
PROPOSED BIOMASS CO-FIRING DEMONSTRATION FACILITY AT ARNOT POWER STATION, MPUMALANGA PROVINCE

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

Submitted as part of the Final Basic Assessment Report
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Prepared for

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PROJECT DETAILS

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Title : Environmental Impact Assessment Process
Draft Environmental Management Programme:
Proposed Biomass Co-Firing Demonstration Facility at
Arnot Power Station, Mpumalanga Province

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DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Biomass: Biomass, a renewable energy source, is biological material from living or dead organisms. Biomass is commonly plant matter grown to generate electricity or produce heat, usually by direct incineration. By-products and waste from livestock farming, food processing, and preparation and domestic organic waste, can all form sources of biomass. Although fossil fuels have their origin in ancient biomass, they are not considered biomass by the generally accepted definition because they contain carbon that has been "out" of the carbon cycle for a very long time. The biomass composition depends on the type of biomass, plant species, and part of the plant used, and a host of associated characteristics related to where and how the plant is grown.

Co-Firing: Co-firing refers to the combustion of two different types of materials simultaneously.

Cumulative impacts: The impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that is made up of:

- i. The land, water and atmosphere of the earth;
- ii. Micro-organisms, plant and animal life;
- iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
- iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations, is a systematic process of identifying, assessing and reporting environmental impacts associated with an activity.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management programme: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local

communities, investors, work force, consumers, environmental interest groups, and the public.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

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PURPOSE AND OBJECTIVES OF THE EMP**CHAPTER 1**

An Environmental Management Programme (EMP) is defined as “an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced.”¹. The objective of this EMP is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMP is to ensure compliance with recommendations and conditions recommended through an EIA process, as well as to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMP is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMP provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (i.e. site clearing and site establishment), during the construction activities themselves (i.e. erosion, noise, dust, and visual impacts), during site remediation (i.e. soil stabilisation, re-vegetation), during operation and decommissioning (i.e. similar to construction phase activities). The EMP also defines monitoring requirements in order to ensure that the specified objectives are met.

This EMP has been compiled in accordance with Section 33 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. The EMP has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

¹ Provincial Government Northern Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

This EMP has the following objectives:

- » Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction and rehabilitation, operation, and decommissioning phases of the project in order to manage and minimise the extent of potential environmental impacts associated with the facility
- » Ensure that all the phases of the project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced
- » Identify entities responsible for the implementation of the measures and outline functions and responsibilities
- » Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation
- » Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the Basic Assessment Process

The management and mitigation measures identified within the Basic Assessment process are systematically addressed in this EMP, and ensure the minimisation of adverse environmental impacts to an acceptable level.

Eskom Holdings SOC Limited (Eskom) must ensure that the implementation of the project complies with the requirements of all environmental authorisations and permits (once issued), as well as any obligations emanating from all relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMP and through its integration into the contract documentation for activities associated with both construction and operation. Since this EMP is part of the Basic Assessment Process it is important that this document be read in conjunction with the Basic Assessment Report. This will contextualise the EMP and enable a thorough understanding of its role and purpose in the integrated environmental management process. This EMP will be further supported by the existing Environmental Management System (EMS) already in place at the Arnot Power Station.

Should there be a conflict of interpretation between this EMP and the environmental authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMP, unless otherwise agreed by the authorities in writing. Similarly, any provisions in current legislation overrule any provisions or interpretations within this EMP.

PROJECT DETAILS

CHAPTER 2

Eskom Holdings SOC Limited (Eskom) is proposing the establishment of biomass co-firing facility for demonstration purposes at the existing coal-fired Arnot Power Station located approximately 50 km east of Middleburg in the Mpumalanga Province (refer to Figure 1.1). This station has a nominal base load generation capacity of 2 400 MW, generated from six units, each with a nominal capacity of approximately 400 MW. Eskom is proposing the substitution of a limited amount of coal with biomass (white wood pellets) as a co-firing fuel source. These wood pellets are proposed to be sourced from a suitable source, as determined through a competitive bidding process. Potential sources have been identified in Mpumalanga, KwaZulu-Natal and the Eastern Cape. The wood pellets will be transported to the power station by road or rail, depending on the source selected. This project is considered a pilot exercise which will form part of Eskom's initiatives towards the reduction of their non-renewable carbon footprint.

The proposed project will be developed and implemented within the existing footprint of Arnot Power Station (i.e. it is a brownfields project). Two milling process options are to be considered within the Basic Assessment process, i.e.:

1. **Co-milling** of biomass and coal within the existing coal mills which will be fed into three of the units. This process will result in replacement of 5% of coal with biomass at three (3) units; and
2. **Separate milling** of coal and biomass which will be fed into only one of the units. This process will result in replacement of 10% of coal with biomass at one (1) unit.

Eskom propose that both of these methods be implemented to facilitate the phasing in of the biomass substitution within the power station. Due to time and infrastructure constraints, co-milling will initially be implemented, and will eventually be replaced by separate milling. Should the biomass not be available for any reason, the power station would continue being operated on 100% coal.

