section 7.7)
<b>NOISE</b>	Noise pollution	Noise management and mitigation plan (section 7.8)
<b>ARCHAEOLOGY</b>	Damage to archaeological resources and landscapes	Archaeology resources management and mitigation plan (section 7.9)
<b>VISUAL</b>	Visual impact	Visual management and mitigation plan (section 7.8)
<b>SOCIO-ECONOMIC</b>	Contribution to national, regional and local economy	Socio-economic management and mitigation plan (section 7.12)
	Employment creation and skills training	
	In-migration and community health	
	Impact on government services	
<b>TRAFFIC</b>	Impact on road infrastructure capacity	Traffic management and mitigation plan (section 7.13)
	Impact on road safety	

#### 4.1 INDUCTION AND ENVIRONMENTAL AWARENESS TRAINING

All persons who work or visit this site will be required to undergo induction. Different induction programmes will be developed for managers, employees, contractors and visitors. The environmental management and mitigation plans in section 7 highlight the areas where training is required.

#### 4.2 SOCIAL AND ENVIRONMENTAL MANAGEMENT SYSTEM

In line with the Equator Principles, Arandis Power will need to develop and implement a Social and Environmental Management System (SEMS). The specific requirements of this EMP will be incorporated into a SEMS to be developed prior to construction, in line with the requirements of the Equator Principles.

## 5. ENVIRONMENTAL OBJECTIVES

The following overall social and environmental objectives, as outlined in the 2012 EIA for the Arandis Power operations, remain applicable. These have been set and are guided by the Arandis Power Sustainability and Environmental Policies, included in Appendix A and Appendix B respectively:

- To ensure compliance with relevant national legislation and standards, Equator Principles, corporate sustainability and environmental policies and objectives as well as the EMP.
- To limit potential impacts on biodiversity through the minimisation of the footprint and the conservation of residual habitat within the operational area.
- To investigate and exploit measures to reduce resource and energy consumption.
- To limit contaminated effluent discharge into the environment through the containment, recycling or removal of contaminated water.
- To conserve soil resources by stripping, stockpiling and managing topsoil.
- To protect soils and surface and groundwater resources through the implementation of measures for spill prevention and clean-up.
- To ensure the appropriate management and disposal of general and hazardous waste, through the implementation of a strategy for the minimisation, management, temporary storage and removal of waste.
- To reduce the potential for dust emissions through the implementation of dust control measures.
- To manage stack emissions to ensure compliance with the World Health Organisation standards for NO<sub>2</sub> and SO<sub>2</sub>.
- To reduce the potential for noise disturbance in surrounding areas.
- To protect archaeological resources by avoiding sites of significance, or, if this cannot be done, to ensure thorough documentation and authorisation thereof prior to destruction.
- To undertake rehabilitation wherever possible during the life of the operations.
- To incorporate final closure objectives in construction and project planning.
- To develop, implement and manage environmental monitoring systems for ground and surface water, soils, air quality, biodiversity and noise.
- To support and encourage environmental awareness and responsibility amongst all employees and service providers.
- To provide appropriate environmental education and training for all employees and service providers.
- To keep surrounding communities informed of project activities through the implementation of forums for communication and constructive dialogue.
- To ensure the safety of surrounding communities through access and traffic control.

## 6. PROJECT OVERVIEW

### 6.1 CONSTRUCTION PHASE

The purpose of the construction phase is primarily to establish the infrastructure and activities required for the operational phase. A number of contractor working areas will be established on site during the construction phase. These work areas associated with the thermal power plant will be within the footprint of the planned operational infrastructure. A new laydown area will be established for the PV plant, as indicated in Figure 6-1. A summary of the construction phase infrastructure, services and activities is provided in Table 6-1.

Subject to authorisation, the construction phase will commence from the date of placement of order (T date) as outlined below.

Construction timetable for the power plant is:

- Manufacturing of engines: T+8 months
- Transportation of engines to site: T+11 months
- Construction and installation works at site: T+15 months
- Commissioning and testing: T+18 months

Construction of the PV plant will take approximately 10 months to complete. This 10 months construction period will overlap with the last 10 months of the thermal power plant construction activities

Construction of the NamPower interconnection facilities (220kV in-out substation) and overhead lines will take 21 months to construct.

### 6.2 OPERATIONAL PHASE

The Thermal Power Plant (baseload power generation) will comprise eight reciprocating engines with a nominal output capacity of 120 MW and will be fuelled by a residual fuel known as heavy fuel oil (HFO). The solar (photovoltaic (PV)) power plant will be used exclusively as a fuel saving mechanism for the power plant and will always be dispatched first as it is more cost-effective (zero fuel cost). The thermal power plant will fill in the gaps up to 120MW depending on the NamPower dispatch order. This hybrid concept takes advantage of the benefits of solar power, whilst providing a power plant that can operate flexibly in baseload, mid-merit and peaking modes.

The PV plant will be located north of the thermal power plant (refer to Figure 1-3) and will have a maximum capacity of 50.8 Megawatt peak (MWp).

The PV component will not connect directly to the national power grid, but the flow of electrons is managed by the power station's internal control room to assure a continuous clean flow of energy to the consumer

without the erratic and challenging ups and downs of tension that are so characteristic of PV, wind and other renewable energy sources.

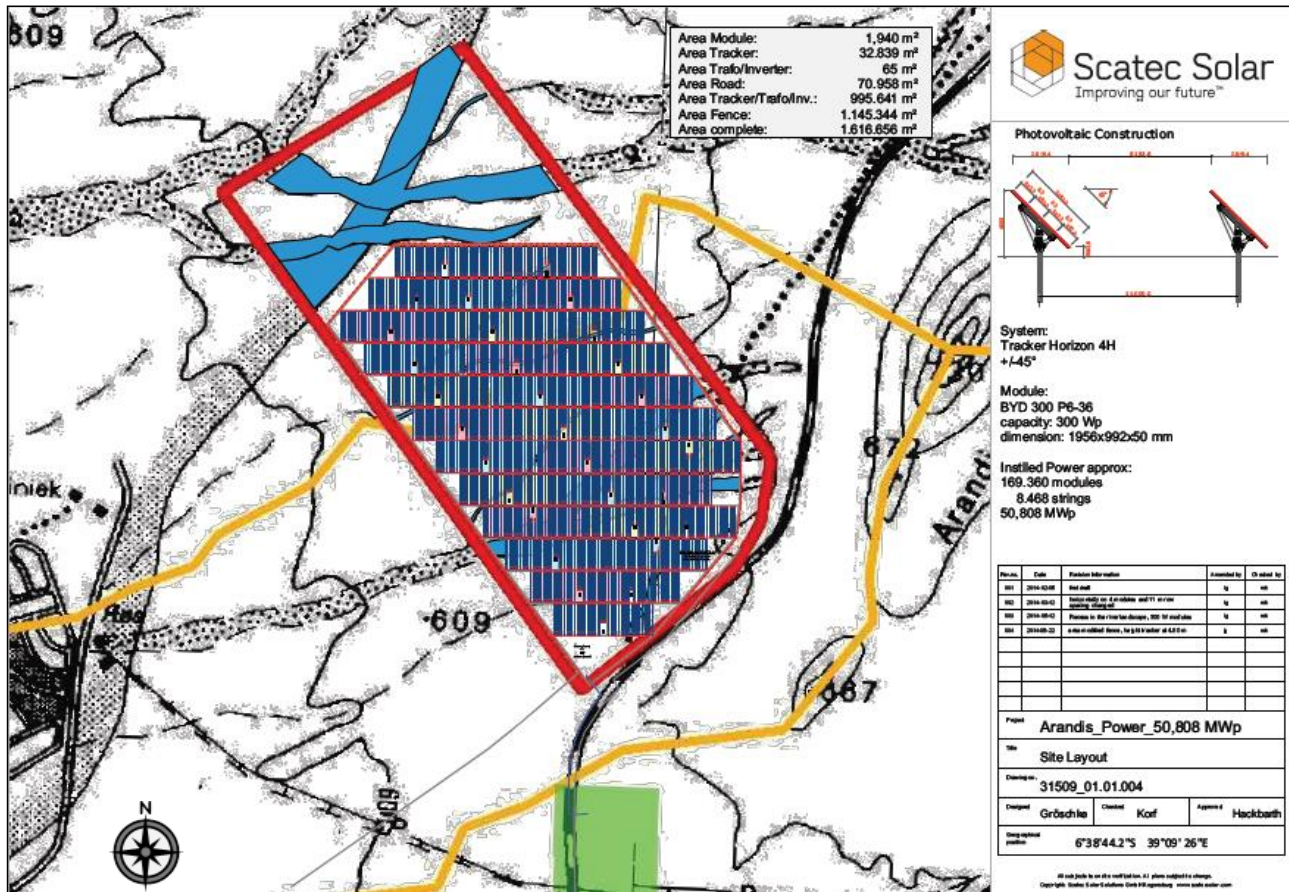


FIGURE 6-1: LAYOUT OF THE PV PLANT INFRASTRUCTURE

A summary of the operational phase infrastructure, services and activities is provided in Table 6-2.

Arandis Power is in the process of negotiating a 20 year Power Purchase Agreement (PPA) with Namibia’s bulk electricity supplier, NamPower, with the intention of commencing commercial operations in the third quarter of 2014.

**6.3 DECOMMISSIONING AND CLOSURE**

It should be noted that although the Power Purchase Agreement (PPA) with NamPower would be for a period of 20 years, the life of the operations could be expanded well into the future. It is therefore at this stage, uncertain when the operations will be decommissioned for rehabilitation and closure.

At a conceptual level, decommissioning will be considered as the reverse of the construction phase activities with the demolition and removal of the majority of infrastructure and activities very similar to those described

with respect to the construction phase. It is anticipated that all the structures associated with the Arandis Power operations will be demolished during the decommissioning phase and that no infrastructure will remain on site.

The final closure objectives will need to be discussed and agreed with the Arandis Town Council as the area has been zoned for heavy industry.

The following broader objectives will be applied:

- Disturbed areas will be returned to as close to their original state as practicable.
- Contamination beyond the site by wind or surface runoff will be prevented through appropriate containment bunds and air pollution prevention measures.
- Relevant linear infrastructure within the footprint of the proposed site comprising roads, railways, pipelines, power lines and related components will be removed and the disturbed land rehabilitated to blend with the surrounding natural environment, unless an alternative end-use is identified.
- Socio-economic impacts (including the loss of employment) will be minimised through careful planning and preparation for closure beginning three to five years before closure takes place.

The above principles and concepts will be refined as part of ongoing detailed closure planning and costing during the life of the operations and in consultation with the Arandis Town Council.

It is envisaged that no surface infrastructure within the proposed plant site will remain once demolition and decommissioning activities have ceased. It is therefore not anticipated that any closure activities, apart from environmental monitoring, will be required once the rehabilitation has been completed. Environmental monitoring should continue for a couple of years after rehabilitation to ensure closure objectives have been achieved.



