

**PROFESSIONAL OPINION  
NOISE ASPECTS OF THE PROPOSED  
EXTENSION OF THE HENDRINA WET ASH  
DISPOSAL FACILITY**

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## GLOSSARY OF ACOUSTICAL TERMINOLOGY

<b>A-weighting</b>	An electronic filter that simulates the human hearing characteristic which is less sensitive to sounds at low frequencies than at high frequencies.
<b>Broad band noise</b>	Noise that contains a wide range of frequencies and cannot be associated with a specific frequency or tone. 'White noise' (like the sound of a radio that is not tuned on a station) is a typical example of broad band noise.
<b>Decibel (dB)</b>	A descriptor that is used to indicate a level determined as 10 times the logarithmic ratio of two quantities of the same physical unit.
<b>dBA</b>	A descriptor that is used to indicate that 10 times the logarithmic ratio of two quantities of the same physical unit has been A-weighted.
<b>Equivalent noise level</b>	A single value noise level that has the same energy content as a time varying noise level measured over a given period of time. Therefore, it is in essence a time- and energy averaged noise level.
<b>Frequency</b>	The characteristic of a time varying signal that describes the number of cycles per second, expressed in Hertz, Hz.
<b>Integrated noise level</b>	A time- and energy averaged measure of a noise signal varying as a function time
<b><math>L_{Aeq}</math></b>	The A-weighted equivalent sound pressure level. This descriptor is internationally used for quantifying and evaluating noise in human-related circumstances. A vast amount of research links this parameter to human physiological and psychological responses.
<b><math>L_{Aeq}(T)</math></b>	The A-weighted equivalent sound pressure level, where T indicates the time over which the noise is averaged, i.e. $L_{Aeq}(10 \text{ min})$ indicates that the $L_{Aeq}$ was measured over a period of 10 min.