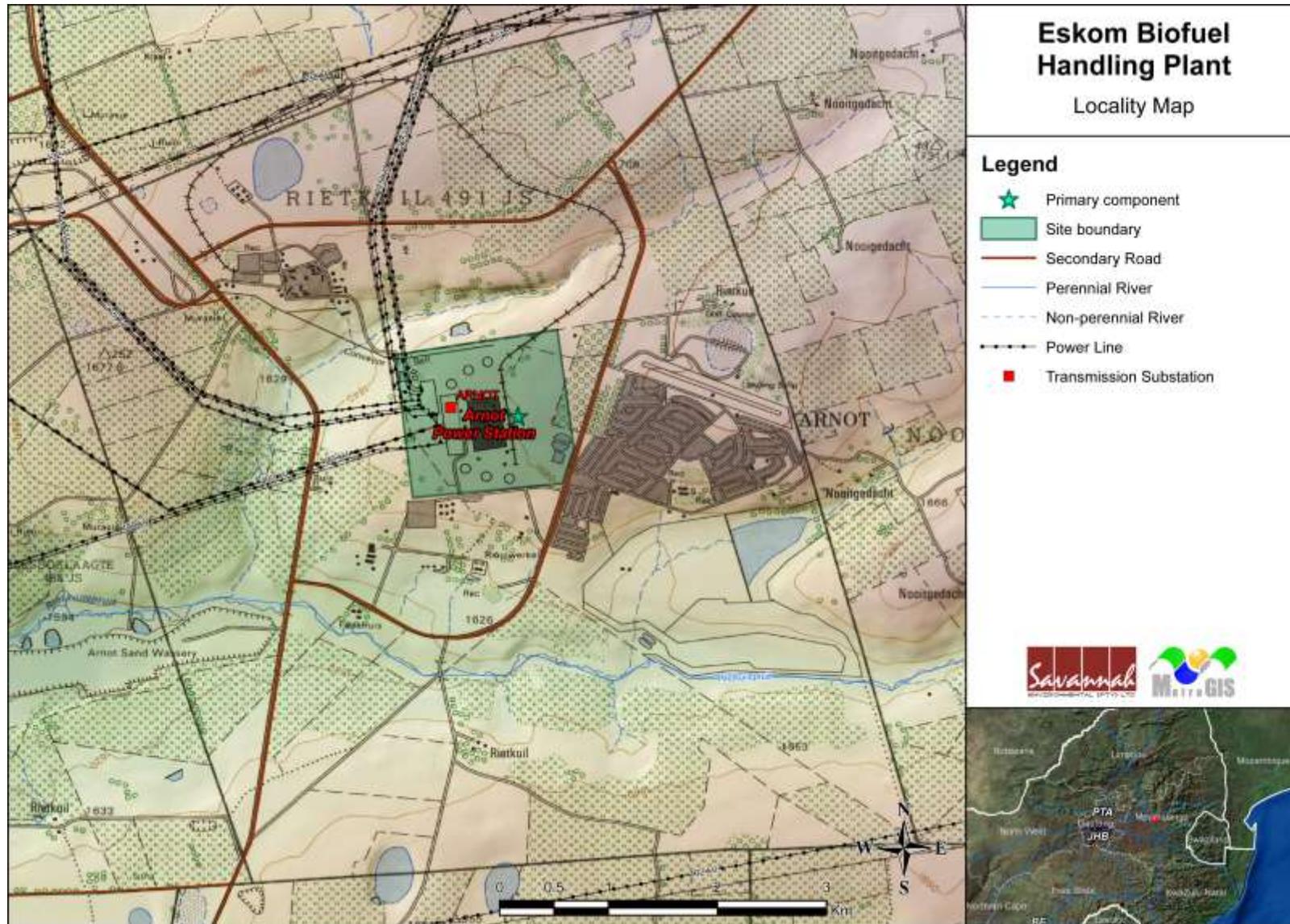


Figure 1.1: Locality map showing the location of the Arnot Power Station in the Mpumalanga Province

The flow of biomass at the power station from the point of delivery to the point of entering the boiler is proposed as follows:

1. Access the plant via the coal delivery gate
2. Traverse across coal weighbridge
3. Off loading building
4. Convey to screening plant
5. Convey to Storage Silo

From this point, the following is applicable for the two milling options:

Co-milling:

- a) From storage silo to existing mill coal conveyor.
- b) From conveyor to coal bunker to existing coal milling plant
- c) From milling plant pneumatic transport to the boiler

Separate milling:

- a) Convey to Day Bin
- b) From Day bin to milling plant
- c) From milling plant pneumatic transport to the boiler

The associated infrastructure required as part of the demonstration facility will include:

- » *Roads* - existing roads and infrastructure will be used as far as possible. However, upgrading of internal existing roads and an additional new road portion will be constructed to enable the delivery of the biomass fuel. It is proposed that the existing gravel road, within the station boundaries, be extended for a distance of approximately 300 m (surface area of 8 m wide road - max 2400 m²) leading up to the off-load facility. The road is also extended into a loop system around the off loading facility. The loop road will be 4m wide and an estimate length of 500m (surface area of 4 m wide road - max 2000 m²). The proposed new portions of road will be tarred.
- » *Other infrastructure* - The construction of new buildings, conveyors and other infrastructure within the power station footprint will also be required in order to accommodate the biomass transportation, milling and temporary storage for separate milling.
- » *Storage* - Two metal storage silos are currently proposed. The first silo is the storage silo and the second is the day bin. Both are similar capacity of between 8 - 12 hours, but would have different discharge equipment. The storage silo is proposed to be located close to the current coal stockpile area,

and the day bin is proposed to be located adjacent to the boiler house above the milling plant. The two are linked by a conveyor of 200-300 m.

- » *Electricity supply* - power would be required for the delivery system, storage facility and screening plant required for the biomass transportation, milling and temporary storage. New transformers are likely to be required (i.e. bigger than 33 kVA), the existing switchgear rooms within the power station will need to be expanded, and a new switchgear room will be required at the offloading plant.
- » *Water* - supply for all activities will be sourced from the existing water allocation to Arnot Power Station (i.e. the station will share its water allocation among all operations).
- » *Waste disposal* - the biomass ash will be mixed with coal ash and disposed by means of the existing Arnot ash disposal system. Other waste associated with the proposed development (such as construction waste) will be disposed of in compliance with the power station's existing waste management procedures and processes.

2.1. Potential Environmental Impacts

In terms of the findings of the Basic Assessment Report, various planning, construction, and operation-related environmental impacts were identified, including:

- » Dust creation and air quality impacts
- » Job creation
- » Waste creation

STRUCTURE OF THIS EMP

CHAPTER 3

The first two chapters provide background to the EMP and the proposed project, while the chapters which follow consider the following:

- » Key legislation applicable to the development
- » Planning and design activities
- » Construction activities
- » Operation activities
- » Decommissioning activities

These chapters set out the procedures necessary for Eskom, as the project developer, to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation for the Biomass Co-Firing Demonstration Facility, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The management programme has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions, monitoring requirements and performance indicators. A specific EMP table has been established for each environmental objective. The information provided within the EMP table for each objective is illustrated below:

OBJECTIVE: Description of the objective, which is necessary to meet the overall goals; which take into account the findings of the Basic Assessment specialist studies

| | |
|-------------------------------------|--------------------------------------------------------------------------|
| Project Component/s | » List of project components affecting the objective. |
| Potential Impact | » Description of potential environmental impact if objective is not met. |
| Activity/Risk Source | » Description of activities which could affect achieving objective. |
| Mitigation: Target/Objective | » Description of the target and/or desired outcomes of mitigation. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------|
| List specific action(s) required to meet the mitigation target/objective described above | Who is responsible for the measures? | Time periods for implementation of measures |

| | |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Performance Indicator | Description of key indicator(s) that track progress/indicate the effectiveness of the management programme. |
| Monitoring | Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting. |

The objectives and EMP tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

- » Planned activities change (i.e. in terms of the components and/or layout of the facility)
- » Modification to or addition to environmental objectives and targets
- » Additional or unforeseen environmental impacts are identified.
- » Relevant legal or other requirements are changed or introduced
- » Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc

3.1. Project Team

This draft EMP was compiled by:

| | Name | Company |
|-----------------------|------------------------------------------------------------------------------------|---------------------------------|
| EMP Compilers: | Tammy Kruger – Environmental Assessment Practitioner (EAP) Jo Anne Thomas – EAP | Savannah Environmental |
| Specialists: | Dr. Mark Zunckel | uMoya-NILU Consulting (Pty) Ltd |
| | Lourens du Plessis – visual aesthetics | MetroGIS (Pty) Ltd |

Savannah Environmental was contracted by Eskom Holdings SOC Limited as an independent consultant to compile the EMP for the proposed project, as required by the NEMA EIA Regulations. The Savannah Environmental team have extensive knowledge and experience in environmental impact assessment and environmental management, having been involved in EIA processes over the past ten (10) years. They have managed and drafted Environmental Management Plans for a number of power generation projects throughout South Africa.