**TABLE 6-1: SUMMARY OF CONSTRUCTION PHASE INFRASTRUCTURE, SERVICES AND ACTIVITIES**

CONSTRUCTION INFRASTRUCTURE AND SERVICES	CONSTRUCTION ACTIVITIES
<p>The following <b>facilities</b> will be required for the construction phase.</p> <ul style="list-style-type: none"> <li>• Contractors lay-down areas;</li> <li>• Workshop and maintenance areas;</li> <li>• Wash bay for washing equipment and vehicles;</li> <li>• Stores for storing and handling fuel, lubricants, solvents, paints and construction materials;</li> <li>• Mobile site offices;</li> <li>• Waste collection and storage areas;</li> <li>• Change houses;</li> <li>• Sanitation facilities;</li> <li>• Access roads</li> <li>• Parking area for cars and equipment; and</li> <li>• Temporary power and water supply infrastructure.</li> </ul> <p><b>Water:</b></p> <p>Potable water will be required for human consumption, civil construction and dust management during the construction phase of the project. The water supply for the project has been approved by the Arandis Town Council and will come from the local municipal supply line.</p> <p><b>Power:</b></p> <p>Temporary power for the construction phase will be supplied by generators.</p> <p><b>Sanitation:</b></p> <p>Temporary sanitation will be provided to site personnel until the permanent sanitation facilities have been constructed and commissioned. Initially, portable toilets with associated septic tanks will be used. The septic tanks will be emptied on a regular basis by an appointed contractor for disposal at the Arandis municipal sewage treatment works.</p>	<p>Earthworks: Cleaning and grubbing and bulldozing activities</p> <p>Earthworks: Soil excavation</p> <p>Earthwork: Stockpiling of topsoil and other material</p> <p>Disposal or treatment of contaminated soil</p> <p>Construction of temporary access roads and internal roads</p> <p>Construction and use of access roads and possible rail siding – clearing of areas</p> <p>Civil works: Foundation excavations</p> <p>Building activities</p> <p>Storage and handling of material: Sand, rock, cement, chemicals, fuel, additives in cements</p> <p>Water utilisation</p> <p>Mixing of concrete (batch plant) and concrete work (casting)</p> <p>Operation and movement of construction vehicles and machinery</p> <p>Refuelling of equipment</p> <p>Use of cranes</p> <p>Erection and dismantling of scaffolding</p> <p>Building of shutters</p> <p>Installing re-enforcement steel</p> <p>Handling, storage and disposal of hazardous waste</p> <ul style="list-style-type: none"> <li>• Hydrocarbon wastes;</li> <li>• Empty paint containers;</li> <li>• Cements bags;</li> <li>• Chemical additives (for cement) containers;</li> <li>• Contaminated PPE and other wastes;</li> <li>• Redundant concrete;</li> </ul> <p>Handling, storage and disposal of non-hazardous waste</p> <ul style="list-style-type: none"> <li>• Domestic waste</li> <li>• Steel</li> <li>• Wood</li> <li>• Other construction waste</li> </ul> <p>Transportation of hazardous material and non-hazardous material.</p> <p>Transportation via abnormal road vehicles</p> <p>Handling and storage of hazardous material:</p>

CONSTRUCTION INFRASTRUCTURE AND SERVICES	CONSTRUCTION ACTIVITIES
<p><b>Site access:</b></p> <p>The main access from the D1911 road to the site will be constructed in consultation with and with approval from relevant regulatory authorities. It will be designed and constructed in strict accordance with the relevant technical standards.</p>	<ul style="list-style-type: none"> <li>• Fuel</li> <li>• Lubricants</li> <li>• Paints</li> <li>• Gas (welding)</li> <li>• Cement</li> <li>• Chemical additives</li> </ul> <p>Installation of water pipelines, electricity lines and sewerage lines</p> <p>Use of electricity generators</p> <p>Installation of transformers</p> <p>Construction of temporary workshops</p> <p>Painting, grinding and welding</p> <p>Provision and operation of sanitation facilities</p> <p>Erosion control</p> <p>Appointment of contractors, labourers, etc.</p> <p><b>Waste management:</b></p> <p>General waste and hazardous waste will be trucked off site and disposed of at the permitted waste sites at Arandis, Swakopmund and Walvis Bay.</p> <p>Waste management plan to be implemented (Section 7.11).</p>

**TABLE 6-2: SUMMARY OF OPERATIONAL PHASE INFRASTRUCTURE, SERVICES AND ACTIVITIES**

OPERATIONAL INFRASTRUCTURE AND SERVICES	OPERATIONAL ACTIVITIES/FACILITIES
<p>The operational phase will consist of the following on site facilities::</p> <ul style="list-style-type: none"> <li>• Fuel (HFO) off-loading facilities;</li> <li>• Storage and handling of hazardous substances: heavy fuel oil, lubricants, process input chemicals;</li> <li>• Thermal power generation plant;</li> <li>• Photovoltaic (PV) power plant, including the following components: <ul style="list-style-type: none"> <li>➤ solar panels;</li> <li>➤ inverters;</li> <li>➤ transformers;</li> <li>➤ AC-, DC-, communication cabling</li> <li>➤ a small substation;</li> <li>➤ a tracking system;</li> <li>➤ a guardhouse;</li> <li>➤ underground power line from the PV plant to the Thermal power plant</li> <li>➤ Fencing</li> </ul> </li> <li>• Oily water treatment facility</li> <li>• Sewage treatment facility</li> <li>• Fire control systems</li> <li>• Services: Transmission substation (15/220kV), pipelines, access road, compressors; telephone lines, communication and lighting masts, possible railway siding;</li> </ul>	<p>Fuel (HFO) will be delivered to site via existing regional road transport infrastructure. The proposed annual HFO consumption is at 201 009 tonnes for baseload mode. Fuel storage facilities with a combined capacity of 12 500 m<sup>3</sup> will be constructed on site. Adequate bunding capacity and fire protection will be incorporated in the design of the facility.</p> <p><b>Thermal power plant (from the 2012 EIA):</b></p> <p>Arandis Power will utilise reciprocating engine technology for power generation. In this regard, the heat of compression is used to initiate ignition to burn the fuel, which is injected into the combustion chamber during the final stage of compression. These compression ignition (CI) engines are typically fuelled by crude oil derivatives and when modified to do so, these engines can also burn gaseous fuels. Arandis Power will utilise sufficient engines to produce a net capacity of approximately 120MW</p> <p><b>Photovoltaic (PV) power plant</b></p> <p>The PV power plant at maximum (50.8 MWp) will cover an area of approximately 116 hectares (ha), including internal roads, and site facilities (refer to Figure 6-1). It will utilize single axis tracked polycrystalline panels. The arrangement of the panels is such that the output of the panels is maximized.</p> <p>The solar panels will each have the following approximate dimensions:</p> <ul style="list-style-type: none"> <li>• Panel size of 1956 mm x 992 mm</li> <li>• Maximum height of maximum 4.5 m above ground level and 11m apart</li> </ul> <p>The total number of panels for the solar power plant at 50.8 MWp will be</p>

OPERATIONAL INFRASTRUCTURE AND SERVICES	OPERATIONAL ACTIVITIES/FACILITIES
<ul style="list-style-type: none"> <li>• Surface water management: water supply tanks, clean and dirty storm water controls;</li> <li>• Lay down and storage yard areas;</li> <li>• Warehouse, stores, workshops and wash bays;</li> <li>• Security and access control;</li> <li>• First aid facility</li> <li>• Offices, control rooms, laboratories.</li> </ul> <p><b>Water:</b> 12 600 m<sup>3</sup> potable water per annum is required for the thermal power plant. This includes domestic use. The PV plant's panels will be cleaned twice per year with water. A maximum of ±1 100 m<sup>3</sup> of water per year is required for this purpose. Water will be transported to the site via a feed line off the existing NamWater pipeline which runs past the site.</p> <p><b>Power:</b> The thermal power plant will self-supply power and include a 67kW black start generating set. A low voltage (LV) station service system will be constructed to distribute LV electricity from the Nampower grid feed during periods when no production at the power plant is taking place.</p> <p><b>Sanitation:</b> A waste water treatment facility will be constructed and will treat oily water generated by the power generation plant, including sewage effluent.</p>	<p>169,360. Each panel will be mounted on a tracking system that will follow the sun, hence the modules move from east to west during the day. Refer to Figure 6-1 for the layout of the PV plant infrastructure.</p> <p><b>Waste management (from the 2012 EIA):</b> General waste and hazardous non-mineralised waste will be sorted and managed by a contractor, and trucked off site and disposed of at the permitted waste sites at Arandis, Swakopmund and Walvis Bay respectively. Waste management plan to be implemented (section 7.11).</p> <p><b>Water management:</b> As described in the 2012 EIA and EMP, surface water runoff upstream of, and within the thermal power plant project area after rainfall events will be managed by the following infrastructure to ensure that clean and dirty water systems are kept separate:</p> <ul style="list-style-type: none"> <li>• Clean water cut off channels have been designed to divert any clean surface water generated upstream of the project area back into the natural environment.</li> <li>• Dirty water cut off channels have been designed to ensure that dirty water generated on the project area is firstly contained, and then diverted to an appropriate stormwater dam for containment.</li> </ul> <p>Plant storm water or site wash will be collected and treated through an oil separator before being either reused within the process or discharged to sewer.</p> <p>The PV plant infrastructure will be positioned/designed in such a way that interruption of drainage and inference with water flow is limited (refer to</p>

OPERATIONAL INFRASTRUCTURE AND SERVICES	OPERATIONAL ACTIVITIES/FACILITIES
<p><b>Housing:</b></p> <p>Housing will not be provided for workers on-site, it is expected that workers will reside in nearby towns and settlements including Arandis, Walvis Bay and Swakopmund.</p>	<p>Section 7.4 of the EMP).</p>

## 7. MANAGEMENT AND MITIGATION PLANS

This section of the Environmental Management Plan (EMP) comprises the following management and mitigation plans:

- Stakeholder consultation
- Safety and security
- Soils
- Biodiversity
- Surface and stormwater
- Groundwater
- Air quality
- Noise
- Archaeological resources
- Visual aspects
- Waste management
- Socio-economic aspects
- Traffic.

The various management and mitigation plans provided below indicate the project phase during which the relevant management and mitigation measures will be implemented.

### 7.1 STAKEHOLDER MANAGEMENT AND MITIGATION PLAN

#### 7.1.1 INTRODUCTION

At the beginning of the 2012 EIA process, SLR identified a number of stakeholders who needed to be informed about the proposed Arandis Power project. The list of Interested and Affected Parties (IAPs) has grown throughout the EIA public consultation process and was again updated as part of the 2014 EIA process.. Table 7-1 provides a broad list of stakeholders that are relevant to the proposed project. They were informed about the project through the EIA public consultation process.

**TABLE 7-1: ARANDIS STAKEHOLDERS**

STAKEHOLDER GROUPING	ORGANISATION
Shareholders	Arandis Power (Pty) Ltd shareholders
Local and regional government – councillors and key officers	Arandis Town Council, Erongo Regional Council, Walvis Bay and Swakopmund Town Councils
Government Ministries, notably:	Ministry of Mines & Energy; Ministry of Environment & Tourism; National Planning Commission; Ministry of Agriculture, Water and Forestry (MAWF), particularly the

STAKEHOLDER GROUPING	ORGANISATION
	Directorate of Water Affairs; Ministry of Fisheries and Marine Resources; Ministry of Works and Transport Ministry of Trade & Industry; Ministry of Labour and Social Welfare; Ministry of Education; Ministry of Health and Social Services; Ministry of Regional & Local Government, Housing and Rural Development
Government Parastatals	NamPort; NamWater; NamPower; TransNamib; Roads Authority; Erongo Red; Telecom Namibia; National Heritage Council;
Neighbouring Mines or Exploration companies	Rössing Uranium; Areva Resources; North River Resources (Namib Lead), Swakop Uranium (Husab); Bannerman (Etango) and Langer Heinrich
Environmental Foundations and NGOs	Namibian Coast Conservation and Management Project (NACOMA); Southern Africa Institute for Environmental Assessment (SAIEA); Earthlife Namibia; Desert Research Foundation of Namibia (DRFN); Wildlife Society of Namibia; Namibian Nature Foundation (NNF); World Wildlife Fund in Namibia (WWF); Namibia Environment and Wildlife Society (NEWS);
National Chambers	Chamber of Mines of Namibia; National Chamber of Commerce and Industry
Local Businesses	Especially in Arandis, Swakopmund and Walvis Bay
Educational Institutions	Namibian Institute of Mining and Technology (NIMT); Arandis Primary School, UB Dax Senior Primary School and Kolin Foundation Secondary School.
Government Services (Arandis)	Namibian Police, MoHSS Clinic, Magistrate's Office, Post Office, Telecom, NATIS, Walvis Bay – NamPol Traffic division
Residents	Residents of Informal settlements; Home owners/tenants in Arandis
Non-Governmental Organizations, Churches	Rössing Foundation; Namibia Non-Governmental Organizations' Forum (NANGOF); Walvis Bay Corridor Group; Coastal Tourism Association of Namibia (CTAN); Hospitality Association of Namibia (HAN)
Media	The Namibian; Allgemeine Zeitung; Die Republikein; Namib Times; Channel 7; Namibian Broadcasting Corporation Radio; Radio Wave 96.7FM; Namibia Economist; Informante; Insight; New Era
Other interested and affected parties	Other people with an interest in or who may be affected by the proposed project who attended meetings in the Scoping Phase, or who attended open days in the EIA Phase, or have responded to advertisements during the main EIA phase.

### 7.1.2 MANAGEMENT AND MITIGATION COMMITMENTS RELATING TO STAKEHOLDERS

Objectives:

- Ensure that ongoing feedback is provided on the relevant project activities, together with feedback on the environmental management performance of the plant and that opportunity is provided for interested and affected parties to raise comments and ensure concerns (complaints) on the same.
- Ensure communication/engagement strategies meet the needs of stakeholders.