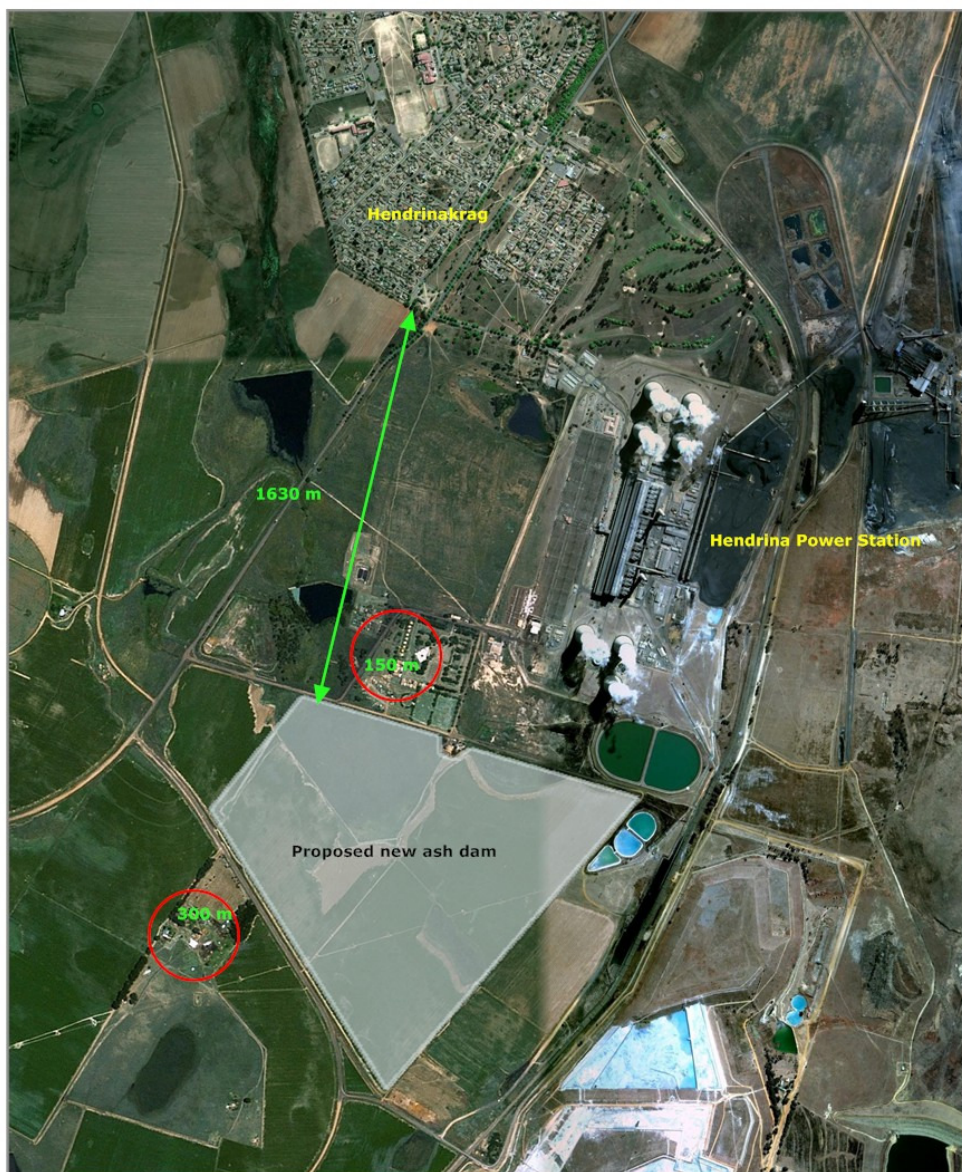
<b>L<sub>Req,d</sub></b>	The L <sub>Aeq</sub> rated for impulsive sound and tonality in accordance with SANS 10103 for the day-time period, i.e. from 06:00 to 22:00.
<b>L<sub>Req,n</sub></b>	The L <sub>Aeq</sub> rated for impulsive sound and tonality in accordance with SANS 10103 for the night-time period, i.e. from 22:00 to 06:00.
<b>Level</b>	The property of any parameter that expresses it's magnitude as 10x the logarithm of the ratio of the value of the parameter to a reference value of the same physical unit. The reference value is 20 µPa (micro- or 20x10 <sup>-6</sup> Pascal, or N/m <sup>2</sup> ) for a sound pressure level and 1 pW (pico or 1x10 <sup>-12</sup> Watt) for a sound power level.
<b>Noise</b>	Unwanted sound
<b>Noise emission</b>	The noise energy that is emitted by a noise source into the environment.
<b>Noise immission</b>	The noise energy that impinges on a receiver.
<b>Octave frequency band</b>	The frequency spectrum is divided into bands with centre frequencies an octave apart from each other, an octave being a doubling in frequency. In practice the standard octave bands most often used are 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz. Used for specifying sound power emission levels of equipment and calculating sound propagation over longer distances.
<b>Sound power level</b>	The level of the sound energy radiated by a given source per unit time. The magnitude does not depend on physical surroundings, e.g. distance, screening, weather. Cannot be directly measured, but has to be calculated from sound pressure level measurements.
<b>Sound pressure level</b>	The level of the varying sound pressure caused by a sound/noise source. The magnitude depends on the physical parameters of the surroundings.



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## 1. INTRODUCTION

Hendrina Power Station came into operation by the end of 1976. The ashing system is a wet system whereby ash is pumped as slurry to wet ash disposal facilities southeast of the Power Station. These wet ash disposal facilities are near to having reached their designed capacity and as a result an extension of the ashing facility is required (see Figure 1.1). In terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) an Environmental Impact Assessment (EIA) needs to be carried out, of which a noise study forms an integral part.



*Figure 1.1: Satellite image showing the location of the proposed new wet ash disposal facility and its environment.*

This professional opinion describes the results and findings of the noise study.

## **2. PURPOSE OF THE NOISE STUDY**

The purpose of this noise study is to:

- Identify the existing major noise sources and noise sensitive areas in the environment of the proposed wet ash disposal facility extension;
- Estimate the current ambient noise levels in the affected areas;
- Carry out sample calculations in order to estimate the impact of noise emissions on ambient noise levels at the identified noise sensitive areas; and
- Assess the noise impact in terms of the applicable regulations in Mpumalanga.

## **3. REGULATORY FRAMEWORK**

The original noise regulations were published in 1990 under the Environment Conservation Act, 1989<sup>1</sup>. They were at first made non-compulsory with a local authority having to apply to make them compulsory in its area of jurisdiction. Since this led to an unsatisfactory number of applications, the noise regulations were made compulsory in 1992. However, the arrival of the new Constitution in 1994 voided the legal driving force behind the regulations, since the responsibility for them was devolved from national to provincial level. The Minister of the Environment did circulate sample noise regulations to the provinces in 1997<sup>2</sup>, which they could adopt unchanged or adapt to their own requirements. This has happened in only three provinces, i.e. the Free State, Gauteng and Western Cape.

