AIR QUALITY SCOPING REPORT FOR THE EIA FOR THE PROPOSED SEKOKO WATERBERG MINE, LIMPOPO PROVINCE

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GLOSSARY OF ACRONYMS, TERMS AND UNITS

AEL	Atmospheric Emission License
AQA	National Environmental Management: Air Quality Act (No. 39 of 2004)
CH_4	Methane
CO_2	Carbon dioxide
DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment
Emission	The direct or indirect release of substances, vibrations, heat or noise from individual or diffuse sources in an installation into the air, water or land.
EMP	Environmental Management Plan
H_2S	Hydrogen sulphide
mg/m_3	Milligrams per cubic meter
MPRA	Mineral and Petroleum Resources Act (Act No. 28 of 2002)
NEMA	National Environmental Management Act (No. 107 of 1998)
NO	Nitrogen oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen (NO_x = NO + NO_2)
PM_{10}	Particulate matter with a diameter less than 10 microns
$PM_{2.5}$	Particulate matter with a diameter less than 2.5 microns
SO_2	Sulphur dioxide
TSP	Total suspended particulates
$\mu g/m^3$	Micrograms per cubic meter
WHO	World Health Organisation

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1. INTRODUCTION

Savannah Environmental has been appointed by Sekoko Resources (Pty) Ltd to undertake an Environmental Impact Assessment (EIA) and compile an Environmental Management Programme (EMP) in support of the EMP amendment process and NEMA application, for the proposed Waterberg Coal mine near Lephalale in the Limpopo Province (Figure 1). uMoya-NILU has in-turn been sub-contracted to provide specialist air quality services for this project, by contributing to the scoping report, conducting a specialist study and conducting baseline dust fallout monitoring for 12 months.

This air quality scoping report describes the scoping methodology and data that was used. The existing state of air quality in the area is described as well as the mining process, the pollutants and the potential sources of emissions to the atmosphere. The potential direct, indirect and cumulative environmental impacts are identified with regards to the potential significance of the impacts or issues. Feasible alternatives are also evaluated. Potentially significant impacts to be assessed in the EIA are presented with a proposed methodology to address these impacts.

2. SCOPING METHODOLOGY

Scoping is a critical, early step in the preparation of an EIA. The scoping process identifies issues that are likely to be of most importance during the EIA and eliminates those that are of little concern. In this way, EIA studies are focused on the significant effects and time and resources are not wasted on unnecessary investigations. Scoping therefore identifies, amongst others:

- The important issues to be included in the EIA;
- Appropriate time and spatial boundaries for the EIA;
- Information required for decision making;
- Significant effects and factors to be studies in detail; and
- Feasible alternatives.

The scoping study for air quality is conducted as a desk top study. Key information sources are the air quality assessment conducted by Asande Project (2009) for Sekoko Resources (Pty) Ltd and the Air Quality Management Plan for the Waterberg District Municipality (GES, 2009). In addition the National Environmental Management Act (No. 107 of 1998) (NEMA), the National Environmental Management: Air Quality Act (Act No. 39 of 2004, (AQA), and the Mineral and Petroleum Resources Act (Act No. 28 of 2002) (MRPA) and supporting regulations are reviewed.