**TABLE 7-2: STAKEHOLDER MANAGEMENT AND MITIGATION PLAN**

No	ISSUE	COMMITMENT
<b>These commitments apply to <u>all phases</u></b>		
1	Arandis stakeholder identification	Maintain and update the stakeholder register, including stakeholders' needs and expectations. Ensure that all relevant stakeholder groups are included.
2	Liaising with interested and affected parties	Devise and implement a stakeholder communication and engagement strategy.
3		As far as is reasonable, inform identified stakeholders about the power plant's activities.
4		Use appropriate communication channels to consult with, and disseminate information to the public.
5		Communication channels could include: public meetings or open days, newsletters for both employees and the public, national and local newspapers, television, radio and the internet, an annual sustainable development report.
6	Managing issues and complaints	Develop and implement a concerns/complaints (grievance) process for the public and publicise the channels through which complaints and comments can be submitted to the company. Respond within reasonable time frames to all complaints and comments on receipt thereof, and keep complete records of both complaints and responses. The process for receiving and responding to concern/complaints will be formally documented in a grievance procedure.
7	Safety of third parties	Through appropriate communication and inductions, provide information to educate third parties about the dangers associated with the power plant and related activities.
8	Reporting	Report regularly as required to the relevant authorities in terms of authorisations issued by the relevant departments or ministries.
9		In the event of an emergency an incident report will be submitted to DWA and MET.

## 7.2 SAFETY AND SECURITY MANAGEMENT

### 7.2.1 INTRODUCTION

It is essential that safety and security measures are defined and implemented to ensure that the plant site cannot be accessed by unauthorised people. Hazardous excavations and infrastructure will be present from construction through operation to decommissioning. The closure phase will not present any permanent hazardous excavations or infrastructure as all infrastructure will be removed from the site.



There is however also the potential for an increase in road accidents because of the increase in traffic to and from the plant site. Traffic safety management measures are addressed in detail in Table 7.41.

### 7.2.2 RELEVANT FACILITIES/ACTIVITIES

Construction	Operational	Decommissioning	Closure
Foundations and excavations Trenches Stockpiles Scaffolding Cranes	Stockpiles Trenches Storm water storage dams Buildings and equipment Scaffolding for maintenance purposes Pipelines Possible rail link	Stockpiles Trenches Voids Storm water storage dams Scaffolding Cranes Rubble and scrap stockpiles	N/A

### 7.2.3 SAFETY AND SECURITY MANAGEMENT PLAN

This plan is made up of the following components:

- General (third party) safety and security.

#### 7.2.3.1 General (third party) Safety and Security

Objective: prevent physical harm to third parties and animals from potentially hazardous excavations and infrastructure.

**TABLE 7-3: GENERAL (THIRD PARTY) SAFETY AND SECURITY MANAGEMENT PLAN**

NO	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>construction, operation and decommissioning</u> phases</b>		
1	Prevent access of unauthorised people to the power plant site	Provide appropriate fencing, security access control and warning signs (in appropriate languages with danger pictures) at the thermal power plant access point, around the entire <b>thermal power plant site, at the PV plant access point, around the entire PV plant site at appropriate intervals</b> , and the rail crossings based on risk.  Train staff to ensure that third parties and animals do not unwittingly enter a safety risk area.  <b>Small vertebrates should however be able to cross the PV plant area undisturbed up to the size of a 20 cm.</b>
2	Educate third parties	Third parties will be provided with information concerning the dangers associated with hazardous excavations and infrastructure at stakeholder information meetings.
3	Prevent drowning	Water holding facilities will be covered and fenced-off to prevent drowning

No	ISSUE	MANAGEMENT COMMITMENT
3	Emergency	Develop and implement an emergency response plan for accidental injury to third parties or animals.

Impacts on the health and safety of workers and contractors were not assessed by the EIA. Arandis Power will adhere to all the relevant Namibian Legislation regarding health and safety and implement a formal health and safety management system.

### 7.3 SOIL MANAGEMENT

#### 7.3.1 INTRODUCTION

The physical loss of soils and/or the loss of soil functionality are important issues because soil is an important natural resource and provides important ecosystem services, such as water filtering, provision of growth medium for plants, provision of shelter and habitat for specialist vertebrate and invertebrates. Soil is also a key component with respect to rehabilitation at the end of the project life. Soil can be impacted upon in the following manner by the proposed project:

- Loss of soil resources through pollution.
- Loss of soil resources through physical disturbance.

#### 7.3.2 RELEVANT FACILITIES/ACTIVITIES

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
<b>Soil pollution</b>			
Site preparation and establishment General construction activities Storage and handling of hazardous substances (chemicals, hydrocarbons) Management of dirty water Waste management Equipment maintenance Concrete mixing Utilisation of vehicles which may leak lubricants and fuel	Off-loading of fuels Storage and handling of hazardous substances (fuels, chemicals, hydrocarbons) Management of dirty water Waste management Equipment maintenance Utilisation of vehicles which may leak lubricants and fuel <b>Waste water treatment</b>	Site demolition General decommissioning activities Storage and handling of hazardous substances (chemicals, hydrocarbons) Management of dirty water Waste management Equipment maintenance Utilisation of vehicles which may leak lubricants and fuel <b>Waste water treatment</b>	N/A
<b>Soil disturbance</b>			
Site preparation & establishment Soil stripping	Vehicle movement Waste management	Demolition Earthworks Transport systems	Erosion of final rehabilitated land

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
Stockpile development General construction activities Preparation of foundations Compacting bases Construction of trenches Access road construction Vehicle movement Possible rail link construction Grading and levelling activities		Waste management Support services and amenities Water supply infrastructure Power supply infrastructure Site management Rehabilitation	

### 7.3.3 SOIL MANAGEMENT AND MITIGATION PLAN

This plan is made up of the following components:

- Loss of soil resources through pollution.
- Loss of soil resources through physical disturbance.
- Topsoil stockpiling/management.

#### 7.3.3.1 Soil Pollution Management

Objective: Prevent soil pollution and mitigate accidental spills.

**TABLE 7-4: SOIL POLLUTION MANAGEMENT AND MITIGATION PLAN**

No	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>construction, operation and decommissioning phases</u></b>		

No	ISSUE	MANAGEMENT COMMITMENT
1	Soil pollution	<p>Ensure that all potentially polluting substances and materials such as heavy fuel oils, hazardous chemicals (new and used), <b>dirty water</b> and wastes, are handled in a manner that they do not pollute soils. This will be implemented through one or more procedure(s), work instruction(s) and or method statement(s) covering the following:</p> <ul style="list-style-type: none"> <li>- Pollution prevention through basic infrastructure design and through education and training of workers (permanent and temporary).</li> <li>- Correct off-loading, storage and handling procedures for the heavy fuel oils</li> <li>- The required steps to enable fast reaction to contain and remediate pollution incidents. Options include in situ treatment or disposal of contaminated soils as hazardous waste. The preferred option is in situ remediation of soils.</li> <li>- Specifications for post rehabilitation audit criteria will be developed as part of detailed closure planning to ascertain whether the remediation has been successful.</li> </ul> <p>Proper hazardous and non-hazardous waste storage and disposal – refer to Table 7-18.</p>
2	Emergency	Major spillage incidents will be handled in accordance with the Arandis Power emergency response procedure.

### 7.3.3.2 Physical Disturbance Management

Objective: Prevent the loss of soils and related functionality through physical disturbance, erosion and compaction.

**TABLE 7-5: SOIL AND PHYSICAL DISTURBANCE MANAGEMENT AND MITIGATION PLAN**

No	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>construction, operation and decommissioning</u> phases</b>		
1	Soil resource management	<p>A soil management plan will be implemented. The key components are:</p> <ul style="list-style-type: none"> <li>- Limit the disturbance of soils to what is absolutely necessary both in terms of site clearing, <b>grading and leveling, as well as</b> in terms of ongoing project development and use of vehicles.</li> <li>- Where soils have to be disturbed the soil will be stripped, stored, maintained and replaced in accordance with the specifications of the Topsoil Management Plan (Table 7-6).</li> </ul>
2		As part of decommissioning and closure planning, the rehabilitation of land will take into consideration the requirements for long term erosion prevention.

### 7.3.3.3 Topsoil Stockpiling and Management

Objective: Ensure that all topsoil stripping, stockpiling and replacement operations will be undertaken in a manner that limits impacts on the soil functionality and ensure it can be used for rehabilitation as and when required.

**TABLE 7-6: TOPSOIL MANAGEMENT AND MITIGATION PLAN**

NO	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>construction and operation phases</u></b>		
1	Delineation of stockpiling areas	Limit the disturbance of soils to what is absolutely necessary (the project footprint is 15ha for the thermal plant and 116ha for the PV plant).
2	Stockpile management	Stockpiling area/s will be identified as far as practically possible in close proximity to the source of the soil.
3		Soil stockpiles will be demarcated, and clearly marked to identify both the soil type and the intended area of rehabilitation.
4		Implement erosion control measures. Options for preventing erosion of stockpiles could include rock cladding or establishment of vegetation such as the Vetivier grass.
5		Soil stockpiles heights will be restricted where possible to a maximum of 20 m with 1.5 m high and 2 m wide benches. Soil stockpiles heights for linear infrastructure will be restricted to a maximum of 2 m. The stockpile sides should as far as practically possible be stabilised as a slope of 1 in 6 or less.
6		No waste material will be placed on the soil stockpiles.
7		Equipment movement on top of the soil stockpiles will be limited as far as possible.
8		Monitoring
9	Stripping and handling of soils	Handle soils in dry weather conditions as far as possible so as to cause as little compaction as possible.
10		The soil stripping depth will be 300 – 500 mm and will depend on the requirements for the construction of foundations and cut and fill requirements <b>and where relevant levelling/grading activities and roads.</b>
11		The soil will be stripped and stockpiled together with any vegetation cover present.
<b>These commitments apply to <u>decommissioning</u></b>		
12	Restoration of disturbed land and restoration of soil utilisation	Stockpiled soil will be used to rehabilitate disturbed sites. The utilizable soil (300 to 500 mm) removed during the construction phase will be redistributed to achieve an approximate uniform stable thickness consistent that is free draining with the approved post-operations land use. A minimum layer of 300 mm of soil will be replaced.
13		A representative sampling of the stripped soils stored will be analysed to determine the nutrient status of the utilizable materials. As a minimum the following elements will be tested for: EC, CEC, pH, Ca, Mg, K, Na, P, Zn, Clay % and Organic Carbon. These elements provide the basis for determining the fertility of soil. Based on the analysis, fertilisers will be applied if necessary.
14		Erosion control measures will be implemented to ensure that the soil is not washed away and that erosion gullies do not develop prior to vegetation establishment.

## 7.4 BIODIVERSITY (FAUNA AND FLORA) MANAGEMENT

### 7.4.1 INTRODUCTION

Biodiversity can be impacted upon in the following manner by the proposed project:

- Physical destruction of organisms and habitats.
- Disturbance and destruction of biodiversity due to pollution sources.
- Interruption of draining and interference with water flow impacting on the ecological process.

### 7.4.2 RELEVANT FACILITIES/ACTIVITIES

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
Physical destruction or organisms and habitats			
Site preparation & establishment Earthworks for all surface infrastructure Soil stripping Stockpile development General construction activities Preparation of foundations Compacting bases Construction of trenches Access road construction Vehicle movement Possible rail link construction Construction of PV plant infrastructure, including levelling and grading, installing solar panels, etc.	General operational activities Transport systems Off-loading of fuels Fuel storage Waste management Waste water treatment Support services and amenities Water supply infrastructure	General demolition and rehabilitation activities Earthworks Waste management Vehicle movement	Erosion of disturbed land
Disturbance and destruction of biodiversity due to pollution sources			
Site preparation and establishment General construction activities Storage and handling of hazardous substances (chemicals, hydrocarbons) Management of dirty water Waste management Equipment maintenance	Off-loading of fuels Storage and handling of hazardous substances (fuels, chemicals, hydrocarbons) Management of dirty water Waste management Equipment maintenance Utilisation of vehicles which may leak lubricants and fuel Vehicle movement	Demolition General decommissioning activities Storage and handling of hazardous substances (chemicals, hydrocarbons) Management of dirty water Waste management Equipment maintenance Utilisation of vehicles which may leak lubricants and fuel	Erosion of disturbed land

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
Utilisation of vehicles which may leak lubricants and fuel Vehicle movement Lighting	Air emissions from thermal power generation plants Lighting	Vehicle movement Lighting	
<b>Interruption of draining and interference with water flow impacting on the ecological process</b>			
<b>Construction of the PV infrastructure in the large drainage line</b>	<b>PV infrastructure in the large draining line</b>		

### 7.4.3 BIODIVERSITY MANAGEMENT AND MITIGATION PLAN

The detailed management plan is provided below and indicates how impacts will be avoided, minimised and mitigated. This plan is made up of the following components:

- Managing the physical destruction of organisms and habitat.
- Managing general disturbance and destruction of biodiversity due to pollution.
- **Design requirements to address the Interruption of draining and interference with water flow in the large drainage line**

#### 7.4.3.1 Managing Physical Destruction of Organisms and Habitats

Objective: Prevent, as far as is possible, the unacceptable loss of species and habitats.