KEY ENVIRONMENTAL LEGISLATION APPLICABLE TO THE DEVELOPMENT

CHAPTER 4

The following legislation and guidelines have informed the scope and content of this EMP Report:

- » National Environmental Management Act (Act No 107 of 1998)
- » EIA Regulations, published under Chapter 5 of the NEMA (GNR R545, GNR 546 in Government Gazette 33306 of 18 June 2010, as amended)
- » Guidelines published in terms of the NEMA EIA Regulations, in particular:
 - * Companion to the National Environmental Management Act (NEMA) EIA Regulations of 2010 (Draft Guideline; DEA, 2010)
 - * Integrated Environmental Management Information Series (published by DEA)
- » The Equator Principles

Several other Acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the Basic Assessment Report. A review of legislative requirements applicable to the proposed project is provided in the table that follows.

Table 4.1: Relevant legislative and permitting requirements applicable to the establishment of the Biomass Co-Firing Demonstration Facility

| Legislation | Applicable Sections |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| National Legislation | |
| National Environmental Management Act (Act No 107 of 1998) | <ul style="list-style-type: none"> » National environmental principles (S2), providing strategic environmental management goals, and objectives of the government applicable throughout the Republic to the actions of all organs of state that may significantly affect the environment. » The requirement for potential impact on the environment of listed activities must be considered, investigated, assessed, and reported on to the competent authority (S24 – Environmental Authorisations). » Duty of Care (S28) requiring that reasonable measures are taken to prevent pollution or degradation from occurring, continuing or recurring, or, where this is not possible, to minimise and rectify pollution or degradation of the |

| Legislation | Applicable Sections |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <p>environment.</p> <ul style="list-style-type: none"> » Procedures to be followed in the event of an emergency incident which may affect on the environment (S30). |
| <p>Environment Conservation Act (Act No 73 of 1989)</p> | <ul style="list-style-type: none"> » National Noise Control Regulations (GN R154 dated 10 January 1992). |
| <p>National Heritage Resources Act (Act No 25 of 1999)</p> | <ul style="list-style-type: none"> » Stipulates assessment criteria and categories of heritage resources according to their significance (S7). » Provides for the protection of all archaeological and palaeontological sites (S35). » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38). » Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44). |
| <p>National Environmental Management: Air Quality Act (Act No 39 of 2004)</p> | <ul style="list-style-type: none"> » Measures in respect of dust control (S32) – no regulations promulgated yet. » Measures to control noise (S34) - no regulations promulgated yet. » Regulate air emissions from defined activities and the National Ambient Air Quality Standards (Republic of South Africa, 2009). |
| <p>National Water Act (Act No 36 of 1998)</p> | <ul style="list-style-type: none"> » National Government is the public trustee of the Nation’s water resources (S3). » Entitlement to use water (S4) – entitles a person to use water in or from a water resource for purposes such as reasonable domestic use, domestic gardening, animal watering, fire fighting, and recreational use, as set out in Schedule 1. General Authorisation Government Gazette No. 20526 8 October 1999 is of relevance. » Duty of Care to prevent and remedy the effects of pollution to water resources (S19) » Procedures to be followed in the event of an emergency incident which may impact |

| Legislation | Applicable Sections |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <p>on a water resource (S20).</p> <ul style="list-style-type: none"> » Definition of water use and requirement for water use licenses for certain activities (S21) » Requirements for registration of water use (S26 and S34). » Definition of offences in terms of the Act (S151). |
| National Environmental Management: Waste Act (Act No 59 of 2008) | <ul style="list-style-type: none"> » The purpose of this Act is to reform the law regulating waste management in order to protect health and the environment by providing for the licensing and control of waste management activities. » List activities which require waste licensing. |

GENERAL CONDITIONS OF THE EMP

CHAPTER 5

The following general conditions apply to the implementation of this EMP:

- » This EMP shall be binding on all the parties involved in the construction and operational phases and shall be enforceable at all levels of contract and operational management within the project.
- » The EMP shall be deemed a binding commitment by the parties to act within the intent and spirit of sound environmental management and to cooperate and enforce the specifications contained therein, as and where necessary.
- » The EMP recognises and enables the force of law attached to environmental aspects of the project and shall be implemented accordingly.
- » Work shall be approached with due concern for the natural and social environment. Management and site procedures shall be directed towards minimising environmental impact and / or damage in all aspects of the work.
- » Archaeological remains, artificial features and structures older than 60 years are protected by the National Heritage Resources Act, Act 25 of 1999. Should any archaeological artefact, unmarked human burials or heritage resources be exposed during excavation for the purpose of laying foundations or site clearing and levelling, construction in the vicinity of the finding shall be stopped. An archaeologist shall be called to the site for inspection and the South African Heritage Agency advised accordingly. Under no circumstance may artefacts be destroyed or removed from the site without the appropriate consent.
- » Water for operational purposes shall only be sourced from existing sources within the power station. The gaining of water for operational purposes must comply at all times with the permitting and licence requirements of the Department of Water Affairs (DWA). Abstraction of water from a stream or river, if required, requires specific approval and may not be undertaken without the appropriate consents being in place.
- » General waste shall be disposed of at an appropriate registered landfill site.
- » Waste during construction and operation shall be managed in terms of the existing systems in place at the Arnot Power Station.
- » Any blasting work required shall be carried out entirely within the provisions of the Explosives Act, Act 26 of 1956 and all other relevant engineering and safety standards.
- » Execution of work falling within the ambit of this EMP and Environmental Specifications shall be carried out in accordance with Method Statements. A method statement is a written submission by the Contractor to the Resident Engineer (RE) setting out the plant, materials, labour, timing and method the Contractor proposes using to carry out an activity. It must be in sufficient detail that the RE and Environmental Control Officer (ECO) are able to assess

whether the Contractor's proposal is in accordance with the EMP and its specification and will produce results in accordance with the intent of the specifications. The RE, ECO and Contractor's Environmental Representative (CER) should agree on the method statements, and to performance thereto.