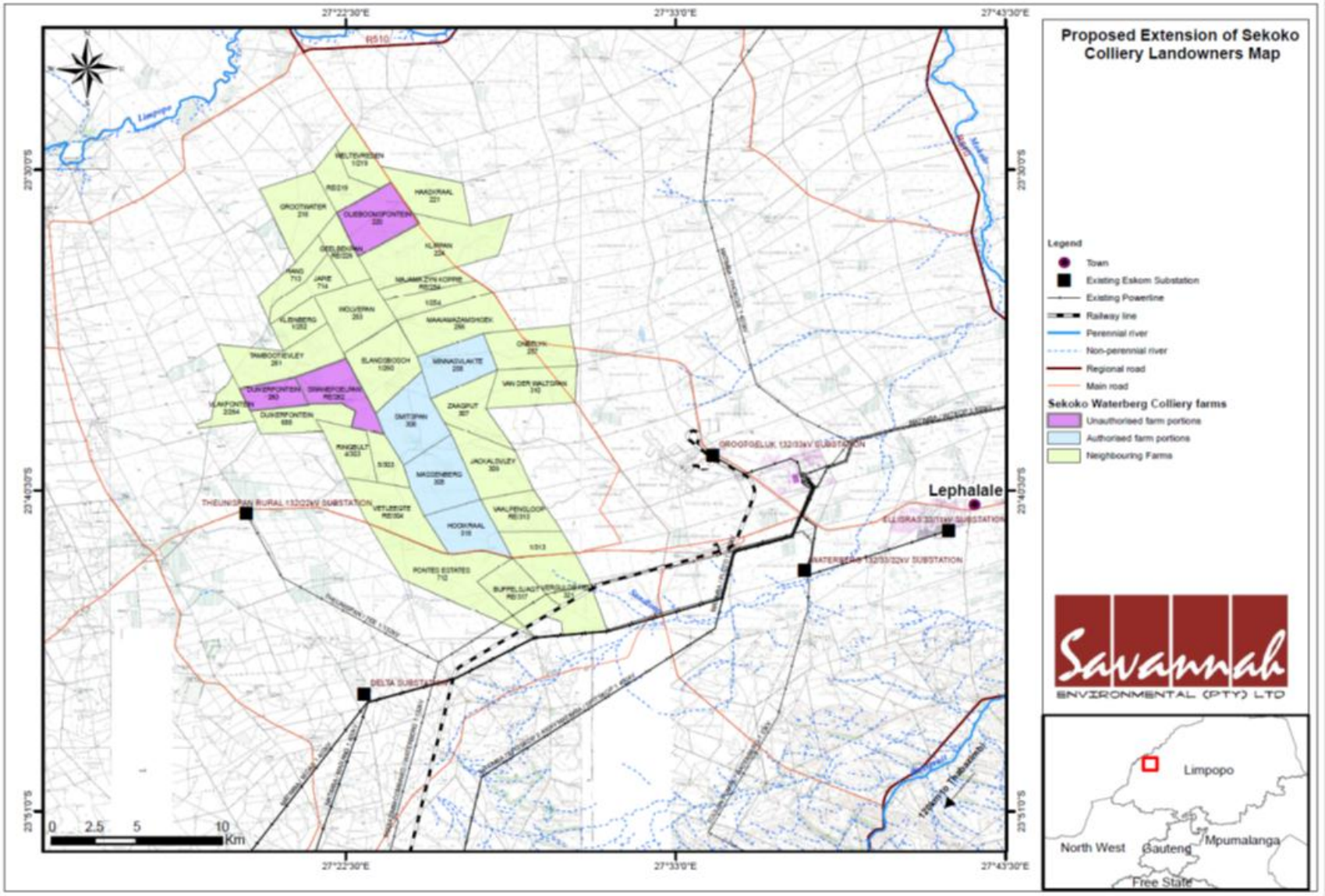

Figure 1: Locality map showing the location of the proposed Sekoko Waterberg Mine (Savannah, 2012)

3. OPEN CAST MINING AND AIR POLUTANTS

3.1 Open cast mining

Open cast coal mining is typically carried out in open pits, using conventional open pit methods, hydraulic excavators and a fleet of haul trucks. Mining activities typically include the removal of topsoil and overburden and its storage, drilling and blasting, hauling, crushing, and stockpiling of the final coal products and waste products. These activities typically result in the generation of dust, or particulates. Pollutants such as sulphur dioxide (SO_2), oxides of nitrogen (NO_X), respireable particulate matter (PM_{10}) and volatile organic compounds (VOC) resulting from vehicle and equipment exhaust emissions also occur. Spontaneous combustion in discard coal and product storage piles (in the event that these occur) is a source of Greenhouse Gases such as methane (CH_4) and carbon dioxide (CO_2) as well as pollutants such as SO_2 and hydrogen sulphide (H_2S).

3.2 Air pollutants

The main air pollutant resulting from coal mining is particulates. Emissions of other pollutants from vehicle and equipment exhausts and from spontaneous combustion are generally small by comparison. Particulates therefore warrant further discussion.