**TABLE 7-7: MANAGEMENT AND MITIGATION PLAN TO PREVENT THE PHYSICAL DESTRUCTION OF ORGANISMS AND HABITATS**

NO	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>Design/Planning &amp; Construction</u></b>		
<b>1</b>	<b>Destruction of organisms and their habitats</b>	<b>Design footprints of each panel to be as small as is practically possible.</b>
<b>2</b>		<b>Avoid the placement of panels in the large drainage line (see Table 7-9).</b>
<b>3</b>		<b>Place all structures in such a way as to allow free passage of water down drainage lines.</b>
<b>4</b>		<b>Avoid significant shading of perennial plants by the PV panels. If the specific plants will be shaded throughout the day, it should be considered for translocation.</b>
<b>These commitments apply to <u>construction</u></b>		
<b>5</b>	Destruction of organisms and their habitats	Limit the areas of disturbance to only what is absolutely necessary.
<b>6</b>		Demarcate and fence construction, operational and decommissioning footprint areas. All personnel including contractors should remain within these boundaries at all times. Clearly define no-go areas outside of the fenced off or demarcated

No	ISSUE	MANAGEMENT COMMITMENT
		<p>areas. These areas will be indicated on a site plan.</p> <p>The fence around the PV plant area should not block the movement of small vertebras. 20 cm.</p>
7		<p>Do not construct wide access roads for each line of the PV plant's panel array, keep tracks as small as possible (like jeep tracks/single tracks).</p>
8		<p>Implement an alien/invasive/weed management programme to control the spread of these plants onto and from disturbed areas</p>
9		<p>Deliberate trapping, collecting, harming, poaching or killing of local fauna is prohibited. Also, the harvesting or collection of plant material is prohibited.</p> <p>The use of fire for cooking, hunting and heating is prohibited</p> <p>Vehicles must use established access roads. No off road driving will be allowed</p> <p>All drivers to adhere to the site speed limits.</p> <p>Commence rehabilitation as soon as area becomes available.</p>
10		<p>Rigorously police the construction crews' adherence to the rules and do not hesitate to invoke penalty clause/s.</p>
11	<p>Protection of <i>Commiphora</i>, <i>Lithops</i>, <i>Aloe</i> and other conservation worthy species</p>	<p>All <i>Commiphora</i> and <i>Aloe</i> on the development site should be considered for replanting, e.g. in a decorative garden at the offices of the operations. A permit will be obtained for the relocation of these plants.</p> <p>The extensive ancient rings comprising &gt;100 <i>A. asperifolia</i> should be completely protected, perhaps by fencing (subject to approval from Arandis Town Council and biodiversity specialist), or otherwise managing that the construction crews and staff do not disturb these patches of plants.</p> <p>Assess the need for plant rescue and translocation operations by consulting the relevant experts (restoration ecologist/ botanist) and implement such a programme if deemed necessary and of low risk. In the event that plant rescue and translocation is required, the following will be considered:</p> <ul style="list-style-type: none"> <li>• Plant rescue and translocation should avoid disturbance of areas that would otherwise remain pristine or undisturbed.</li> <li>• Advantages must be weighed up to determine whether such high-profile fixes should be undertaken. If they are, then they should be carefully designed and include long-term monitoring, from which the results should be published to inform future activities of this nature. In all cases there should be a clear-cut long-term goal.</li> <li>• The entire development site should be carefully searched for the occurrence of <i>Lithops</i> and these should be marked for avoidance or translocation.</li> <li>• A permit will be obtained in a timeously manner for the removal or destruction of protected plant species such as <i>Lithops ruschiorum</i> and <i>Aloe asperifolia</i>.</li> <li>• Transplanting should be to nearby similar, safe, undisturbed natural habitats, bearing in mind the high potential of illegal trade in these plants.</li> <li>• About half of the translocated plants should be offered to botanical gardens. The Namib Botanical Garden is the only local recognised facility that accepts Namib species.</li> </ul>
12		<p>Plant rescue and translocation should not be undertaken lightly, and should avoid disturbance of areas that would otherwise remain pristine or undisturbed.</p>



No	ISSUE	MANAGEMENT COMMITMENT
		Advantages must be weighed up to determine whether such high-profile fixes should be undertaken. If they are then they should be carefully designed and include long-term monitoring, from which the results should be published to inform future activities of this nature.
13		As a matter of principle, apply the following priority rule for each PV panel: avoid all Aloes and Lithops spp. if at all possible > avoid all other perennial vegetation (especially trees) if at all possible. Remove and translocate affected plant species where avoidance is not possible.
14		Transplanting should be to nearby similar, safe, undisturbed natural habitats, bearing in mind the high potential of illegal trade in these plants. About half of the translocated plants could be offered to botanical gardens.
15		Assess usefulness of plant rescue and translocation operations by consulting the relevant experts (restoration ecologist/botanist) and implement such a programme if deemed necessary and of low risk.
<b>These commitments apply to <u>construction, operation and decommissioning</u></b>		
16	Impacts on fauna and flora in general	<p>Implement an alien/invasive/weed management programme.</p> <p>Install clean and dirty water systems. Redirect diverted flow back to natural flow paths.</p> <p>Cover all water dams to prevent access by larger fauna / birds. Equip dams with measures to enable fauna that may fall into the water to get out.</p> <p>Deliberate trapping, collecting, harming, poaching or killing of local fauna, as well as plant harvesting is prohibited.</p> <p>No off road driving is allowed and all personnel must adhere to the site speed limits.</p>
17	Educate workers	Educate all workers on the sensitivity of the plant site and surrounds and on species of conservation importance
18	Monitoring	Monitor success of plant translocation projects.
19		Regularly inspect areas immediately adjacent to operations for signs of illegal plant or fauna collection or hunting.
20		The rings of Aloe plants should be monitored, starting with an initial survey prior to the start of development
<b>These commitments apply to <u>construction, operation, decommissioning and closure</u></b>		
21	Rehabilitation of destroyed or damaged habitat	<p>During the operational phase closure objectives will be established in consultation with the Arandis Town Council and a biodiversity expert.</p> <p>Develop a rehabilitation plan in consultation with relevant experts and stakeholders at an early stage in the life of project.</p> <p>As part of the rehabilitation plan, ensure that all surface infrastructure is removed from site and no residual infrastructure or land forms remain</p> <p>Establish a rehabilitation budget and including funding of concurrent rehabilitation into the operational budget for the operation.</p> <p>Where possible, commence rehabilitation as soon as area becomes available.</p> <p>Undertake follow up audits and monitoring in the short and long term to determine the success of the rehabilitation and restoration.</p>
22	Emergencies	Injury to or killing of animals and illegal harvesting of plants by Arandis Power

No	ISSUE	MANAGEMENT COMMITMENT
		<p>employees and contractors will be managed in accordance with the Arandis Power emergency response procedure.</p> <p>Unauthorised access by Arandis Power employees and contractors in “no go” areas may constitute an emergency situation and will be managed in accordance with the Arandis Power emergency response procedure.</p>

#### 7.4.3.2 Managing General Disturbance and Degradation of Biodiversity by Pollution

Objective: Prevent the degradation and destruction of biodiversity through pollution sources.

**TABLE 7-8: MANAGEMENT AND MITIGATION PLAN TO PREVENT THE GENERAL DISTURBANCE AND DEGRADATION OF BIODIVERSITY BY POLLUTION**

No	Issue	Management commitment
<b>These commitments apply to <u>construction, operations and decommissioning</u></b>		
1	Lighting	<p>Reduce fixed outdoor lights to the minimum that is compatible with operational effectiveness and safety</p> <p>Where light is only intermittently needed, use motion detectors, time switches or similar to only supply light when needed</p> <p>Use yellow outdoor lights (invertebrates see yellow poorly)</p> <p>Install self-closing doors and non-opening windows in night-time operating buildings</p>
2	Pollution of the environment	<p>Implement air quality management measures as outlined in Table 7-13 and Table 7-14.</p> <p>Implement surface and groundwater management measures as outlined in Table 7-12, Table 7-9 and Table 7-10.</p> <p>Implement spill management measures as outlined in Table 7-11.</p> <p>Implement soil management measures as outlined in Table 7-6.</p> <p>Implement noise management measures as outlined in Table 7-15.</p> <p>Implement an efficient waste management system section Table 7-18.</p> <p>Ensure proper handling, storage and use of input materials as outlined in Table 7-9.</p> <p>Provide adequate sanitation facilities for workers.</p>
3	Monitoring	<p>Monitor the areas outside of the plant site for evidence of pollution arising from construction, operational and decommissioning activities. In particular this monitoring will include checking for changes in soil chemistry and deposition of particulates.</p> <p>Monitor surface and groundwater quality and air quality as outlined in section 8.</p>

## 7.5 SURFACE AND STORMWATER MANAGEMENT

### 7.5.1 INTRODUCTION

Water is a scarce resource in Namibia, particularly along the west coast. The proposed Arandis Power Plant Project will introduce a range of infrastructure and activities that have the potential to contaminate surface water resources. No significant impacts have been identified with regard to alteration of surface drainage patterns.

### 7.5.2 RELEVANT FACILITIES/ACTIVITIES

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING -	CLOSURE
Site preparation and establishment General construction activities Storage and handling of hazardous substances (chemicals, hydrocarbons) Management of dirty water Waste management Equipment maintenance Utilisation of vehicles which may leak lubricants and fuel Fallout dust	Off-loading of fuels Storage and handling of hazardous substances (fuels, chemicals, hydrocarbons) Management of dirty water Waste management Equipment maintenance Utilisation of vehicles which may leak lubricants and fuel Fallout dust	Demolition General decommissioning activities Storage and handling of hazardous substances (chemicals, hydrocarbons) Management of dirty water Waste management Equipment maintenance Utilisation of vehicles which may leak lubricants and fuel Fallout dust	N/A

### 7.5.3 SURFACE AND STORM WATER MANAGEMENT AND MITIGATION PLAN

This plan is made up of the following components:

- Pollution of surface water.
- Process, domestic and treated effluent management.
- Spill management.

#### 7.5.3.1 Contamination of Surface Water

Objective: Prevent pollution of surface water resources and run-off and related health impacts on third parties.

**TABLE 7-9: CONTAMINATION OF SURFACE WATER MANAGEMENT AND MITIGATION PLAN**

NO	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>design, construction, operation and decommissioning phases</u></b>		
1	Clean and dirty water	<p>Surface water management facilities will be designed, constructed and operated so that dirty water is kept separate from clean water run-off through a system of berms, channels, trenches, flood protection measures, erosion protection and dams.</p> <p>Clean water from the catchments located upstream of the <b>thermal power plant site</b> will be minimized by diverting clean water around the site. A simple storm water bund/v-drain on the northern and western boundaries of the <b>thermal power plant site</b> formed by grading is planned for the diversion of clean water.</p> <p>Dirty water from the <b>thermal power plant site</b> will not be allowed to spill into clean water catchments to the east and south of the site. Dirty water will therefore be directed via cut off channels to containment dams sized to contain stormwater generated during a 1:100 year 24 hour duration rainfall event.</p> <p><b>Priority will be given to re-using dirty water from the containment dams at the site before sourcing clean water.</b></p> <p><b>Dirty water will only be discharged from the site to the environment after treatment and subject to the appropriate permit or license.</b></p> <p>All surface water management infrastructure will be maintained.</p>
2	General surface water pollution/spills	<p>All hazardous chemicals (new and used), dirty water and wastes are stored, used and handled in a manner that they do not contaminate surface water run-off.</p> <p>Cement and cement aggregate will be stored and mixed on impermeable covers. Concrete will not be mixed directly on the ground.</p> <p>Emptied cement bags will be stored in weatherproof containers and disposed of regularly and will not be used for any other purpose.</p> <p>All excess cement will be collected from the batching plant on a daily basis and disposed of appropriately.</p>
3		No sanitation facilities will be located within 100 m of a watercourse.
4		Vehicles and equipment will be properly maintained and oil or fuel leaks will be repaired immediately upon detection.
5		<p>Any spills will be cleaned up immediately.</p> <p>Spill kits or adsorbent materials will be kept on hand to clean up spills. Once used, this material will be treated as hazardous waste and disposed of accordingly.</p>
6		Implement proper hazardous and non-hazardous waste storage and disposal procedures as outlined in Table 7-18
7		If run-off related discharges occur from the storm water system, the water discharge quality will be monitored as well as at appropriate points situated up and downstream of the discharge. If the quality of the monitored discharge exceeds acceptable levels, additional measures will be identified and implemented to prevent the future potential for surface water related discharge and pollution.