- » The RE or a designated Project Manager may, at his / her sole discretion, stop any work, activity or process that is not in accordance with this directive.
- » This EMP should be considered a dynamic document, requiring regular review and updating as new information becomes available in order for it to remain relevant to the requirements of the site and the environment. Any changes to the EMP must be approved by DEA.
- » All site activities shall be conducted in accordance with the objectives and procedures set out in the relevant Eskom Safety and Environmental Management Systems.
- » Project and Site Management personnel shall furthermore establish appropriate management structures, liaison and communication forums to integrate all construction activities into existing safety programmes.
- » A complaints register shall be maintained during the construction phase, in which any complaints from the community shall be logged. Complaints shall be investigated and acted upon appropriately.
- » An incident reporting system shall be put in place to record non-conformances to the EMP. Any appropriate incident reporting system in place at the power station could be used for this purpose.

MANAGEMENT PROGRAMME: PLANNING AND DESIGN CHAPTER 6

Overall Goal: Undertake the planning and design phase in a way that:

- » Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
- » Ensures that adequate regard has been taken of any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
- » Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

6.1. Objectives

OBJECTIVE: Ensure the facility design responds to identified environmental constraints and opportunities

| | |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project Component/s | » Biomass facility and associated infrastructure. |
| Potential Impact | » Impact on identified sensitive areas. |
| Activities/Risk Sources | » A facility that does not respond to environmental and technical sensitivities that have been identified. |
| Mitigation: Target/Objective | » The design of the facility responds to the identified environmental constraints and opportunities. » Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------|
| Undertake a geotechnical pre-construction survey. | Geotechnical specialist | Design |
| Obtain any additional environmental permits required. | Eskom | Project planning |
| Consider and incorporate design level mitigation measures recommended by the specialists as detailed within the Basic Assessment Report and specialist air quality report contained within Appendix D of this BAR. | Engineering design consultant, and Eskom | Design review |

| Mitigation: Action/Control | Responsibility | Timeframe |
|-----------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| Ensure the design of the facility complies with the power station's existing storm water management plan. | Eskom | Design |
| The terms of this EMP and the Environmental Authorisation (once issued) must be included in all tender documentation. | Eskom | Tender process |

| | |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Performance Indicator | <ul style="list-style-type: none"> » The design meets the objectives and does not degrade the environment. » Design and layouts respond to the mitigation measures and recommendations in the Basic Assessment Report. |
| Monitoring | <ul style="list-style-type: none"> » Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction. |

OBJECTIVE: Minimise stormwater runoff

| | |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Project Component/s | <ul style="list-style-type: none"> » Stormwater management components. » Any hard engineered surfaces |
| Potential Impact | <ul style="list-style-type: none"> » Poor stormwater management and subsequent erosion. |
| Activities/Risk Sources | <ul style="list-style-type: none"> » Construction of the facility (i.e. placement of hard engineered surfaces). |
| Mitigation: Target/Objective | <ul style="list-style-type: none"> » Appropriate management of stormwater to minimise impacts on the environment. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|-----------------------------------------------------------------------------------------------------------------|----------------|----------------------------|
| Update the existing stormwater management plan to include the biomass facility site. | Eskom | Planning and design |
| Reduce the potential increase in surface flow velocities through appropriate design of the facility. | Eskom | Planning and design |
| Suitable handling of stormwater within the site (i.e. separate clean and dirty water streams around the plant). | Eskom | Construction and operation |

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| Performance Indicator | <ul style="list-style-type: none"> » Sound water quality and quantity management (i.e. as per station's existing Water Use Licence Conditions). |
| Monitoring | <ul style="list-style-type: none"> » Surface water quality monitoring plan. |

MANAGEMENT PROGRAMME: CONSTRUCTION

CHAPTER 7

Overall Goal: Undertake the construction phase in a way that:

- » Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
- » Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, traffic and road use, and effects on local residents.
- » Establishes an environmental baseline during construction activities on the site, where possible.

7.1. Institutional Arrangements: Roles and Responsibilities for the Construction Phase

As the proponent, Eskom must ensure that the implementation of the facility complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMP, and the implementation of the EMP through its integration into the contract documentation. Eskom will retain various key roles and responsibilities during the construction of the facility.

OBJECTIVE: Establish clear reporting, communication, and responsibilities in relation to overall implementation of the EMP

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Safety, Health and Environment Representative; Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below. The figure below provides a schematic overview of the lines of reporting.

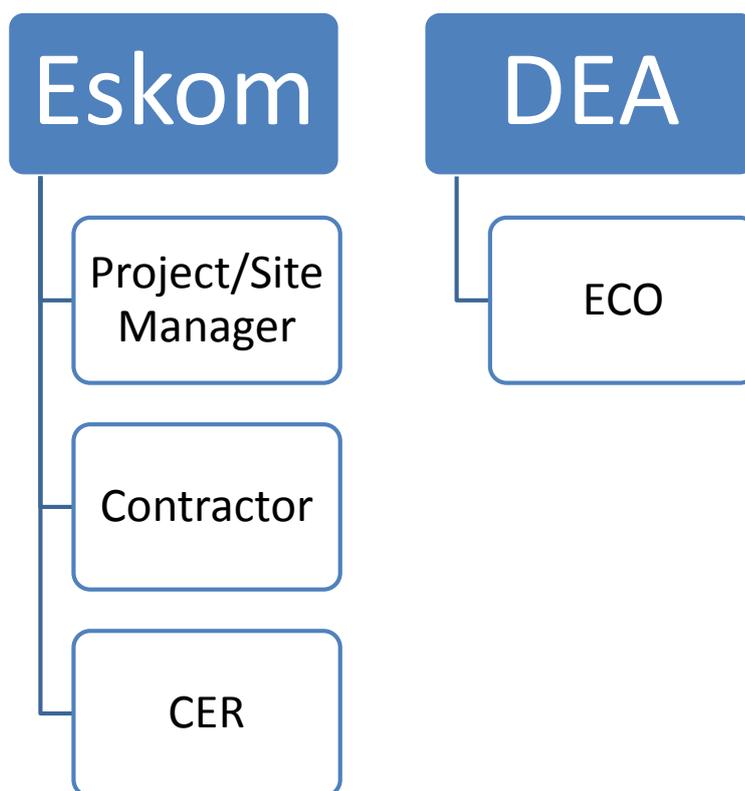


Figure 7.1: Hierarchy of personnel

Project/Site Manager will:

- » Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- » Ensure that Eskom and its Contractor(s) are made aware of all stipulations within the EMP.
- » Ensure that the EMP is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
- » Be fully conversant with the Basic Assessment Report for the project, the EMP, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.
- » Have overall responsibility of the EMP and its implementation.
- » Conduct audits to ensure compliance to the EMP.
- » Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
- » Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
- » Confine activities to the demarcated construction site.

