Eskom	Arnot Power Station Fugitive and Atmospheric Emission Management Plan	ENVIRONMENT

Title: **Arnot Power Station Fugitive and Atmospheric Emission Management Plan**

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1. Introduction

Most releases into the atmosphere from power stations are from tall smoke stacks. These stacks aid in the dispersion of pollutants before they reach ground-level, and the emissions can be well quantified, either by direct measurements, or by calculations based on the amount and characteristics of the coal burnt.

This plan will outline the fugitive emissions emitted from the coal stockpile, ash dams and unpaved roads within the station's boundaries.

The station comprises of six 400MW units. Each boiler has six mills nominally allocated to it; five are required for the boiler to reach full load whilst the sixth is on standby. There are two types of mills i.e. vertical spindle and tube mills which are fed from a common coal storage bunker. The bunker is supplied by three incline conveyors coming from the coal staithes which are fed from the coal stock yard and a number of randomly selected mines.

Fugitive dust may be emitted from a number of sources at a power station, most notably from the ashing facility and the coal stockyards. Fugitive dust may also originate from a number of other sources, including unpaved roads. This dust tends to be generated mainly in association with strong winds, or when a surface is disturbed. Fugitive emissions from sources are usually irregular and emitted over a large area, and therefore are very difficult to quantify.

This document is aimed at identifying, monitoring and measuring fugitive dust and atmospheric emissions and putting appropriate control and mitigation measures for compliance with the requirements as set out in the Atmospheric Emissions License. Licence No. 17/4/AEL/MP313/11/10.

2. Supporting Clauses

2.1 Scope

This plan contains the identification of fugitive dust sources, atmospheric emissions and an assessment of the significance of emissions from these sources. The current and future control measures as well as the mitigation applications and timeframes for planned measures.

2.1.1 Purpose

In order to satisfy the requirements of a fugitive and atmospheric emission management plan as outlined in sections 7.5 Area and/or line source – Management and Mitigation Measures and 7.7 Investigations AEL, License no: 17/4/AEL/MP313/11/10.

Control measures and a plan for mitigation and implementation have been identified and the template and schedule for reporting to the Licencing Authorities is proposed.

2.1.2 Applicability

This document applies to Arnot Power Station, The Ash dams as well as the Coal stock yard and unpaved roads within the power station boundary.

2.1.3 Effective date

This document is effective from the date of signatures.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] Atmospheric Emission Licence (AEL) 17/4/AEL/MP313/11/10

2.2.2 Informative

None

2.3 Definitions

2.3.1 Fugitive Emissions:

Means emissions to the air from a facility for which an emission licence has been issued, other than those emitted from a point source.

2.4 Abbreviations

Abbreviation	Explanation
AEL	Atmospheric Emissions License
CSY	Coal Stock Yard
CEMS	Continuous Emissions Monitoring System
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
FEMP	Fugitive Emission Management Plan
FFP	Fabric Filter Plant
LDV	Light Driving Vehicles.
SHEQ	Safety, Health ,Environmental and Quality

2.5 Topsoil is currently channelled and used to cover the ash dam walls.Roles and Responsibilities

The Environmental Department is responsible to enforce the implementation and continual improvement of this plan. The Boiler System Engineer, Environmental and General Station Manager shall ensure compliance.

2.6 Process for Monitoring

The effectiveness of the plan will be evaluated through audits and complaints.

2.7 Related/Supporting Documents

Atmospheric Emission Licence (AEL) 17/4/AEL/MP313/11/10

3. Management of fugitive emissions

3.1 Sources of fugitive dust

Three sources of fugitive dust has been outlined and explained in this procedure. This encompasses the Ashing facility, Coal stock yard and unpaved roads.

3.1.1. Ashing facility

Arnot Power Station makes use of a wet ashing system. The ash is transported by ash lines using water as a transport medium to the ash dams situated approximately 4km from the station. About 780.996kT of ash is disposed at the ash dam complex on an annual basis (based on the 2017/2018 financial year figures).