No	ISSUE	MANAGEMENT COMMITMENT										
8	Handling and storage of input material	Input materials will be properly stored and handled. Material Safety Data Sheets (MSDS) will be kept and adhered to where relevant. The table below lists the anticipated input materials, and summarises how these will be handled and stored. Detailed procedures for off-loading, storing and handling of these materials will be developed and implemented.										
		<table border="1"> <thead> <tr> <th>Input material</th> <th>Handling and storage</th> </tr> </thead> <tbody> <tr> <td>Heavy fuel oil (HFO) and Light fuel oil (LFO)</td> <td>Obtain relevant licences for fuel storage facilities and provide reports on fuel storage tanks condition (as per legal requirements). The fuel oil will be delivered on a daily basis to storage tanks at the proposed site using properly constructed off-loading facilities. A maximum volume of 12 500m<sup>3</sup> of HFO and 1500m<sup>3</sup> of LFO will be stored on site in properly bunded containment facilities capable of accommodating 110% of the largest container contents and will include a sump and oil trap.</td> </tr> <tr> <td>Nitrogen, Propane/Butane</td> <td>Transported by truck to site and stored in a cylinder rack.</td> </tr> <tr> <td>Lubricants and chemicals</td> <td>Transported by truck to site and stored within a bunded area in the warehouse. Bunded areas will be able to accommodate 110 % of the container contents and include a sump and oil trap.</td> </tr> <tr> <td>Building materials, tools, machinery</td> <td>Stored in the warehouse or storage yards.</td> </tr> </tbody> </table>	Input material	Handling and storage	Heavy fuel oil (HFO) and Light fuel oil (LFO)	Obtain relevant licences for fuel storage facilities and provide reports on fuel storage tanks condition (as per legal requirements). The fuel oil will be delivered on a daily basis to storage tanks at the proposed site using properly constructed off-loading facilities. A maximum volume of 12 500m <sup>3</sup> of HFO and 1500m <sup>3</sup> of LFO will be stored on site in properly bunded containment facilities capable of accommodating 110% of the largest container contents and will include a sump and oil trap.	Nitrogen, Propane/Butane	Transported by truck to site and stored in a cylinder rack.	Lubricants and chemicals	Transported by truck to site and stored within a bunded area in the warehouse. Bunded areas will be able to accommodate 110 % of the container contents and include a sump and oil trap.	Building materials, tools, machinery	Stored in the warehouse or storage yards.
		Input material	Handling and storage									
		Heavy fuel oil (HFO) and Light fuel oil (LFO)	Obtain relevant licences for fuel storage facilities and provide reports on fuel storage tanks condition (as per legal requirements). The fuel oil will be delivered on a daily basis to storage tanks at the proposed site using properly constructed off-loading facilities. A maximum volume of 12 500m <sup>3</sup> of HFO and 1500m <sup>3</sup> of LFO will be stored on site in properly bunded containment facilities capable of accommodating 110% of the largest container contents and will include a sump and oil trap.									
		Nitrogen, Propane/Butane	Transported by truck to site and stored in a cylinder rack.									
Lubricants and chemicals	Transported by truck to site and stored within a bunded area in the warehouse. Bunded areas will be able to accommodate 110 % of the container contents and include a sump and oil trap.											
Building materials, tools, machinery	Stored in the warehouse or storage yards.											
Nitrogen, Propane/Butane	Transported by truck to site and stored in a cylinder rack.											
Lubricants and chemicals	Transported by truck to site and stored within a bunded area in the warehouse. Bunded areas will be able to accommodate 110 % of the container contents and include a sump and oil trap.											
Building materials, tools, machinery	Stored in the warehouse or storage yards.											
9	Monitoring	A surface water monitoring programme will be implemented to monitor potential pollution impact on surface water resources. Corrective action will be taken when necessary.										
10	Emergency	Major spillages incidents will be handled in accordance with the Arandis Power emergency response procedure.										
11	Training and awareness	Induct all relevant employees and contractors in the Arandis Power spillage management procedure.										

### 7.5.3.2 Process, Domestic and Treated Effluent Management

Objective: Prevent pollution of surface water resources and run-off and related health impacts on third parties.

**TABLE 7-10: EFFLUENT MANAGEMENT AND MITIGATION PLAN**

No	ISSUE	MANAGEMENT COMMITMENT
		<b>These commitments apply to <u>construction phase only</u></b>
1	Domestic wastewater management	Temporary sanitation will be provided to site personnel until the permanent sanitation facilities have been constructed and commissioned. Initially, portable toilets with associated septic tanks will be used. The septic tanks will be emptied on a regular basis by an appointed contractor for disposal at the Arandis municipal sewage treatment works.

No	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>operation phase only</u></b>		
<b>2</b>	Domestic and oily wastewater management	<p>Treat all domestic wastewater (up to 4301m<sup>3</sup>/annum) in the sewerage r treatment plant, and oily water (up to 3469 m<sup>3</sup>/annum) in the oily water treatment plant (OWTP).</p> <p>Operate the treatment plants according to the operations manual to ensure optimum performance.</p> <p>Treated waste water could be utilised for land application depending on the volumes and quality.</p> <p>Treated wastewater used for the purpose of irrigation shall meet the required local and international standard and be suitable for the type of irrigation practised. In the event that the treated waste water is to be released back into the environment the effluent quality shall comply with any and all conditions as prescribed in the Namibian General Standards for Wastewater Discharge into a Water Resource and the necessary permit will be obtained.</p> <p>In the event that the treated waste water is to be discharged to the public sewer the effluent quality shall comply with maximum specified pollutants as dictated by the applicable local authority regulations.</p>
<b>3</b>	Spillage of process, domestic and treated effluent	Prevent spillages of process, domestic and treated effluent by properly maintaining and regularly inspecting effluent holding facilities and conveyance infrastructure. Where spillage does occur, ensure it is properly contained.
<b>4</b>		Ensure that checking for process, domestic and treated effluent spills is included in the daily inspection checklist.
<b>5</b>		Report spillages as per the incident management procedure and clean up spills within 24 hours of the incident occurring.
<b>6</b>	Pollution of soil and / or water when spillage or discharge occurs.	In the event of process, domestic and treated effluent discharge into the environment without prior authorisation, stop the incident as soon as possible and then find the root cause.
<b>7</b>		In the event of soil or water pollution, spills will be cleaned up/remediated immediately (within 24 hours) in line with spillage management procedure.
<b>8</b>	Legal compliance	Apply to DWA for the sewage treatment plant (STP) and waste water discharge permit/exemption. Conduct regular inspections and audits relating to the STP activities and ensure compliance to conditions of such possible permits issued by DWA (i.e. monitoring, etc.), where required.
<b>9</b>	Emergency	Major spillages incidents will be handled in accordance with the Arandis Power emergency response procedure.
<b>10</b>	Training and awareness	Induct all relevant employees and contractors in the Arandis Power spillage management procedure.

### 7.5.3.3 Spill Management

Objective: Prevent pollution of surface water resources and run-off and related health impacts on third parties.

**TABLE 7-11: SPILLAGE MANAGEMENT AND MITIGATION PLAN**

No	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>construction, operation and decommissioning</u></b>		
1	Dealing with spills	Ensure that all fuel and oil storage facilities (farms) and transport tankers have spill kits.
2		Ensure that the fuel transport companies have a system in place to deal with hydrocarbon spills and subsequent cleanup thereof.
3		Contain any spills and commence with remediation within 24 hours. In this regard the remediation options include in situ treatment or disposal of contaminated soils as hazardous waste.
4		In cases where spills cannot be cleaned up immediately, monitor seepage into deeper soils and groundwater closely.
5		If contamination of water occurs, separate hydrocarbons from water and treat water before recycling and re-use.
6	Legal Compliance	Comply with all legal requirements regarding spills and containment structures.
7		Hydrocarbon spills of 200 l or more must be reported to MME in terms of Section 49 of the Petroleum Products Regulations 2000.
8	Monitoring of spills	Ensure that the monitoring of all tanks, pipelines and bunds are included in the daily inspection programme to develop an early detection system for leaks.
9		Identify post rehabilitation audit criteria for verifying that remediation has been successful.
10	Awareness and training	Induct all employees and contractors in the Arandis Power spillage management procedure.
11		Train selected employees on containment, handling of spills and the de-contamination and rehabilitation of affected environments.
12	Emergency	Major spillages incidents will be handled in accordance with the Arandis Power emergency response procedure.
13		Identify and contract a service provider/specialist to assist with the handling and clean-up of emergency spills off site.
14		Periodically test the Arandis Power emergency response.

## 7.6 GROUNDWATER MANAGEMENT

### 7.6.1 INTRODUCTION

Potential groundwater quality impacts are a potential issue during the construction, operation and decommissioning phases unless measures are undertaken to prevent and mitigate such impacts. Potential pollution sources from the proposed operations are expected to be of a diffuse nature. No significant groundwater quantity impacts are expected due to the nature of the project.

### 7.6.2 RELEVANT FACILITIES/ACTIVITIES

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
Site preparation and establishment General construction activities Storage and handling of hazardous substances (chemicals, hydrocarbons) Management of dirty water Waste management Equipment maintenance Utilisation of vehicles which may leak lubricants and fuel Fallout dust	Off-loading of fuels Storage and handling of hazardous substances (fuels, chemicals, hydrocarbons) Management of dirty water Waste management Equipment maintenance Utilisation of vehicles which may leak lubricants and fuel Fallout dust	Demolition General decommissioning activities Storage and handling of hazardous substances (chemicals, hydrocarbons) Management of dirty water Waste management Equipment maintenance Utilisation of vehicles which may leak lubricants and fuel Fallout dust	N/A

### 7.6.3 GROUNDWATER MANAGEMENT AND MITIGATION PLAN

Objective: Prevent groundwater contamination

**TABLE 7-12: GROUNDWATER MANAGEMENT PLAN**

NO	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>construction, operation and decommissioning</u> only</b>		
1	Contamination of groundwater	Engineered containment of process areas, sewage facilities, wastewater treatment plant, waste storage areas, vehicle maintenance areas, and hydrocarbon storage areas. Collection of stormwater and site wash water for treatment in an oil separator before reuse. Site speed limit and vehicle signage to reduce risk of vehicle accidents and spillage of tanker contents.



No	ISSUE	MANAGEMENT COMMITMENT
2	Training	Prevent pollution through education and training of workers (permanent and temporary).
3	Monitoring	<p>A groundwater monitoring programme will be implemented to monitor potential pollution impact on groundwater resources. Drilling of monitoring 2 monitoring boreholes:</p> <ul style="list-style-type: none"> <li>• One at northeastern boundary</li> <li>• One at (south) western site boundary</li> </ul> <p>Monitoring suites:</p> <ul style="list-style-type: none"> <li>• Major Ions - pH, EC, Ca, Mg, Na, K, Alkalinity/Hardness, SO<sub>4</sub>, Cl, Minor Ions - Amm-N, F, NO<sub>3</sub>, NO<sub>2</sub>,</li> <li>• Free CN Metals - As, Al, Ba, Be, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Se, V, Zn (all dissolved not total)</li> <li>• Organics - BTEX, TPH, Phenol, PAHs, Chlorinated Hydrocarbons</li> </ul> <p>Corrective action will be taken when necessary.</p>
4	Emergency	Major spillage incidents will be handled in accordance with the Arandis emergency response procedure.