Environmental Control Officer (ECO) will be an independent party responsible for monthly monitoring, reviewing, and verifying compliance by the Contractor with the environmental specification and accordingly will:

- » Be fully knowledgeable with the contents with the Basic Assessment Report.
- » Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents with the EMP.
- » Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- » Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
- » Ensure that the compliance of the EMP is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that if the EMP conditions or specifications are not followed then appropriate measures are undertaken to address this.
- » Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
- » Ensure approval of construction methods and method statements by the Project Manager.
- » Ensure that activities on site comply with all relevant environmental legislation.
- » Ensure that the compilation of progress reports during the construction phase for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
- » Ensure that there is communication with the Site Manager regarding the monitoring of the site.
- » Ensure that any non-compliance and/or remedial measures that need to be applied to address non-compliance are reported.
- » Independently report to DEA in terms of compliance with the specifications of the EMP and conditions of the Environmental Authorisation (once issued).

7.2. Objectives

In order to meet the overall goal for construction (as detailed at the beginning of this chapter of the EMP), the following objectives, actions, and monitoring requirements have been identified.

OBJECTIVE: Minimise impacts related to inappropriate site establishment

The site manager must take all reasonable measures to ensure the safety of Eskom staff and community members in the surrounding area. Where they could be exposed to danger by any of the works or site activities, suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, must be provided by the site manager.

All unattended open excavations shall be adequately demarcated and/or fenced (fencing shall consist of a minimum of three strands of wire wrapped with danger tape). Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.

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| Project Component/s | » Biomass facility and associated infrastructure. |
| Potential Impact | » Hazards to Eskom staff and surrounding community members. |
| Activities/Risk Sources | » Movement of construction vehicles in the area and on-site. » Open excavations. |
| Mitigation: Target/Objective | » To secure the construction site against unauthorised entry. » To protect Eskom members of staff and community members. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------------------------|
| Fence and secure site, working areas and excavations in an appropriate manner, as agreed with the ECO and detailed in an approved site plan. | Contractor | Site establishment |
| All development footprints should be appropriately fenced off and clearly demarcated. | Contractor | Site establishment |
| Control access to the site to ensure entry by authorised personnel only. | Contractor | Duration of construction |
| Establish appropriately bunded areas for storage of hazardous materials. | Contractor | Site establishment |
| If not able to utilise existing facilities at Arnot Power Station, establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site as determined by the ECO. | Contractor, and ECO | Site establishment, and duration of construction |
| Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including water courses, wetlands. | Contractor | Site establishment, and duration of |

| Mitigation: Action/Control | Responsibility | Timeframe |
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| | | construction |
| Supply adequate waste collection bins at site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling. | Contractor | Site establishment, and duration of construction |

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| Performance Indicator | <ul style="list-style-type: none"> » Site is secure and there is no unauthorised entry. » No members of staff or the community are injured. » Appropriate and adequate waste management and sanitation facilities (if required) provided at construction site. |
| Monitoring | <ul style="list-style-type: none"> » An incident reporting system will be used to record non-conformances to the EMP. » ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances will be immediately reported to the site manager. |

OBJECTIVE: Appropriate management of the construction site and construction workers

Construction equipment will need to be stored at appropriate locations on site. The on-site workforce must commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation (once issued), the Basic Assessment Report, and this EMP, as well as the requirements of all relevant environmental legislation.

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| Project Component/s | » Biomass facility and associated infrastructure. |
| Potential Impact | <ul style="list-style-type: none"> » Damage to and/or loss of topsoil (i.e. pollution, compaction etc). » Pollution/contamination of the environment. |
| Activities/Risk Sources | <ul style="list-style-type: none"> » Access to and from the equipment storage area/s. » Ablution facilities. » Contractors not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment. |
| Mitigation: Target/Objective | <ul style="list-style-type: none"> » Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding |

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| | <p>environment.</p> <ul style="list-style-type: none"> » Minimise any impacts on the current power station operational activities |
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| Mitigation: Action/Control | Responsibility | Timeframe |
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| The siting of the construction equipment camp/s will take cognisance of existing activities/operations within the power station footprint. The location of this construction equipment camp/s shall be approved by the project ECO. | Contractor | Pre-construction |
| Ensure waste removal facilities are maintained and emptied as and when required in line with the station's waste management practices. | Contractor | Site establishment, and duration of construction |
| Ensure that all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training by the contractor for all personnel. Records of all training undertaken must be kept. | Contractor | Prior to construction & updates/ refresher training for duration of construction |
| Cooking/meals must take place in a designated area. | Contractor and sub-contractor/s | Duration of contract |
| All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste. | Contractor and sub-contractor/s | Duration of contract |
| Fire fighting equipment and training provided before the construction phase commences. | Contractor and sub-contractor/s | Duration of contract |
| Contractors need to comply with the relevant Eskom Code of Conduct. | Contractor and sub-contractor/s | Construction |

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| Performance Indicator | <ul style="list-style-type: none"> » The construction equipment camps have taken cognisance of the operational activities of the power station. » Ablution and waste removal facilities are appropriately maintained. » Correct management of complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. |
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| Monitoring | <ul style="list-style-type: none"> » Regular audits of the construction camps and areas of construction on site by the ECO. » Proof of disposal of sewage at an appropriate waste water treatment works (if applicable). » An incident reporting system should be used to record non-conformances to the EMP. » Observation and supervision of Contractor practices throughout construction phase by the ECO. » Complaints will be investigated and, if appropriate, acted upon. |
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OBJECTIVE: Management of dust and air emissions

For construction and decommissioning of the infrastructure for the biomass receipt, storage, milling and mixing, the impacts on ambient air quality concern particulate matter only. The impacts are expected to be of a nuisance nature only, and will be limited to less than 500m from the source and may affect Rietkuil. The impacts have a low significance.

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| Project Component/s | <ul style="list-style-type: none"> » Construction activities associated with the proposed facility. » Vehicle movements in and around the site. |
| Potential Impact | <ul style="list-style-type: none"> » Dust and particulates from vehicle movement to, from and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility. » Release of minor amounts of air pollutants (for example NO₂, CO and SO₂) from vehicles and construction equipment. |
| Activities/Risk Sources | <ul style="list-style-type: none"> » Clearing of vegetation and topsoil. » Excavation, grading, scraping, levelling, digging. » Transport of materials, equipment, and components on internal access roads. » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces. » Fuel burning vehicle and construction equipment. |
| Mitigation: Target/Objective | <ul style="list-style-type: none"> » To ensure emissions from all vehicles and construction equipment are minimised, where possible, for the duration of the construction phase. » To minimise nuisance to the nearby community and surrounding landowners from dust emissions. » To comply with workplace health and safety requirements for the duration of the construction and operation phase. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------|
| Roads must be maintained to a manner that will ensure that nuisance to the community from dust emissions from road or vehicle sources are not visibly excessive, as determined by the Project Manager and ECO. | Contractor Project Manager ECO | Site establishment and construction |
| Ensure that any damage to roads because of construction activities is repaired before completion of the construction phase. | Contractor | Site establishment and construction |
| An appropriate dust suppressant must be applied on all exposed areas as required to minimise/control airborne dust. | Contractor | Duration of contract |
| Haul vehicles moving outside the construction site carrying material that can be wind-blown must be covered with tarpaulins. | Contractor | Duration of contract |
| Speed of construction vehicles on site must be restricted, as defined by Eskom policy. | Contractor | Duration of contract |
| Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if visible dust is blowing toward nearby residences outside the site. | Contractor | Duration of contract |
| Vehicles and equipment must be maintained in a road-worthy condition at all times. | Contractor | Duration of contract |
| Limit drop heights for loading and tipping construction material, etc. | Construction Project Manager | During construction |
| Load and unload in areas protected from wind where possible | Construction Project Manager | During construction |
| Wet or cover stockpiles of construction material. | Construction Project Manager | During construction |
| Rehabilitate open areas after construction in an area is completed. | Construction Project Manager | During construction |