Figure 1: A map illustrating the location of the ash dam facility, coal stockyard.

3.1.2. Coal stockyard

The coal stock yard is located within the station and is utilised for the handling and storage of coal. It is located 29 47' 42.3'' E latitude and 25 56' 39.0" S longitude, with a height release above ground of approximately 10m, length of 780m and the width of 370m.

The station is currently receiving coal from different mines through trucks. The trucks offload the coal at the coal stock yard. There are three reclaim belts from the coal stockyard to the staithes. Three incline belts feed the coal from the staithes into the bunkers situated on the 113ft level. The coal is then gravity fed in-to the mills by means of the coal pipes for grinding.

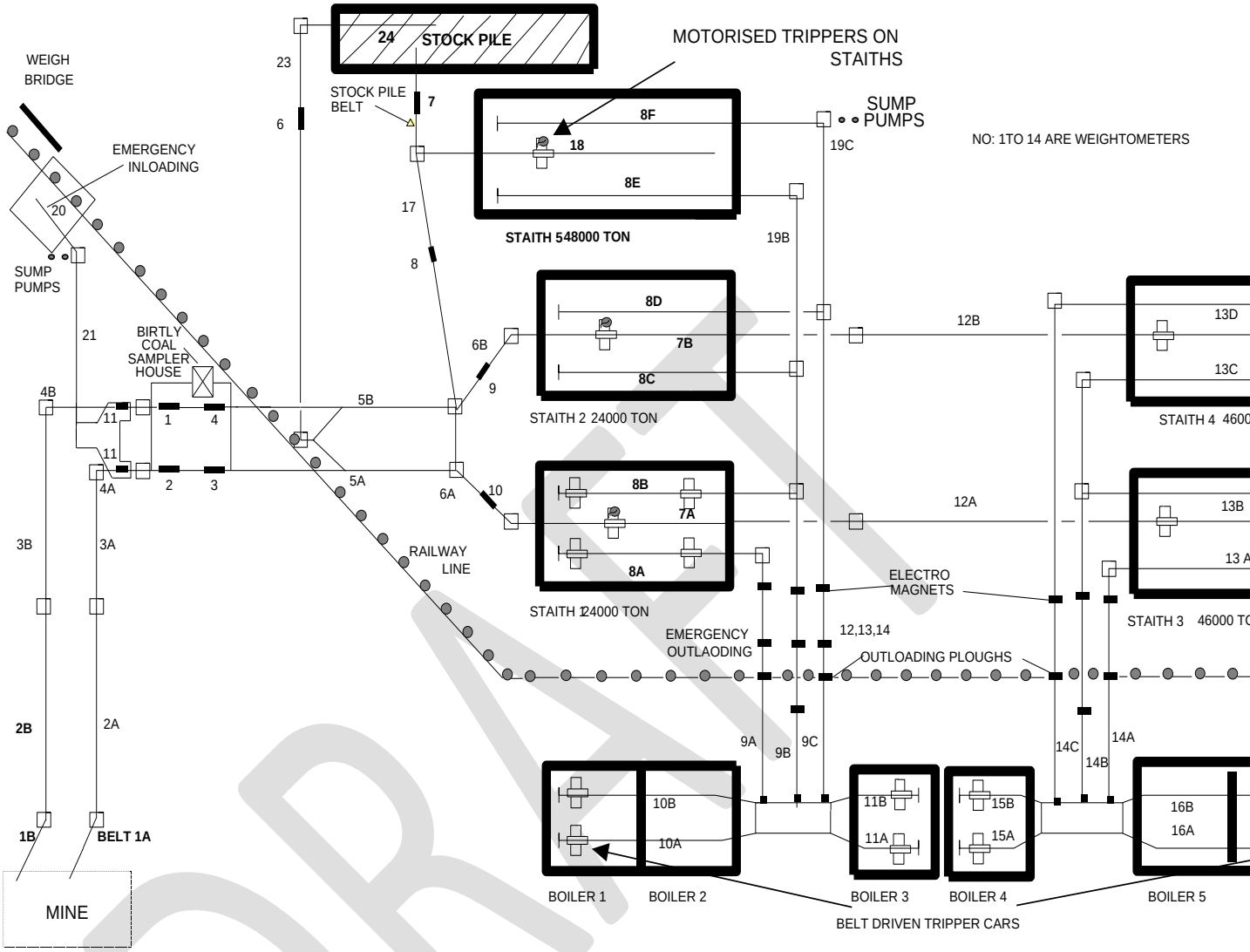


FIG NO 1 COAL PLANT

Figure 2: Coal Plant.

3.1.3. Unpaved roads

Majority of the unpaved roads are found inside the ash dam complex and coal stock yard. Unpaved roads used, are also utilised to the coal stock yard dam area, ash dams, sewage plant and waste disposal site. These roads are used on a daily basis by personnel responsible for the maintenance, monitoring and operation of these sites. Light diesel vehicle (LDV's) and tractors are mostly used for travelling on the roads.

3.2 Metrology