## 7.7 AIR QUALITY MANAGEMENT

### 7.7.1 INTRODUCTION

There are a number of activities in all phases that have the potential to pollute the air. In the construction and decommissioning phases these activities are temporary in nature and will only last a few months. The operational phase will present more long term activities with the main sources of emissions being associated with the release of PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, CO and NO<sub>x</sub> as NO<sub>2</sub> from the thermal power generation plant engine stacks. The most relevant off site receptor points are the Arandis Railway Station accommodation site and Arandis town, approximately 0.8km and 1.7km away respectively. No residual impacts are expected after closure.

### 7.7.2 RELEVANT FACILITIES/ACTIVITIES

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
Site preparation & establishment General construction activities Earthworks for all surface infrastructure Soil stripping Construction of trenches and foundations Access road construction Vehicle movement	Off-loading of fuels Materials handling Vehicle movement Power plant engine stacks Exhaust fumes (vehicles, generators)	Site preparation & establishment General construction activities Earthworks for all surface infrastructure Soil stripping Construction of trenches and foundations Access road construction	N/A

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
Exhaust fumes (vehicles, generators)		Vehicle movement Exhaust fumes (vehicles, generators)	

### 7.7.3 AIR QUALITY MANAGEMENT AND MITIGATION PLAN

This management plan is made up of the following components:

- Dust management.
- Gaseous emissions management.

#### 7.7.3.1 Dust Management

Objective: To limit Arandis Power's contribution to cumulative air pollution impacts.

**TABLE 7-13: DUST MANAGEMENT AND MITIGATION PLAN**

NO	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to construction, operation and decommissioning</b>		
1	Dust suppression	Dust suppression on temporary access and site roads through chemical binding agents and/or water sprays combined with vehicle speed controls to achieve a control efficiency of 90% and at least 75% respectively.  Dust controls at material handling points (loading and offloading) by water sprays to achieve 50% control efficiency.
2	Monitoring	A PM <sub>10</sub> and TSP monitoring programme will be implemented with input from an air specialist  The collection and analysis of dust fall out must be done in accordance with relevant standards. Data should be analysed and appropriate action taken to correct non-conformances.
3	Auditing	Quarterly performance audits and inspections will be done to verify that the monitoring is taking place according to specifications and that the operation is adhering to the specified dust fallout indicators.
4	Complaints system	All air-related complaints will be documented, investigated and reasonable efforts made to address the area of concern

#### 7.7.3.2 Gaseous Emissions Management

Objective: To limit Arandis Power's contribution to cumulative air pollution impacts

**TABLE 7-14: GASEOUS EMISSIONS MANAGEMENT AND MITIGATION PLAN**

NO	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>Operations only</u></b>		
1	Green house gas emissions	Develop a greenhouse gas emissions inventory and calculate the power plant's annual emission of greenhouse gases.
2		Periodically investigate ways to decrease the power plants emission of greenhouse

No	ISSUE	MANAGEMENT COMMITMENT
		gases.
3		Where appropriate, implement initiatives to decrease the volume of greenhouse gasses emitted to air.
4	Emissions from diesel generators	If diesel generators are used these will be operated and maintained according to supplier specifications and International Finance Corporation emission limits.
5	Stack emissions (power generation plant engine stacks)	<p>The standard power station engine will meet the NO<sub>x</sub> level set by the evaluation criteria defined in the EIA.</p> <p>Notify the Ministry of Health and Social Services of the proposed stack emissions.</p> <p>The power plant will be operated in a manner to ensure SO<sub>2</sub> and NO<sub>2</sub> ground level concentrations are below the WHO annual guideline.</p> <p>A single 30m segmented stack configuration for the power generation plant engine stacks will be constructed to ensure optimal dispersion of pollutants and compliance with the WHO guideline. This is in line with Good International Industry Practice (GIIP) to avoid excessive ground level concentrations and minimize impacts, and the World Bank Thermal Power Guidelines.</p> <p>Ensure that emissions from the plant do not contribute more than 25% of the applicable ambient air quality standards to allow additional, future sustainable development in the same airshed in line with the IFC General EHS Guidelines.</p>
6	Monitoring	Passive monitoring of ambient SO <sub>2</sub> and NO <sub>2</sub> will be undertaken bi-annually (summer and winter months) at the nearest residential area (Arandis) to ensure ground-level concentrations are within the relevant limits. If after two sampling campaigns (one month in summer and one month in winter) the relevant limits are not exceeded, the sampling frequency can be reduced in consultation with a specialist.
7	Complaints system	All air-related complaints will be documented, investigated and reasonable efforts made to address the area of concern

## 7.8 NOISE MANAGEMENT

### 7.8.1 INTRODUCTION

There is a range of construction, operation and decommissioning activities that have the potential to generate noise. Potential receptors sites include the town of Arandis, tourists that may frequent potential attractions in the surrounding area, as well as fauna. The sensitivity of noise receptors usually increases at night when conditions are still and ambient noise levels are at their lowest.

### 7.8.2 RELEVANT FACILITIES/ACTIVITIES

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
Site preparation & establishment General construction	General site management activities Off-loading of fuels	Demolition General decommissioning and rehabilitation activities	N/a

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
activities Earthworks for all surface infrastructure Construction of trenches and foundations Equipment maintenance Access road construction Vehicle movement Generators Possible rail link construction	Materials handling Equipment maintenance Vehicle movement Power generation plant Waste management Water management (pumps) Support services and amenities	Earthworks Vehicle movement Waste management Water management (pumps) Support services and amenities	

### 7.8.3 NOISE MANAGEMENT AND MITIGATION PLAN

Objective: Prevent an unacceptable increase in disturbing noise and limit nuisance noise at sensitive receptors as far as practically possible.

**TABLE 7-15: NOISE MANAGEMENT AND MITIGATION PLAN**

No	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>design</u></b>		
1	Design of facility	<p>The layout of the proposed <b>thermal</b> power plant will be designed in such a way that maximum benefit is provided to the amenity of the local area and occupiers of the nearest noise-sensitive receptors.</p> <p>The main operational processes of the <b>thermal</b> power plant will take place within the building envelope which comprises a 'sandwich' panelling system.</p>
<b>These commitments apply to <u>construction, operation and decommissioning</u></b>		
2	Minimise noise during operations	<p>The engines will have silencers fitted to both the engine air intake and engine exhaust.</p> <p>Ventilation equipment will also be fitted with silencer systems.</p> <p>The cooling radiators will be located on the roof of the building and comprise low noise radiators.</p> <p>The fuel oil tanks, fuel treatment house, fuel loading area, electrical equipment building, workshop and warehouse building, social facility and administration building and the step-up transformer area will be located external to the main building. It is considered that these areas would produce minimal levels of noise.</p>
3	Maintenance of vehicles and equipment	<p>Vehicles and equipment will be regularly serviced and maintained in good working order.</p> <p>The sound of reverse hooters will be engineered in such a manner to limit audibility in the surrounding environment.</p>
4	Complaints system	<p>All noise complaints will be documented, investigated and reasonable efforts made to address the area of concern. This may include consulting a noise specialist for mitigation advice.</p>

No	ISSUE	MANAGEMENT COMMITMENT
5	Monitoring	Where necessary, noise monitoring will be used as part of the investigatory process into noise complaints and as part of the assessment of the impact of mitigation and, if required, the alteration thereof.

## 7.9 ARCHAEOLOGICAL RESOURCES MANAGEMENT

### 7.9.1 INTRODUCTION

There are a number of activities/infrastructure components in all phases of the project that have the potential to damage archaeological resources. These must be managed in order to minimise destruction of heritage resources.

### 7.9.2 RELEVANT FACILITIES/ACTIVITIES

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
Site preparation & establishment Earthworks for all surface infrastructure Soil stripping Stockpile development General construction activities Preparation of foundations Compacting bases Construction of trenches Access road construction Vehicle movement Possible rail link construction Construction of PV plant infrastructure, including levelling and grading, installing solar panels, etc.)	Site preparation General operational activities Transport systems Off-loading of fuels Fuel storage Power generation Waste management Waste water treatment Support services and amenities Water supply infrastructure	General demolition and rehabilitation activities Earthworks Waste management Vehicle movement	N/A

### 7.9.3 ARCHAEOLOGICAL MANAGEMENT AND MITIGATION PLAN

Objective: Minimise damage of heritage resources that may be caused by the proposed project.

**TABLE 7-16: ARCHAEOLOGICAL MANAGEMENT AND MITIGATION PLAN**

No	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to pre-construction only</b>		
1	Disturbance of heritage sites 157/2 – 5 and 157/10	A Phase II heritage study will be conducted by an accredited archaeologist of the four sites that may be disturbed by the proposed project (sites 157/2 –4 and 157/10). This will involve documentation and mapping of the sites and possibly small test excavations. Upon conclusion of the Phase II study, a permit will be obtained from the Namibian National Heritage Council prior to the removal, alteration or destruction of these heritage resources.
<b>These commitments apply to construction, operation and decommissioning phases</b>		
2	Identification of archaeological sites	All workers (temporary and permanent) will be educated about the heritage and cultural sites that may be encountered and about the need to conserve these.
3	sites	Contractors working on the site shall be made aware that under the National Heritage Act any items protected under the definition of heritage found in the course of development should be reported to the National Heritage Council.
4	Disturbance of archaeological sites	The relevant archaeological sites outside of the project footprint area will be demarcated in order to restrict incidental access to the various sites.
5	Emergency	In the event that new heritage and/or cultural resources are discovered, the project proponent will follow a chance find emergency procedure, which includes the following: <ul style="list-style-type: none"> <li>• Work at the find will be stopped to prevent damage</li> <li>• An appropriate heritage specialist will be appointed to assess the find and related impacts</li> <li>• Permitting applications will be made to the National Heritage Council, if required.</li> </ul>
6	Chance finds	In the event of any archaeological chance find (other than the ones already identified through the EIA process, implement the procedure in Appendix ???

## 7.10 VISUAL ASPECT MANAGEMENT

### 7.10.1 INTRODUCTION

Visual impacts may be caused by activities and infrastructure in all project phases. Views from the Rest Area on the B2 at the Arandis junction and Hospital Road present the greatest visual exposure. The proposed development is however not likely to visually affect either of the nearby National Parks. Furthermore, once the proposed Arandis Town Plan is partially or fully implemented, visual impacts would reduce as the area would become industrial.

### 7.10.2 RELEVANT FACILITIES/ACTIVITIES

Construction	Operational	Decommissioning	Closure
Site preparation & establishment	Site preparation General operational	Site preparation and establishment	N/A

Construction	Operational	Decommissioning	Closure
Earthworks for all surface infrastructure Soil stripping and stockpiling General construction activities Scaffolding & cranes Access road construction Vehicle movement Possible rail link construction	activities Transport systems Fuel storage Power generation plant, particularly stacks Waste management Support services and amenities Water supply infrastructure	General demolition and rehabilitation activities Earthworks Scaffolding & cranes Waste management Vehicle movement	

### 7.10.3 VISUAL MANAGEMENT AND MITIGATION PLAN

Objective: limit negative visual impacts.

**TABLE 7-17: VISUAL DISTURBANCE MANAGEMENT AND MITIGATION PLAN**

NO	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to the <u>construction, operation and decommissioning</u></b>		
1	Minimising visual impacts	Land disturbance should be limited to what is absolutely necessary.
2		Manage all dust plume sources with dust suppressants to limit visual intrusion by dust in line with the air quality management plan (refer to Table 7-13).
3		The use of night light will be kept to a minimum and will illuminate only that which is required. The use of standard high pole flood lights will be avoided.
4		Painting infrastructure with colours that blend in with the surrounding environment where possible. Advice on the appropriate colours should be sought from a visual impact expert.
5		Prevent littering.
6		On-going vegetation establishment on rehabilitated areas
7		In the decommissioning phase all infrastructure will be removed and the site will be rehabilitated and re-vegetated.

## 7.11 WASTE MANAGEMENT

### 7.11.1 INTRODUCTION

The types of solid waste expected to be generated include:

- General waste (domestic waste and other non-hazardous waste).
- Hazardous waste.
- Medical waste.

Liquid waste (effluent and contaminated surface runoff) is dealt with under the surface water/stormwater management plan.

### 7.11.2 SOLID WASTE MANAGEMENT AND MITIGATION PLAN

Objective: Ensure proper storage, removal, transportation and disposal of all solid waste.

The solid waste management plan for Arandis Power is outlined in Table 7-18 below and should be read together with Table 7-19 .