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| Performance Indicator | <ul style="list-style-type: none"> » No complaints from affected residents or community regarding dust or vehicle emissions. » Dust suppression measures implemented for all gravel roads. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis. |
| Monitoring | <p>Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods:</p> <ul style="list-style-type: none"> » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. |

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| | <ul style="list-style-type: none"> » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP. |
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OBJECTIVE: Traffic management and transportation of equipment and materials to site

The construction phase of the project will be the most significant in terms of generating traffic impacts; resulting from the transport of equipment and materials to the site and the return of the vehicles after delivery of materials.

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| Project component/s | <ul style="list-style-type: none"> » Construction activities associated with the proposed facility. » Vehicle movements in and around the site. |
| Potential Impact | <ul style="list-style-type: none"> » Traffic congestion, particularly on narrow roads where overtaking is not permitted. » Risk of accidents. » Deterioration of road pavement conditions (both surfaced and gravel road). |
| Activity/risk source | <ul style="list-style-type: none"> » Site preparation and earthworks. » Transportation of equipment and materials. » Mobile construction equipment movement on-site. |
| Mitigation: Target/Objective | <ul style="list-style-type: none"> » To minimise impact of traffic associated with the construction of the facility on local traffic. » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction. |

| Mitigation: Action/control | Responsibility | Timeframe |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------|
| The designated access to the proposed site within the power station must be used by all vehicles to ensure safe entry and exit. | Contractor | Pre-construction |
| Approved access routes on site shall be used. | Contractor | Duration of contract |
| Hazardous road conditions shall be communicated to Contractors and material delivery drivers, especially when new to the site and its surroundings. | Contractor (or appointed transportation contractor) | Pre-construction |
| Signage shall be established at appropriate points warning of turning traffic and the construction site (all | Contractor | Duration of contract |

| Mitigation: Action/control | Responsibility | Timeframe |
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| signage to be in accordance with prescribed standards). | | |
| Appropriate maintenance of all construction vehicles shall be ensured. | Contractor | Duration of contract |

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| Performance Indicator | <ul style="list-style-type: none"> » No traffic incidents involving Eskom personnel or appointed contractors or public. » Appropriate signage in place. » No complaints resulting from traffic congestion, delays or driver negligence associated with construction of the facility. |
| Monitoring | <ul style="list-style-type: none"> » Visual monitoring of dust produced by traffic movement by ECO and RE. » Visual monitoring of traffic control measures to ensure they are effective by ECO and RE. » An incident reporting system will be used to record non-conformances to the EMP. |

OBJECTIVE: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

- » Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere.
- » Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.), which will also lead to accelerated erosion.
- » Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities, which will affect soil forming processes and associated ecosystems.

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| Project Component/s | » Biomass facility and associated infrastructure. |
| Potential Impact | <ul style="list-style-type: none"> » Soil degradation. » Soil erosion. » Increased run-off over the site. |
| Activities/Risk Sources | <ul style="list-style-type: none"> » Excavation, stockpiling, compaction, and pollution of soil. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity. |
| Mitigation: Target/Objective | <ul style="list-style-type: none"> » Minimise extent of disturbance areas. » Minimise activity within disturbance areas. » Minimise soil degradation (mixing, wetting, compaction, etc). » Minimise soil erosion. |

» Minimise instability of embankments/excavations.

| Mitigation: Action/Control | Responsibility | Timeframe |
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| Identify disturbance areas and restrict construction activity to these areas. | Contractor | Before and during construction |
| Stabilise disturbed areas as soon as practicable when construction in an area is complete. | Contractor | During and after construction |
| Upgrading and extension of access roads within the site to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil. | Engineer/ECO/ Contractor | Design and construction |
| Soil conservation: Stockpile topsoil for re-use in rehabilitation phase, protect stockpile from erosion | Contractor | Before and during construction |
| Control depth of excavations and stability of cut faces/sidewalls. | Engineer/ECO/ Contractor | Before construction and Maintenance Duration of contract |

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| Performance Indicator | <ul style="list-style-type: none"> » No activity outside demarcated disturbance areas. » Acceptable level of activity within disturbance areas, as determined by the ECO. » Acceptable level of soil erosion around site, as determined by the ECO. » Acceptable state of excavations, as determined by the ECO. » No activity in restricted areas. |
| Monitoring | <ul style="list-style-type: none"> » Monthly inspections of the site by the ECO. » Monthly inspections of sediment control devices. » An incident reporting system will record non-conformances. |

OBJECTIVE: Appropriate handling and management of waste

The construction of the proposed facility will involve the generation of some construction waste. In order to manage the wastes effectively, guidelines for the assessment, classification, and management of wastes, along with industry principles for minimising construction wastes must be implemented. The main wastes expected to be generated include:

- » General solid waste
- » Liquid waste (including grey water and sewage)

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| Project Component/s | » Biomass facility and associated infrastructure. |
| Potential Impact | <ul style="list-style-type: none"> » Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices. |
| Activity/Risk Source | <ul style="list-style-type: none"> » Packaging. » Other construction wastes. » Hydrocarbon use and storage. » Spoil material from excavation, earthworks and site preparation. |
| Mitigation: Target/Objective | <ul style="list-style-type: none"> » To comply with waste management legislation. » To minimise production of waste. » To ensure appropriate waste storage and disposal. » To avoid environmental harm from waste disposal. » A waste manifest should be developed for the ablutions showing proof of disposal of sewage at appropriate water treatment works. |

| Mitigation: Action/Control | Responsibility | Timeframe |
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| Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities. | Contractor | Duration of contract |
| Construction contractors must adhere to Arnot's waste management plan and procedure to deal with all waste streams. | Contractor | Duration of contract |
| Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control. | Contractor | Duration of contract |
| Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.). | Contractor | Duration of contract |
| Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors. | Contractor | Duration of contract |

| Mitigation: Action/Control | Responsibility | Timeframe |
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| Uncontaminated waste must be removed at least weekly for disposal; other wastes will be removed for recycling/ disposal at an appropriate frequency. | Contractor | Duration of contract |
| Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area. | Contractor | Duration of contract |
| Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated and licensed for their disposal. | Contractor | Duration of contract |
| Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time. | Contractor | Duration of contract |
| Upon the completion of construction, the area must be cleared of potentially polluting materials. | Contractor | Completion of construction |

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| Performance Indicator | <ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams. |
| Monitoring | <ul style="list-style-type: none"> » Observation and supervision of waste management practices throughout construction phase. » Waste collection must be monitored on a regular basis. » Waste documentation completed. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMP. |

OBJECTIVE: Appropriate handling and storage of chemicals, hazardous substances

The construction phase will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents.