Particulate matter (PM) is a broad term used to describe airborne particles found in the atmosphere. These include soil dust, dirt, soot, smoke, pollen, ash, aerosols and liquid droplets. The particle size and chemical composition are the most distinguishing characteristics of PM. Particle size has the greatest influence on the behaviour of PM in the atmosphere, with smaller particles tending to have longer residence times than larger ones. PM is categorised according to particle size. Total suspended particulates (TSP) consist of all sizes of particles suspended within the air smaller than 100 micrometres (µm). TSP is useful for understanding nuisance effects of PM, e.g. settling on houses, deposition and discolouration of buildings.

PM_{10} describes all particulate matter in the atmosphere with a diameter equal to or less than 10 µm. Sometimes referred to as coarse particles, they are generally emitted from motor vehicles (primarily those using diesel engines), factory and utility smokestacks, construction sites, tilled fields, unpaved roads, stone crushing, and burning of wood. Natural sources include sea spray, windblown dust and volcanoes. Coarse particles tend to have relatively short residence times as they settle out rapidly and PM_{10} is generally found relatively close to the source except in strong winds.

$PM_{2.5}$ describes all particulate matter in the atmosphere with a diameter equal or less than 2.5 µm. They are often called fine particles, and are mostly related to combustion (motor vehicles, smelting, incinerators), rather than mechanical processes as is the case with PM_{10}. $PM_{2.5}$ may be suspended in the atmosphere for long periods and can be transported over large distances. Fine particles can form in the atmosphere in three ways: when particles form from the gas phase, when gas molecules aggregate or cluster together without the aid of an existing surface to form a new particle, or from reactions of gases to form vapours that nucleate to form particles.

Particulate matter may contain both organic and inorganic pollutants. The extent to which particulates are considered harmful, depends on their chemical composition and size. Very fine particulates pose the greatest health risk, as they can penetrate deep into the lung as opposed to larger particles that may be filtered out through the airways' natural mechanisms. In normal nasal breathing, particles larger than 10 µm are typically removed from the air stream as it passes through the nose and upper respiratory airways Particles between 3 µm and 10 µm are be deposited on the mucociliary escalator in the upper airways. Only particles in the range of 1 µm to 2 µm penetrate deeper where deposition in the alveoli of the lung can occur (WHO, 2003). Coarse particles (PM_{10} to $PM_{2.5}$) can accumulate in the respiratory system and aggravate health problems such as asthma. $PM_{2.5}$ can penetrate deeply into the lungs, are more likely to contribute to the health effects (e.g. premature mortality and hospital admissions) than coarse particles (WHO, 2003).

3. LEGAL REVIEW

Being a mining operation, the Sekoko Mine will be regulated primarily by the Mineral and Petroleum Resources Act (Act No. 28 of 2002) including the control of dust. Other relevant legislation is the National Environmental Management Act (Act 107 of 1998) and it's daughter act the National Environmental Management: Air Quality Act (Act No. 39 of 2004, the AQA) as well as the supporting regulation, the National Ambient Air Quality Standards (DEA, 2009). The declaration of the Waterberg Bojanala National Priority Area (DEA, 2012a) has implication for air quality management at existing and future operations in the Waterberg and in Bojanala.

3.1 Minerals and Petroleum Resources Act (Act No. 28 of 2002)

Section 39 of the MPRA addresses environmental management. Parts of Sub-section 3 apply to air quality management, including the establishment of baseline information, assessing impacts, creating awareness and the implementation of measures to control pollution. It reads as follows:

An applicant who prepares an environmental management programme or an environmental management plan must—

a) Establish baseline information concerning the affected environment to determine protection, remedial measures and environmental management objectives;
b) Investigate, assess and evaluate the impact of his or her proposed prospecting or mining operations on—
    i. the environment;
    ii. the socio-economic conditions of any person who might be directly affected by the operation; and
c) Develop an environmental awareness plan describing the manner in which the applicant intends to inform his or her employees of any environmental risks which may result from their work and the manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment; and
d) Describe the manner in which he or she intends to:
    i. modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
    ii. contain or remedy the cause of pollution or degradation and migration of pollutants; and

iii. comply with any prescribed waste standard or management standards or practices.

3.2 National Environmental Management Act (Act No. 107 of 1998)

Section 28 of the NEMA addresses the duty of care and remediation of environmental damage. While Sub-section 1 and 3 apply to environmental management at the proposed Sekoko Mine, they also apply directly to and air quality management and the control of dust and other pollutants. They read as follows:

Sub-section 1: Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.