**TABLE 7-18: SOLID WASTE MANAGEMENT AND MITIGATION PLAN**

NO	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply <u>construction, operation and decommissioning</u> phases</b>		
1	Waste management hierarchy	<p>The following waste management hierarchy will be implemented:</p> <ul style="list-style-type: none"> <li>• Waste minimisation.</li> <li>• Re-use and recover waste.</li> <li>• Treat waste if required.</li> <li>• Disposal in suitably permitted and managed landfills.</li> </ul> <p>Arandis Power will assess each waste type to see whether there are alternative uses for the material. This will be done as a priority before the disposal option.</p>
2	Classification and record keeping	<p>Arandis Power will develop and implement a waste management procedure that will cover the storage, handling and transportation of waste to and from the site. Arandis Power will ensure that the contractors responsible are made aware of these procedures.</p> <p>An inventory of wastes will be compiled and will include estimated quantities of waste. The inventory will be kept up to date.</p> <p>Written evidence of safe disposal of all waste types will be kept.</p>
3	Waste collection in work areas	<p>Adequate skips and rubbish bins equipped with lids will be provided in relevant work areas.</p> <p>Waste will be separated at source.</p> <p>Littering will be prohibited.</p> <p>Mixing of re-usable materials with other wastes, especially hazardous wastes will be prevented.</p> <p>Care will be taken to ensure that scrap metal and building rubble does not become polluted or mixed with any other waste.</p> <p>On site facilities will be provided for sorting and temporary storage prior to removal and disposal to appropriate recycling or disposal facilities off-site (Arandis for general waste and Walvis Bay for hazardous waste).</p> <p>During decommissioning and closure, lay down areas within the site footprint for re-usable non-hazardous materials will be established.</p>



No	ISSUE	MANAGEMENT COMMITMENT
4	Waste transport	Waste will be transported to the appropriate disposal facilities by an approved waste contractor. Vehicles transporting hazardous waste will be clearly marked. The integrity of transport packaging and containers will be appropriate to the type of waste being transported. Loading and unloading procedures will be followed to avoid spillage.
5	Waste disposal	No waste shall be burnt or buried on site. Domestic waste will be disposed of to a licensed landfill site in Arandis. Hazardous waste will be disposed of to the licensed hazardous landfill in Walvis Bay.
6	Waste management	The types of waste per project phase, storage and disposal procedures are provided in Table 7-19 below

The following table briefly outline the procedure for the storage and disposal of solid wastes.

**TABLE 7-19: WASTE STORAGE AND DISPOSAL PROCEDURE**

WASTE TYPE	WASTE SPECIFICS (EXAMPLE OF WASTE TYPES)	STORAGE FACILITY	END USE
<b>CONSTRUCTION AND DECOMMISSIONING PHASE</b>			
<b>Non-hazardous waste</b>	Pallets and wooden crates, cable drums, scrap metal, general domestic waste such as food and packaging	Skips in relevant work areas will be provided for different waste types.	Waste will be sorted and recyclable waste will be sent to a reputable recycling company. The remainder of the waste will be transported by a waste management contractor to a permitted general landfill facility in Arandis for disposal.
	Building rubble and waste concrete	Designated rubble collection areas will be identified to which contractors will take rubble and concrete.	The waste management contractor will regularly remove the waste from the designated collection points to a disposal facility.
<b>Hazardous solid waste</b>	Hydrocarbon contaminated waste, treated timber crates, printer cartridges, batteries, fluorescent bulbs, paint, solvents, tar, empty hazardous material containers etc.	Hazardous waste will be separated at source and stored in designated containers in dedicated banded storage areas.	Hazardous waste will be disposed of at the permitted hazardous disposal site in Walvis Bay by the waste management contractor.
	Hydrocarbons (oils, grease)	Used oil and grease will be stored in drums in dedicated banded	Used oil will be sent to a reputable recycling company for recycling.

WASTE TYPE	WASTE SPECIFICS (EXAMPLE OF WASTE TYPES)	STORAGE FACILITY	END USE
		areas. The bunds will be able to accommodate 110 % of the container contents and include a sump and oil trap. The storage area will include a concrete slab, proper bunding and an oil sump.	
	Sewage	Sewage will be collected in septic tanks for removal by an appointed contractor.	Sewage will be collected by a waste contractor for disposal at the Arandis municipal sewage treatment facility.
<b>Medical waste</b>	Medical waste such as material with blood stains, bandages, etc.	Medical waste will be stored in sealed containers at the first aid station.	Medical waste will be transported by the waste management contractor to a permitted incineration facility in Swakopmund for incineration.
OPERATIONAL AND DECOMMISSIONING PHASE			
<b>Non-hazardous solid waste</b>	Pallets and wooden crates, rubber, cardboard, paper, cable drums, metal cut-offs. scrap metal, general domestic waste such as food and packaging	Skips in relevant work areas will be provided for different waste types. A waste management contractor will remove skips regularly	Recyclable waste will be sent to a reputable recycling company. The remainder of the waste will be transported by the waste management contractor to a permitted general landfill facility in Arandis for disposal.
	Building rubble and waste concrete	Designated rubble collection points will be determined to which rubble and concrete will be taken.	Building rubble will be disposed of at a designated waste disposal facility
<b>Hazardous solid waste.</b>	Treated timber crates, printer cartridges, batteries, fluorescent bulbs, paint, solvents, tar, empty hazardous material containers, sludge from oily water treatment plant etc.	Hazardous waste will be separated at source and stored in designated containers in banded work areas. The waste management contractor will remove these drums regularly.	Hazardous waste will be disposed of at the permitted hazardous disposal site in Walvis Bay by a waste management contractor.
	Sewage	Sewage will be treated at a sewage treatment plant.	Sewage sludge disposed at Arandis sewage treatment plant.
<b>Medical waste</b>	Medical waste such as material with blood stains, bandages, etc.	Medical waste will be stored in sealed containers at the first aid station.	Medical waste will be transported by the waste management contractor to a permitted incineration facility in Swakopmund for incineration.

## 7.12 SOCIO-ECONOMIC ASPECT MANAGEMENT

### 1.1.1 INTRODUCTION

The project will have socio-economic impacts in all phases. Some of these are considered to be positive impacts such as economic development, while others are considered to be negative impacts such as increased pressure on infrastructure, society and the tourism industry.

#### 7.12.1 RELEVANT FACILITIES/ACTIVITIES

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
Construction and initial operational activities Recruitment of contractors and workers	Operational activities Recruitment of contractors and workers	Decommissioning activities Dismissal of contractors and workers	Aftercare and maintenance activities

#### 7.12.2 SOCIO –ECONOMIC MANAGEMENT AND MITIGATION PLAN

Objectives:

- Enhance the positive economic impacts and limit the potential negative economic impacts.
- Enhance the positive impacts and limit the potential negative impacts associated with the employment and skills training.
- Minimise the impact of in-migration of job seekers and the associated community health.
- Minimise the impact on government services.

**TABLE 7-20: SOCIO-ECONOMIC IMPACT MANAGEMENT AND MITIGATION PLAN**

No	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>construction, operation and decommissioning</u></b>		

No	ISSUE	MANAGEMENT COMMITMENT
1	Enhancement of positive economic impacts	<p>Recruitment of nationals, in particular local people.</p> <p>Payment of competitive salaries and wages to nationals.</p> <p>Local procurement whenever possible and encourage employees and the community to do the same.</p> <p>A recruitment office is set-up in Arandis for both the construction and operations phases; to ensure that local people are considered first, followed by people from the rest of the Erongo Region and then other Namibians. Several local institutions offered to share their database of skilled artisans and service providers to maximise benefits to the local community.</p> <p>Development and implementation of socio-economic management policies which will promote positive impacts. Training of local and regional contractors, beginning before the project commences.</p> <p>Promote small and medium enterprises (SME) development wherever possible.</p> <p>Use small-scale contractors wherever possible.</p>
2	Skills training and procurement	<p>Up-front skills training, particularly to potential employees currently living in Arandis and the Erongo Region.</p> <p>Training of local employees will continue throughout the life of the operation.</p> <p>Technical training and skills development will form part of the training programme.</p> <p>The government policy of improving gender equality and the empowerment of women will be supported.</p> <p>Provide support to NIMT, based in Arandis, and the Arandis Town Council in working towards the town becoming a centre of education excellence.</p>
3		<p>Tender selection criteria will include suppliers of goods and services which use local suppliers down the supply chain. Support the development of a workers database together with the Arandis Town Council and suggest that this is made available to construction contractors.</p> <p>Procurement policies will promote the use of small and medium enterprises.</p> <p>The human resources policy will support the selection of women for training and recruitment and support women to perform well in the workplace while balancing their other duties in the family and community.</p> <p>Support employees and community members to continue learning and developing skills so they too benefit from being able to offer labour flexibility and productivity.</p>

No	ISSUE	MANAGEMENT COMMITMENT
4	Minimise loss of jobs and economic impact upon closure	<p>In preparation for decommissioning and of planned and unplanned closure, Arandis Power will:</p> <ul style="list-style-type: none"> <li>• Promote continuous learning programmes to diversify and upgrade skills.</li> <li>• Maximise the permanent workforce and make pension plans compulsory.</li> <li>• Provide training on personal financial management.</li> <li>• Enable and promote home ownership.</li> <li>• Ensure that closure planning considerations incorporate the following aspects: <ul style="list-style-type: none"> <li>○ the skilling of employees for the downscaling, early closure and long term closure scenarios</li> <li>○ the needs of tourism for the downscaling, early closure and long term closure scenarios.</li> </ul> </li> </ul>
5	In-migration and social ills	<p>A representative stakeholder committee together with the Arandis Town Council to monitor social impacts and the effectiveness of the mitigation measures will be put in place.</p> <p>Broadly disseminate information on the actual number of skilled and unskilled positions available during all project phases in an effort to manage expectations.</p> <p>Arandis Power and its construction contractor(s) will have zero tolerance to alcohol in the workplace and will breathalyse all personnel arriving for work on every shift.</p> <p>Establish a comprehensive HIV / AIDS / TB workplace policy and employees wellness programme. Tender requirements for all contractors will stipulate clear HIV policies and programmes. These will be part of their reporting requirements.</p> <p>Arandis Power will work closely with the Town Council and the Ministry of Health and Social Services (MHSS) to support partnerships that encourage a sense of community that combats social ills, e.g. multi-purpose community and skills development centres; networking points for new migrants; sports tournaments, social clubs, youth clubs, activities that promote women's empowerment that can lead to gender equality, and community policing.</p>
6	Increased pressure on government services	<p>Arandis Power, together with the Arandis Town Council and other stakeholders, will engage with the relevant authorities to ensure that the planned upgrading of government services is implemented.</p> <p>Arandis Power will ensure that the basic health services are provided to its workforce during all phases of the project. Arandis Power will collaborate with the MHSS for the benefit of all users.</p>

### 7.13 TRAFFIC MANAGEMENT

There are a number of transportation activities in all phases of this proposed project that have the potential to impact on the existing road transportation infrastructure and community safety. The increase

in transportation activities during the construction and decommissioning will be temporary in nature, while the operational activities will be of a long term nature. No impacts are expected in the closure phase.

### 7.13.1 RELEVANT FACILITIES/ACTIVITIES

CONSTRUCTION	OPERATIONAL	DECOMMISSIONING	CLOSURE
Vehicle movement associated with earth moving activities Transportation of construction workers Deliveries, including abnormal vehicles	Deliveries, including fuel Transportation of operational personnel Collection activities, in particular waste products	Vehicle movement associated with demolition and rehabilitation activities Transportation of workers	N/A

### 7.13.2 TRAFFIC MANAGEMENT AND MITIGATION PLAN

Objective: Minimise the impact on road transport infrastructure and community safety.

**TABLE 7-21: TRAFFIC IMPACT MANAGEMENT AND MITIGATION PLAN**

No	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>design</u></b>		
1	Access point	Submit detailed design drawings to the various authorities for approval of the relocation of the site access from the D1911.  Ensure changes to road infrastructure comply with the requirements of the Road Authority.
<b>These commitments apply to <u>construction, operation and decommissioning</u></b>		
2	Community safety	Traffic and information signs, road markings and lighting will be provided where relevant.  Dedicated pedestrian routes will be identified and implemented in conjunction with the Arandis Town Council.  Signage and pedestrian routes will be properly maintained.  All persons working on the Arandis plant site are expected to conform to the site traffic rules: <ul style="list-style-type: none"> <li>• Adhere to speed limits.</li> <li>• Ensure drivers have valid driver licenses.</li> <li>• All vehicles should be roadworthy.</li> <li>• Zero tolerance for drinking and driving.</li> <li>• Drive with lights on when on site.</li> </ul> Co-ordinate transport of heavy loads with the relevant Roads Authority.  Transport hazardous substances in line with the requirements as indicated on the material safety data sheet (MSDS)

No	ISSUE	MANAGEMENT COMMITMENT
3		Arandis Power, together with other stakeholders, will need to engage with the Roads Authority to address the predicted decline in the level of service of the Arandis intersections. It is however noted that upgrading of the intersections will be the responsibility of the Roads Authority.
4.	Training	Road traffic will be included in the general awareness training programmes for employees, which includes contractors.
5	Emergency	Any road accident involving or caused by project related traffic will be handled in accordance with Arandis Power's emergency response procedure.