Arnot Power Station is situated in the Highveld in the eastern part of the Mpumalanga province at an average height of 1650 m above mean sea level. The winters are dry and cold with frost occurring regularly. The summers are mild and most of the rainfall occurs in the summer season, sometimes with thundershowers.

3.2.1. Temperature

The average temperature varies between 11,7^{o}C during winter and 19,5^{o}C during summer.

3.2.2. Relative humidity

The average relative humidity at Arnot Power Station is 61,4 %

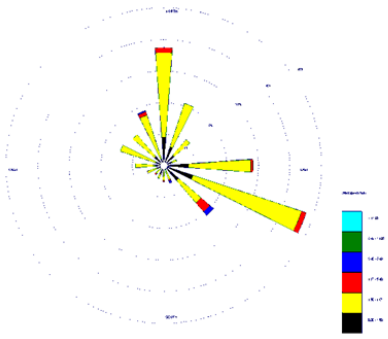
3.2.3. Lightning

A moderate to high lightning risk exists at Arnot Power Station where the lighting ground flash density is approximately 8,9 ground flashes/km^{2}/year.

3.2.4. Wind

The prevailing wind directions shift from Northwest during the daytime to a predominantly easterly component at night with a mean wind speed of 13,1km/hr for a 24-hour period. The wind rose for Arnot can be seen below.

Wind Direction	Daily Average	
	Frequency (%)	Wind Speed (m/s)
N	8.7	3.5
NNE	5.7	3.1
NE	7.4	3.8
ENE	11.6	4.6
E	13.2	5.1
ESE	5.9	4.3
SE	2.9	3.4
SSE	1.7	2.6
S	2.2	2.5
SSW	2.6	2.8
SW	3.9	3.1
WSW	3.9	3.4
W	3.3	3.6
WNW	7.2	4.4
NW	10.3	4.4
NNW	9.6	3.8



3.2.5. Rainfall data

Extremes:

	Annual	Daily
Maximum	1 048 mm	106 mm

Minimum	439 mm	0 mm
Average	735 mm	0mm

3.2.6. Flood conditions

The flood conditions for a 24-hour event leading to a 1 in 50-year flood are a rainfall event of 116 mm over a 24-hour period. A rainfall event of 133 mm over the 24-hour period is classified as a 1 in 100-year flood event.