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| Project Component/s | » Storage and handling of chemicals, and hazardous substances. |
| Potential Impact | » Release of contaminated water from contact with spilled |

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| | chemicals » Generation of contaminated wastes from used chemical containers |
| Activity/Risk Source | » Vehicles associated with site preparation and earthworks. » Construction activities. » Hydrocarbon use and storage. |
| Mitigation: Target/Objective | » Ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------|
| Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants. | Contractor | Duration of contract |
| Corrective action must be undertaken immediately if a complaint is received, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. | Contractor | Duration of contract |
| In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents. | Contractor | Duration of contract |
| Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site. | Contractor | Duration of contract |
| Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility. | Contractor | Duration of contract |
| Routine servicing and maintenance of vehicles must not take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils. | Contractor | Duration of contract |
| All stored fuels to be maintained within a bund and on a sealed surface. | Contractor | Duration of contract |
| Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function. | Contractor | Duration of contract |
| Construction machinery must be stored in an appropriately sealed (cemented or lined) area. | Contractor | Duration of contract |
| Oily water from bunds at the substations must be removed from site by licensed contractors or managed | Contractor | Duration of contract |

| Mitigation: Action/Control | Responsibility | Timeframe |
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| in line with station's management procedures. | | |
| The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files. | Contractor | Duration of contract |
| Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with. | Contractor | Duration of contract |
| Transport of all hazardous substances must be in accordance with the relevant legislation and regulations | Contractor | Duration of contract |
| Upon the completion of construction, the area must be cleared of potentially polluting materials. | Contractor | Completion of construction |
| Where concrete is batched on site, all mixing shall take place in a contained area such that there is no runoff of contaminated water from the batching / mixing area into the environment. Such effluent shall be collected, sediment or solids settled and water recycled where possible. Cement sludge shall be properly disposed of. | Contractor | Construction |

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| Performance Indicator | <ul style="list-style-type: none"> » No chemical spills outside of designated storage areas. » No untreated water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping. |
| Monitoring | <ul style="list-style-type: none"> » Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register must be maintained, in which any complaints from the community will be logged. » An incident reporting system will be used to record non-conformances to the EMP. |

7.3. Detailing Method Statements

OBJECTIVE: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMP will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Project Manager and ECO.

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications". The Method Statement must cover applicable details with regard to:

- » Construction procedures;
- » Materials and equipment to be used;
- » Getting the equipment to and from site;
- » How the equipment/material will be moved while on-site;
- » How and where material will be stored;
- » The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- » Timing and location of activities;
- » Compliance/non-compliance with the Specifications, and
- » Any other information deemed necessary by the Site Manager.

The Contractor may not commence the activity covered by the Method Statement until it has been approved, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

7.4. Awareness and Competence: Construction Phase of the Biomass Co-Firing Demonstration Facility

OBJECTIVE: Ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Contractors obligations in this regard include the following:

- » Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » Ensuring that a copy of the EMP is readily available on-site, and that all site staff are aware of the location and have access to the document.
- » Employees will be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
- » Employees must undergo training for the operation and maintenance activities associated with a facility of this nature and have a basic knowledge of the potential environmental impacts that could occur and how they can be minimised and mitigated.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course.
- » The course should be sufficient to provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Awareness of any other environmental matters, which are deemed necessary by the ECO.
- » Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) are erected at prominent locations throughout the site.
- » Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, management of waste.
- » Records must be kept of those that have completed the relevant training.

- » Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
- » Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible.

7.5. Monitoring Programme: Construction Phase of the Biomass Co-Firing Demonstration Facility

OBJECTIVE: Monitor the performance of the control strategies employed against environmental objectives and standards.

A monitoring programme must be in place not only to ensure conformance with the EMP, but also to monitor any environmental issues and impacts which have not been accounted for in the EMP that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the Environmental Authorisation (once issued). Where this is not clearly dictated, Eskom will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project Manager will ensure that the monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to routinely monitor the implementation of the specified environmental specifications, in order to:

- » Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications.
- » Ensure adequate and appropriate interventions to address non-compliance.
- » Ensure adequate and appropriate interventions to address environmental degradation.
- » Provide a mechanism for the lodging and resolution of public complaints.
- » Ensure appropriate and adequate record keeping related to environmental compliance.
- » Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site.
- » Aid communication and feedback to authorities and stakeholders.

The ECO will ensure compliance with the EMP, will conduct monitoring activities, and will report any non-compliance or where corrective action is necessary to the Site Manager and/or any other monitoring body stipulated by the regulating

authorities. The ECO must have the appropriate experience and qualifications to undertake the necessary tasks.

MANAGEMENT PROGRAMME: REHABILITATION

CHAPTER 8

Overall Goal: Undertake the rehabilitation measures in a way that:

- » Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed

8.1. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

OBJECTIVE: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are avoided or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

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|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project Component/s | » Area infrastructure. |
| Potential Impact | » Environmental integrity of site undermined resulting in reduced erosion and increased runoff, and the requirement for on-going management intervention. |
| Activity/Risk Source | » Temporary construction areas. » Other disturbed areas/footprints. |
| Mitigation: Target/Objective | » Ensure and encourage site rehabilitation of disturbed areas. » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are avoided or curtailed. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------------|
| A rehabilitation plan that specifies the rehabilitation process and appropriate timeframes should be compiled and should be approved by the ECO. | Contractor, Eskom and ECO | Construction |
| All temporary facilities, equipment, and waste materials must be removed from site. | Contractor | Following execution of the works |
| All temporary fencing and danger tape must be | Contractor | Following |

| Mitigation: Action/Control | Responsibility | Timeframe |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------------------------------|
| removed once the construction phase has been completed. | | completion of construction activities in an area |
| The area that previously housed the construction equipment camp is to be checked for spills of substances such as oil, paint, etc. and these should be cleaned up. | Contractor | Following completion of construction activities in an area |
| Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion. | Contractor | Following completion of construction activities in an area |

| | |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Performance Indicator | <ul style="list-style-type: none"> » All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities. » Topsoil replaced on all areas and stabilised where practicable or required after construction and temporally utilised areas. » Disturbed areas rehabilitated. |
| Monitoring | <ul style="list-style-type: none"> » Ensure appropriate rehabilitation in a specified timeframe. |

MANAGEMENT PROGRAMME: OPERATION

CHAPTER 9

Overall Goal: Ensure that the operation of the Biomass Co-Firing Demonstration Facility does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the facility in a way that:

- » Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
- » Enables the operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices, traffic and road use, and effects on local residents.