Sub-section 3: The measures required in terms of the above may include measures

i) Investigate, assess and evaluate the impact on the environment;
ii) Inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment;
iii) Cease, modify or control any act, activity or process causing the pollution or degradation;
iv) Contain or prevent the movement of pollutants or the cause of degradation;
v) Eliminate any source of the pollution or degradation;
vi) Remedy the effects of the pollution or degradation.

3.3 The Air Quality Act (Act No. 39 of 2004)

3.3.1 Atmospheric emission license

Opencast mining, coal processing and the storage of coal on a mine site is not classified as a Listed Activity in terms of the AQA (DEA, 2010). An Atmospheric Emission License is therefore not required to be obtained by Sekoko Resources as part of their environmental permitting process.

3.3.2 Ambient air quality standards and guidelines

The effects of air pollutants on human health occur in a number of ways with short-term, acute, chronic, or long-term effects. Different groups of people are affected differently, depending on their level of sensitivity, with the elderly and young children being more susceptible. Factors that link the concentration of an air pollutant to an observed health effect are the level and the duration of the exposure to that particular air pollutant.

The National Ambient Air Quality Standard (DEA, 2009 and 2012) criteria pollutants consist of a limit value and a permitted frequency of exceedance. The limit value is the fixed concentration level aimed at reducing the harmful effects of a pollutant. The permitted

frequency of exceedance represents the tolerated exceedance of the limit value and accounts for high concentrations as a result of process upsets and meteorological variation. Compliance with the ambient standard therefore implies that ambient concentrations are below the limit value and the frequency of exceedance does not exceed the permitted tolerance. Being a health-based standard, ambient concentrations below the standard imply that air quality is acceptable and poses little or no risk to human health; while exposure to ambient concentrations above the standard implies that there is a risk to human health, particularly for sensitive individuals. The National Ambient Air Quality Standards for pollutants typically associated with and from mining are listed in Table 3.1

Table 3.1: Ambient standard for SO_2 (DEA, 2009 and 2012*)

	Exposure period	Limit value ($\mu g/m^3$)	Number of permissible exceedances per annum
SO_2	Hourly	350	88
	Daily	125	4
	Annual	50	0
NO_2	Hourly	200	88
	Annual	40	0
PM_{10}	Daily	120 (75)[1]	4
	Annual	50 (40)[1]	0
$PM_{2.5}$*	Daily	65 (40)[2] (25)[3]	0
	Annual	25 (20)[2] (15)[3]	0

1: 1 Jan 2015
2: 1 Jan 2016 – 31 Dec 2029
3: 1 Jan 2030

The Minister published her intention to make National Dust Control Regulation, inviting public comment on the draft regulations (DEA, 2012b). This regulation applies to the proposed Sekoko Mine and states that no person may conduct any activity in such a way as to give rise to dust in such qualities and concentrations that:

i) The dust, or dust fall, has a detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage, or has contributed to the degradation of ambient air quality beyond the premises where it originates; or
   a. The dust remains visible in the ambient air beyond the premises where it originates; or
   b. The dust fall at the boundary and beyond the boundary of the premises where it originates exceeds:

ii) 600 mg/m^2/day averaged over 30 days in residential or light commercial areas measured using reference method ASTM D1739; or

iii) 1200 mg/m^2/day averaged over 30 days in areas other than residential and light commercial areas measured using reference method ASTM D1739.

4. STATE OF THE RECEIVING ENVIRONMENT

The rich coal reserves in the Lephalale area have led to the establishment of a coal fired power station (Matimba) and the construction of a second power plant (Medupi). Amongst other, development plans for the area include a new coal mine by Exxaro Resources Ltd and a proposed coal-fired power plant close to the Groottegeluk coal mine in the Lephalale Local Municipality, Limpopo, South Africa. Mining and coal-fired power stations in Botswana are within 100 km of the Lephalale area.

The combination of the existing sources of air pollution have a negative impact on air quality, and the potential exists for further impact in the light of the current development projects and proposed projects. As a result, the Minister recently declared the Waterberg Priority Area for air quality management (DEA, 2012), which includes the Lephalale LM. Although relatively limited ambient air quality monitoring has been conducted in the area, this declaration implies that air quality currently, or in the future, may not meet ambient air quality standards.