3.2.7. Temperature data

	Extremes
Maximum	36,1°C
Minimum	-11,6°C
Average	15,5°C

3.2.8. Evaporation

The evaporation reported for the Arnot power station area is 1 905 mm/annum. It is further reported that the seasonal contribution to this evaporation is as follows:

Summer: 30 %	Autumn: 22%
Winter: 18%	Spring: 30%

3.3 Control measures for fugitive dust sources

3.3.1 Ashing facility

Arnot is a wet ashing Power Station where ash is mixed with water at the ash plant and is transported in ash pipes to the ash dams. There are no significant fugitive emissions from the transportation process. Ashing is carried out at night into ash dam 1, 2, and flamingo pan, while dusting is done during the day. The coarse ash is kept inside the dam and the fine ash is used to build the ash dam wall. With time the coarse ash in ash dam 1, 2 and flamingo pan dries up and during severe windy conditions, dust is visibly generated.

Topsoil is currently channelled and used to cover the ash dam walls to enhance grass growth for rehabilitation. Dust suppression is also executed by means of water on unpaved roads. Topsoil is currently channelled and used to cover the ash dam walls Future control measures will depend on feasibility of dust suppressant measures.

Area	Current Control Measures	Future Control Measures	Frequency of Mitigating Application
Ash Disposal Facility Walls	Covering of ash dam walls with topsoil for vegetation enhancement. Trees serving as a filtering medium.	Investigating usage of treated sewage sludge to enhance vegetation growth. Investigating feasibility of sprinkler systems. Investigating feasibility of chemical dust suppression	As and when the walls dry up.
Ash Disposal Facility Dams	No current control measures	Dust suppression	Depending on the dust suppressant medium.
Unpaved Roads			Approximately 5 x during the day

3.3.2 Coal stockyard

The coal stock yard receives coal from the mines, transported by covered trucks to reduce coal dust particles into the environment. For the transportation of coal, dust suppression is not required because there are no fugitive emissions from this process. The coal stockyard is compacted as and when required.

Area	Current Control Measures	Future Control Measures	Frequency of Mitigating Application
Coal stockyard	Regular compacting and suppression. Trees as a filtering medium. Trucks are covered Speed humps Speed limit signage (as well as ash dams)	Investigating feasibility of chemical dust suppression	As and when required.
Unpaved roads			Dust suppression during daytime and

			night time

3.3.3 Unpaved roads

On unpaved roads, fugitive dust emissions result from movement of traffic as well as windy weather conditions.

The unpaved road around and within the ash dam facility is approximately 24km, the road to the sewage plant is approximately 1.2km, and to the coal stock yard dam is approximately 2.5km. The road around and within the coal stock yard network is approximately 5km.

These roads are watered twice on a daily basis, and repairs are done as and when required.

Area	**Current control measures**	**Future Control Measures**	**Frequency of Mitigation Application**
Unpaved roads	Watering with water tankers. Grading of roads	Chemical dust suppression	As and when required

3.4 Fugitive emissions inspection and monitoring

The station has a total of 20 single dust fall-out samplers at pre-selected locations. Four are situated within the boundaries of the station and 16 are located around the power station. This include areas within the neighbouring communities of Rietkuil village, East village, South East village, Mine Shaft, Exxaro Town and the West village as portrayed in Figure 3 and Figure 4 respectively. Fall-out Dust Monitoring shall include chemical and gravimetric analysis and will be performed according to the ASTM D 1739 method and SANS SANS 1929:2011 standard. The results will be evaluated against the SANS 1929:2011 standard. Monitoring will be done on a monthly basis.

Complaints related to fugitive dust emissions are addressed through the General Manager or Environmental Manager's office and a complaint register is updated by the Environmental department.

Figure 3: Monitoring points around the power station.

3.4.1. Ashing facility

Monitoring around this point, as illustrated in Figure 3, commenced in July 2012.

3.4.2. Coal stockyard

Monitoring around the stockyard as illustrated in Figure 3, commenced in July 2012.

3.4.3. Unpaved roads

Visual inspection of fugitive emissions emanating from unpaved roads during dusty conditions, windy conditions and periods of heavy traffic, are done on a regular basis.

3.5 Reporting

Annual reports on the implementation of the fugitive emission management plan will be submitted to the Licencing Authority.