## 7.14 CARBON MANAGEMENT

There are a number of activities in all phases of this proposed project that have the potential to impact on the carbon footprint of the project. The carbon footprint which will result from construction and decommissioning activities will be temporary in nature. Activities during the operational phase will however result in a longer term carbon footprint. No impacts are expected in the closure phase.

### RELEVANT FACILITIES/ACTIVITIES

Construction	Operational	Decommissioning	Closure
Exhaust fumes (vehicles, generators) Construction activities and materials	Power plant engine stacks Exhaust fumes (vehicles, generators) Utilisation of consumables Waste management Waste water treatment Transportation activities	Site preparation and establishment Demolition and earthwork activities Exhaust fumes (vehicles, generators)	N/A

### 7.14.1 CARBON MANAGEMENT AND MITIGATION PLAN

Objectives: To minimise the impact on the carbon footprint.

**TABLE 7-22: CARBON MANAGEMENT AND MITIGATION PLAN**

No	ISSUE	MANAGEMENT COMMITMENT
<b>These commitments apply to <u>all</u> phases of the project</b>		

No	ISSUE	MANAGEMENT COMMITMENT
1	Resources consumption	Resources such as process consumables and water will utilised efficiently during all phases of the project.
<b>These commitments apply to <u>the operational phase</u></b>		
2	Maintenance	Ensure that an ongoing and comprehensive maintenance programme is implemented to ensure that each plant is retained at its optimum operating point.
3	Monitoring	A carbon footprint will need to be updated on an annual basis by Arandis Power in line with acceptable international guidelines



## 8. MONITORING PLAN

### 8.1 INTRODUCTION

This section outlines the monitoring plan for the Arandis Power Plant and activities.

As a general approach, the monitoring programmes will comprise the following:

- A formal procedure.
- Appropriately calibrated equipment – regular inspections and calibration of equipment will be undertaken in line with the equipment calibration/validation procedure.
- Where samples require analysis they will be preserved according to laboratory specifications.
- Where practical, an accredited, commercial laboratory will undertake sample analyses
- Parameters to be monitored can be identified in consultation with a specialist in the field and/or the relevant authority.
- If necessary, following the initial monitoring results, certain parameters may be removed from the monitoring programme in consultation with a specialist and/or the relevant authority.
- Monitoring data will be stored in a structured database.
- Data will be interpreted and reports on trends in the data will be compiled on a quarterly basis.
- Both the data and the reports will be kept on record for the life of mine.

As a general comment, if monitoring points become damaged or redundant then they can be replaced with new points.

### 8.2 SURFACE AND GROUNDWATER MONITORING

Surface and groundwater monitoring requirements are indicated in Table 8-1 below will be implemented by Arandis Power. The table below also lists the monitoring frequency and parameters to be monitored. Initially, a large suite of parameters will be monitored; however this list will be reduced once monitoring data shows consistently low concentrations of parameters. It is noted that no permanent surface water bodies or major rivers occur in the project area and rainfall events are very sparse and erratic, therefore surface water sampling will have to take place during and immediately after rainfall events.

**TABLE 8-1: SURFACE AND GROUNDWATER MONITORING**

Monitoring point	Monitoring frequency	Parameter to be monitored
<b>Surface water</b>		
Downstream of site (western boundary)	When rainfall occurs	<ul style="list-style-type: none"> <li>• Major Ions - pH, EC, Ca, Mg, Na, K, Alkalinity/Hardness, SO<sub>4</sub>, Cl, Minor Ions - Amm-N, F, NO<sub>3</sub>, NO<sub>2</sub>,</li> <li>• Free CN Metals - As, Al, Ba, Be, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Se, V, Zn (all dissolved not total)</li> <li>• Organics - BTEX, TPH, Phenol, PAHs, Chlorinated Hydrocarbons</li> </ul>
<b>Groundwater</b>		
Two monitoring boreholes to be established: one upstream and one downstream	Quarterly	<ul style="list-style-type: none"> <li>• Major Ions - pH, EC, Ca, Mg, Na, K, Alkalinity/Hardness, SO<sub>4</sub>, Cl, Minor Ions - Amm-N, F, NO<sub>3</sub>, NO<sub>2</sub>,</li> <li>• Free CN Metals - As, Al, Ba, Be, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Se, V, Zn (all dissolved not total)</li> <li>• Organics - BTEX, TPH, Phenol, PAHs, Chlorinated Hydrocarbons</li> </ul>

In addition, the following will also be monitored:

- Treated wastewater to be used for irrigation will be monitored for quality on a daily basis in order to ensure compliance to the required local and international standard. In addition the volume of wastewater used for irrigation will be monitored on a continuous basis.
- Any plant storm water or site wash that is treated and discharged to the sewer will be monitored for quality on a daily basis in order to ensure compliance to the required local municipality standard. In addition the volume of wastewater discharged to sewer will be monitored on a continuous basis.

### 8.3 WATER BALANCE

The climatic water balance for the site will be updated on an annual basis during the life of the project. This will be done by an appropriately qualified person. Flow meters will be installed in the water circuit to provide actual data on water flows to confirm or amend predictions made in the water balance model. The water balance will be used to check on an on-going basis that the capacity of the dirty water containment facilities is adequate, taking the operational distribution and use of water into account.

#### **8.4 AIR QUALITY MONITORING**

Passive monitoring of ambient SO<sub>2</sub> and NO<sub>2</sub> will be initiated once the proposed thermal power plant is operational on a bi-annual (summer and winter months) basis at the nearest residential area (Arandis) to ensure ground-level concentrations are within the relevant WHO limits. If after two sampling campaigns (one month in summer and one month in winter) the relevant limits are not exceeded, it will not be necessary to continue with the monitoring.

In addition, a PM<sub>10</sub> and TSP monitoring programme will be implemented with input from an air specialist. The collection and analysis of dust fall out must be done in accordance with relevant standards. Data should be analysed and appropriate action taken to correct non-conformances.

#### **8.5 NOISE MONITORING**

A noise monitoring programme will be undertaken at the nearest receptor areas once the project is fully operational to confirm whether noise levels are within the relevant guideline values.

#### **8.6 SOIL MANAGEMENT MONITORING**

Regular inspections of soil stockpiles and rehabilitated areas will be undertaken to ensure that the topsoil management plan is being properly implemented.

#### **8.7 WASTE MANAGEMENT AND DISPOSAL MONITORING**

Regular inspections of all waste handling and management facilities will be undertaken to ensure that the waste management procedures are being properly implemented. The volume and type of waste, and the disposal destination, will be monitored and recorded as required. Safe disposal certificates will be kept on file.

#### **8.8 CARBON FOOTPRINT**

A carbon footprint has been developed as part of the EIA process and will need to be updated on an annual basis in line with acceptable international guidelines.

## 9. PERSONS RESPONSIBLE FOR IMPLEMENTING THE EMP

During the construction phase, the contractors responsible for the engineering, procurement and construction (EPC) of the hybrid Thermal/PV power plant, will be responsible for implementing the requirements of the EMP. This requirement will be included in the respective EPC contracts. During the operational phase, Operations and Maintenance (O&M) contracts will be put in place for the O&M of the plants, which will include the implementation of the EMP.

An Environmental Officer on site will be responsible for co-ordinating the implementation of the EMP.

Other responsibilities will include:

- Inspections and auditing.
- Provide environmental awareness training to all employees and temporary workers.
- Implement the monitoring plan on site.
- Ensure compliance to this EMP.
- Ensure compliance to any authorisations issued to Arandis Power.
- Regular reporting as required by any authorisations issued to Arandis Power.
- Implement and manage the stakeholder complaints and grievance procedure.
- Stakeholder engagement.

At this stage it is envisaged that this department will be headed up by an Environmental Manager.

It should also be noted that any contractors used during any phase of the project will also be responsible for implementing this EMP.

## **10. MONITORING AND AUDITING COMPLIANCE TO THE EMP**

### **10.1 AUDITS AND INSPECTIONS**

The Arandis Power Environmental Officer will conduct internal management audits against the commitments in the EMP. During the construction phase, daily inspections and two-weekly audits will be conducted. In the operational phase, weekly inspections and quarterly audits will be conducted. The audit findings will be documented for both record keeping purposes and for informing continual improvement.

In addition, an independent professional will conduct an EMP performance assessment on annual basis. The Arandis Power's compliance with the commitments of the EMP and the continued adequacy of the EMP relative to the on-site activities will be assessed in this report.

### **10.2 SUBMISSION OF INFORMATION**

Monitoring reports will be provided to the relevant authorities as per permits and authorisations issued by the relevant departments and ministries.

## 11. REFERENCES

**SLR 2012 (EIA)**

**SLR 2012 (EMP)**

**SLR 2014**

**John**

**Theo**

**APPENDIX A: ARANDIS POWER SUSTAINABILITY POLICY**

Arandis Power (Pty) Ltd is an independent power producer based in the Erongo Region in Namibia. We are committed to operating our activities in a responsible manner that meets the needs of the present without compromising the ability of future generations to meet their own needs. To do this we aim to ensure that our business is:

- Economically sound and financially profitable,
- Socially responsible, and
- Operated in a safe and environmentally responsible manner.

Arandis Power is committed to achieving world-class sustainable development and will therefore:

- Incorporate sustainable development principles in all aspect of our business.
- Implement and maintain risk management strategies that take cognisance of sustainable development risks and mitigating procedures.
- Implement and maintain ethical business practices and sound corporate governance processes.
- Implement and maintain an effective and transparent stakeholder engagement process.
- Develop capacity to ensure the future well-being of our employees.
- Safeguard the health and safety of all our stakeholders.
- Promote fundamental human rights.
- Support meaningful and sustainable local community development programmes.
- Ensure continual improvement in environmental performance, specifically in optimising resource utilisation, conserving biodiversity and minimising any negative impacts from our operations on the environment.
- Facilitate and encourage responsible energy use.
- Implement social transformation policies and practices in line with relevant legislation and in the interests of creating a diverse and balanced workforce.

Arandis Power furthermore undertakes to measure, record, independently verify and report on all material sustainable development issues on a regular and transparent basis.

**APPENDIX B: ARANDIS POWER ENVIRONMENTAL POLICY**

Arandis Power (Pty) Ltd is an independent power producer based in the Erongo Region in Namibia. We are committed to operating our activities in a responsible manner to avoid, reduce and/or mitigate our impacts on the environment.

To achieve excellence in environmental performance in a sustainable manner, we are committed to:

- Integrating environmental management our business model.
- Complying with all applicable Namibian policies, regulations and guidelines and where no local legislation exists, adhering to international good practice.
- In our area of impact, identifying and managing significant environmental aspects of our business in order to:
  - optimise resource consumption,
  - protect environmental biodiversity,
  - minimise the social, environmental and economic impacts,
  - minimise the release of effluent,
  - minimise the generation waste,
  - rehabilitate disturbed land where possible,
  - safeguard cultural heritage resources,
  - mitigate our impact on climate change.
- Putting into place an integrated environmental management system and action plans for all significant aspects and set targets in key areas. Progress towards these targets will be monitored and reported on a regular basis to Arandis Power's management, internal and external stakeholders.
- Promoting education, training and motivation of employees to raise their environmental awareness and conduct.
- Sharing information with interested and affected parties to inform them of our environmental performance.
- Integrating risk and closure planning into the project development and management and ensuring that funds are put aside during the project's lifetime to meet our rehabilitation and closure commitments.

This policy and associated objectives and targets will be regularly reviewed to ensure that they adequately reflect our commitment to continually improving our environmental management systems and performance. This policy will be communicated to and applied by all our employees, contractors and suppliers and will be made available to the public.



**RECORD OF REPORT DISTRIBUTION**

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