A 3-month dust fallout monitoring campaign was conducted by Asande Project (2009) on four farms in the proposed mining area from mid-March to mid-July 2009. At Farm Smitspan, Massenberg, Minnasvlakte and Hooikraal Farm the average monthly dust fallout was well below the proposed standard in residential or light commercial areas.

The air quality status quo assessment for the Waterberg District Municipality Air Quality Management Plan (GES, 2009) was based on the available ambient air quality monitoring data for Lephalale. The key findings for measurements between November 2006 and December 2009 at the Marapong station near Lephalale were:

- Ambient 24-hour PM_{10} concentrations were generally in compliance with the national ambient standard of 120 µg/m^3, with four exceedances over the period.
- Ambient 24-hour PM_{10} concentrations frequently exceed the 2015 ambient standard of 75 µg/m^3 particularly in the winter from May to September, attributed largely to domestic fuel burning.
- Ambient SO_2 concentrations currently were below the National 24-hour ambient standard, but are regarded as potentially problematic for shorter averaging periods.
- Ambient NO_2 and O_3 concentrations were well below their respective ambient standards.

5. POTENTIAL IMPACTS

There are direct and cumulative impacts on human health associated with the operational phase of the Sekoko Mine. The impacts result primarily from the emission of dust and other pollutants from the mining operations.

Ambient PM_{10} concentrations are currently below the national ambient standard, but have been shown to frequently exceed the 2015 standard. The emissions of particulates from the Sekoko Mine will add to the existing particulate concentrations. The potential exists to increase the frequency of exceedance of the ambient standards for particulates around the proposed coal mine and in the surrounding environment. Indirect impacts may result from

the emission of Greenhouse Gases such as methane (CH_4) and carbon dioxide (CO_2) from spontaneous combustion, should this occur.

6. SIGNIFICANT IMPACTS TO BE ASSESSED

It is recommended that the detailed air quality study to be undertaken in the impact assessment phase includes the following:

1) Establishment of an emission inventory for particulates and other pollutants from the Sekoko Mine with and without appropriate control measures;
2) Estimation of the ambient concentrations of PM_{10} and dust deposition in the surrounding environment for mine operations;
3) Assessment of the potential impact on human health (e.g. increased risk of respiratory infections) by comparing predicted concentrations with the National Ambient Air Quality Standards; and
4) Assessment of the relative contribution to global warming resulting from GHG emissions.

7. METHODOLOGY

The following methodology is required in order to assess the issues:

1) The compilation of an emission inventory for the Sekoko Mine will be based on the methodology described by the United States Environmental Protection Agency (US-EPA) for mining activities, which uses information on mine layout, mining activities, vehicle movement and material volumes, with information on air pollution control measures, hourly meteorological data and appropriate emission factors.
2) Air dispersion modelling will be used to estimate the resultant ambient concentrations of pollutants in the surrounding environment, using either the DEA recommended AERMOD or SCREEN 3 models (US EPA, 2013; DEA, 2012c). SCREEN3 is a single source Gaussian plume model which provides maximum ground-level concentrations for point and area sources. As the name suggests, it is a screen-level modelling tool. AERMOD is steady-state plume model which can handle multiple sources. It is a much more refined dispersion modelling system that incorporates dispersion based on the planetary boundary layer turbulence structure. Added or cumulative effects will be assessed by considering the existing ambient concentrations.
3) Results will be compared with National Ambient Standards to assess the significance of the potential impacts. A quantitative rating of the significance of environmental issues as per DEA Guideline 5: Assessment of Alternatives and Impacts, will be used for the impact assessment of potential impacts. The purpose of the significance rating is to highlight relevant important issues, and to eliminate the insignificant issues from the investigation.
4) The potential contribution of Greenhouses Gas emissions to global warming will be assessed by estimating the emissions and comparing these with national figures.

8. CONCLUSION

The information contained in this air quality scoping report will be used to inform the draft scoping report for the EIA for the proposed Waterberg Coal mine near Lephalale in the Limpopo Province. The scoping report will be finalised following public participation and the

terms of reference for the specialist studies will be defined, including air quality, before these studies commence.

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