These reports will comprise of the following sections:

3.5.1. FEMP reporting

3.5.1.1. Location of fugitive emission sources

The location of all fugitive emission sources will be depicted and the report will outline whether any points have been moved, and will stipulate the reasons.

3.5.1.2. Control measures for fugitive emissions sources

This section will focus on the implementation of, and will trace changes in the control measures throughout the year.

3.5.1.3. Fugitive emission monitoring results

In this section, emphasis shall be on the monthly dust fallout monitoring results and will be reported internally and externally to the licencing authority.

4. Management of point source emissions

4.1. Abatement technology

Abatement technology for particulate emissions is Fabric Filter Plant (FFP). Particulates captured by FFP are dislodged inside the dust hopper. The hoppers are equipped with the hopper level switches which initiate an alarm when hopper levels are high. Hoppers are emptied once in 24 hours. Three units feed into a common stack, therefore Units 1 - 3 feed to the North stack and Unit 4 -6 feed to the South Stack.

4.2. Operational practices

Emissions responsibility procedure AEBP 0063 stipulates different department's responsibilities towards emissions management in order to ensure that the station complies with the licence conditions and internal set targets. There is an alarm to alert the operator if the particulates are above the limit. The alarm response card AOFG17 0001 stipulates the actions to be taken. AOFG17 0002 alarm response card for high hopper levels also stipulates actions to be taken if there are high or blocked dust hoppers.

4.3. Maintenance practices

The Flue Gas Plant maintenance execution strategy AEBP 0008 stipulates the types of maintenance to be done on the CEMS and FFP.

4.4. Planned upgrades

Currently there are no planned upgrades

4.5. Emission monitoring

The North and South Stacks are equipped with continuous emission monitoring system (CEMS) namely particulates monitor, Nitrix oxides (NOx), Sulphuric Oxides (SOx), Carbon monoxide (CO), Carbon dioxide (CO2) analyser, Oxygen (O2) analyser. Emissions monitoring is done as per the Emissions reporting instruction AEBP 0059.

5. Management of impact of Eskom's activities on ambient air quality

5.1. Air quality offsets

Air quality offsets address emission sources directly within vulnerable communities, targeting greater improvement in community experienced air quality than is achievable from other approaches. In addition, such offsets are more cost effective and result in meaningful improvement of air quality within a shorter time frame.

The Air Quality Implementation Plan for the Nkangala District Municipality (refer to http://www.eskom.co.za/AirQuality/Pages/default.aspx) covers the period from March 2018 to March 2025, and aims to improve ambient air quality in several communities around Eskom's coal-fired power stations in the district including areas around Arnot Power Stations (e.g. Silobela).

KwaZamokuhle, a Township near Hendrina, has been selected as a lead implementation site in the Nkangala District. Implementation in KwaZamokuhle is planned to commence in the first half of next year (2019).

5.2. Community engagement

A stakeholder meeting with surrounding farmers, interested and affected parties are held on an ad hoc basis in the Rietkuil Community. The station also sits in the Highveld Priority Task Team meetings on a quarterly basis.

6. Acceptance

This document has been seen and accepted by:

Name	Designation
Bryan Mccourt	Middle Manager Environmental Management
Christo Spammer	General Manager
Mariam Joseph	Environmental Manager
Nomathemba Mpulo	Senior Technologist
Olga Makhalemele	Senior Advisor Environmental Management
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7. Revisions

Date	Rev.	Compiler	Remarks
July 2012	0	K Mothapo	Compile document as required by Atmospheric Prevention Pollution License
April 2015	1	R Tshikovha	Review Procedure Include metrology data Review monitoring points and frequency. Transfer procedure to new template Include Management plan for atmospheric emissions
September 2018	2	R Tshikovha	Review Procedure Remove Belts from the mine that are no longer in use Include South gaseous analyser Additional mitigation measures acquired

8. Development Team

The following people were involved in the development of this document:

- N Mpulo
- R Tshikovha
- M Joseph
- T Khoza