An environmental manager must be appointed during operation whose duty it will be to ensure the implementation of the operational EMP.

9.1. Objectives

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE: Integration of the biomass facility operation into the Power Station Environmental Management System

The Arnot Power Station, as an operational power station, ensures appropriate environmental management practices are implemented through their Environmental Management System (EMS). This EMS includes specifications and procedures which must be followed in terms of all aspects of environmental management for activities associated with the operation of the power station. As the railway line will be owned and operated by Eskom, the activities associated with the operational phase will be incorporated into this existing EMS.

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|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project component/s | <ul style="list-style-type: none"> » Operational activities associated with the biomass facility. » Milling infrastructure. » Fuel storage facilities. » Access roads. » Waste management. » Chemical storage and handling. |
| Potential Impact | <ul style="list-style-type: none"> » Pollution of water bodies from polluted runoff. |

| | |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <ul style="list-style-type: none"> » Contamination of the site or water through poor operational practices. » Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices. » Noise generation. » Visual impacts. » Air pollution. |
| Activity/risk source | <ul style="list-style-type: none"> » Operation of the biomass facility. » Storage of fuel. » Storage and handling of hazardous substances. » Waste generation and disposal. |
| Mitigation: Target/Objective | <ul style="list-style-type: none"> » To ensure appropriate waste and materials management during operation. |

| Mitigation: Action/control | Responsibility | Timeframe |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------|
| Integrate the activities associated with the operation of the biomass milling facility into the Arnot Power Station EMS prior to the commencement of operation, in terms of identifying aspects (direct and indirect) and impacts associated with each activity, risk sources and actions required to minimise impacts, as well as emergency preparedness and response. | Eskom | Operation |
| Ensure that the biomass facility and associated infrastructure is monitored in terms of the requirements of the Arnot Power Station EMS, as appropriate. | Eskom | Operation |
| Reporting systems in terms of the EMS specifications must be put in place for the biomass facility. | Eskom | Operation |
| Ensure appropriate training and awareness in terms of environmental requirements is undertaken for all operation personnel in accordance with the specifications of the EMS. | Eskom | Operation |

| | |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Performance Indicator | <ul style="list-style-type: none"> » Incorporation of the biomass milling facility activities into the Arnot Power Station EMS prior to the commencement of operation. |
| Monitoring | <ul style="list-style-type: none"> » Regular monitoring and auditing of activities in accordance with the specifications of the Arnot Power Station EMS |

OBJECTIVE: Minimise the potential impact on farming activities and on the surrounding landowners

Once operational, the impact on the daily living and movement patterns of neighbouring residents is expected to be minimal and intermittent (i.e. the increase in traffic to and from site, possible dust creation of vehicle movement on gravel roads on site).

| | |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project Component/s | » Possible negative impacts of activities undertaken on site on the activities of surrounding property owners on the route from Sabi to the power station. |
| Potential Impact | » Possible limited intrusion impact on surrounding land owners. |
| Activities/Risk Sources | » Increase in traffic to and from site could affect daily living and movement patterns of surrounding residents. |
| Mitigation: Target/Objective | » Effective management of the facility. » Mitigation of intrusion impacts on property owners. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|--------------------------------------------------------------------------------------------------------|-----------------------|------------------|
| Vehicle movement to and from the site should be minimised as far as possible. | Eskom and employees | Operation |
| The designated access to the proposed site must be used by all vehicles to ensure safe entry and exit. | Transport Contractor | Operation |
| Approved access routes shall be used. | Transport Contractor | Operation |
| Appropriate maintenance of all vehicles shall be ensured. | Transport Contractor | Operation |

| | |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Performance Indicator | » No intrusion on private properties and on the activities undertaken on the surrounding properties. |
| Monitoring | » Developer should be able to demonstrate that facility is well managed without environmental pollution and that the above requirements have been met. |

OBJECTIVE: Appropriate handling and management of waste

The ash produced from the burning of the biomass within the power generation process for both the separate and co-milling operation will be disposed by means of the existing Arnot ash disposal system.

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|-------------------------------------|-------------------------------------------------------------------------------------|
| Project Component/s | » Co-firing system. |
| Potential Impact | » Contamination of the environment because of poor ash waste management. |
| Activity/Risk Source | » Biomass combustion. |
| Mitigation: Target/Objective | » Comply with waste management legislation. » Ensure appropriate waste disposal. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------|
| Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors. | Eskom / waste management contractor | Operation |
| Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor. | Eskom / waste management contractor | Operation |

| | |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Performance Indicator | » No complaints received regarding waste on site or indiscriminate dumping. » Provision of all appropriate waste manifests. » No contamination of soil or water. |
| Monitoring | » Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection. » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the ECO. » All appropriate waste disposal certificates with the monthly reports. |

MANAGEMENT PROGRAMME: DECOMMISSIONING

CHAPTER 10

The infrastructure which will be utilised for the proposed Biomass Co-Firing Demonstration Facility is expected to have a lifespan of 20 - 30 years and eventual extensions (i.e. with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the co-firing infrastructure with more appropriate technology/infrastructure available at that time.

The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore is not repeated in this section.

10.1. Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate required equipment, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of construction equipment.

10.2 Disassemble and Replace Infrastructure

Disassembled components will be reused, recycled, or disposed of in accordance with regulatory requirements.

OBJECTIVE: Avoid and or minimise the potential impacts associated with the decommissioning phase

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|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Project Component/s | » Decommissioning phase of the biomass facility. |
| Potential Impact | » Decommissioning is similar to the construction phase in that it will also create intrusion impacts (i.e. noise and dust). |
| Activity/Risk Source | » Decommissioning of the biomass facility. |
| Mitigation: Target/Objective | » To avoid and or minimise the potential intrusion impacts associated with decommissioning phase. |

| Mitigation: Action/control | Responsibility | Timeframe |
|------------------------------------------------|-----------------------|------------------|
| Retrenchments should comply with current South | Eskom | At |

| Mitigation: Action/control | Responsibility | Timeframe |
|-----------------------------------|-----------------------|------------------|
| African Labour Legislation. | | decommissioning |

| | |
|------------------------------|-----|
| Performance Indicator | N/A |
| Monitoring | N/A |

FINALISATION OF THE EMP

CHAPTER 11

The EMP is a dynamic document, which must be updated to include any additional specifications as and when required. It is considered critical that this draft EMP be updated to include site-specific information and specifications following the final walk-through survey by specialists of the powerline, water supply pipeline and development site. This will ensure that the construction and operation activities are planned and implemented considering sensitive environmental features.