The original sample noise regulations contain a number of serious flaws and a revision was undertaken by the Department of Environmental Affairs. The resulting new regulations<sup>3</sup> were published on 2 July 2010 under the Air Quality Act, 2005<sup>4</sup>. They are in essence also a model that can be adapted by municipalities.

In terms of the setting of standards the new regulations make direct and extensive reference to SANS 10103<sup>5</sup>. This document successfully addresses the manner in which environmental noise measurements are to be taken and assessed in South Africa. It also provides guidelines to typical ambient noise levels that may be expected in different types of districts. Therefore, SANS 10103<sup>5</sup> was followed for the purpose of this noise impact study.

## **4. METHODOLOGY OF THE NOISE STUDY**

### **4.1 STUDY OF THE AVAILABLE INFORMATION**

All the available and relevant information<sup>6-8</sup> was studied and working group meetings attended on 17<sup>th</sup> February 2011 and 19<sup>th</sup> August 2011.

## 4.2 ESTIMATION OF PRESENT AMBIENT NOISE LEVELS

Based on the information studied and in consultation with the client it was realised that the noise impact caused by the construction and operation of the new wet ash disposal facility will only be of minor importance. Therefore, it was decided not to conduct costly ambient noise level measurements, but rather to apply the typical ambient noise levels listed for different kind of districts listed in Table 2 of SANS 10103<sup>5</sup>, as summarised in Table 4.2.1:

TABLE 4.2.1  
Estimated present ambient noise levels (from Table 2 of SANS 10103<sup>5</sup>)

Type of district	Ambient noise level, dBA	
	Daytime $L_{Req,d}$	Night-time $L_{Req,n}$
a) Rural districts	45	35
b) Suburban districts with little road traffic	50	40

## 4.3 SAMPLE CALCULATIONS

Sample calculations were carried out to estimate the noise contributions of the wet ash disposal facility operations at the group of buildings north, the farmstead south during operations (see the red circles in Figure 1.1, the estimated shortest distances are given in green) and the nearest corner of Hendrinakrag north of the proposed wet ash disposal facility. The noise sources causing these contributions were:

- A bulldozer, excavator, articulated truck and vibrating roller during construction; and
- A backhoe loader and vibrating compactor during operations.

The results were used to determine the resulting total ambient noise levels and the increase in ambient noise levels caused by the noise emissions from the new wet ash disposal facility operations during construction and operation. A list of the noise emission levels used in the calculations is given in Appendix A.

## 5. RESULTS

### 5.1 CONSTRUCTION

The calculated noise contributions and the resulting total ambient noise levels and the increase in ambient noise levels during construction are summarised in Table 5.1.1.



TABLE 5.1.1  
Summary of the results during construction

Location	Noise level, dBA			Increase dB
	Existing ambient	Contribution	Resulting ambient	
Group of buildings	45.0	51.2	52.1	7.1
Farmstead	45.0	42.0	46.8	1.8
Hendrinakrag	50.0	18.8	50.0	0.0

The results in Table 5.1.1 indicate that:

- As expected, the noise contribution is highest at the nearest inhabited location, i.e. the group of buildings immediately north of the new wet ash disposal facility;
- The increase in ambient noise level of 7.1 dB is significant and, according to Table 5 of SANS 10103<sup>5</sup>, the community/group reaction to this increase will be 'little' with 'sporadic complaints';
- However, the resulting total ambient noise level will be well within the 55 dBA listed in Table 2 of SANS 10103<sup>5</sup> for 'urban districts' and recommended by the World Health Organisation (WHO)<sup>9</sup> as an average for residential developments during the day;
- At the farmstead the increase will only be an insignificant 1.8 dB, and the community reaction will at most be 'little' with 'sporadic complaints'. It must be noted that for a person with average hearing acuity an increase in the general ambient noise level of 3 dB would just be noticeable, i.e. significant; and
- At the nearest point of the village to the new wet ash disposal facility there will be no noise impact and as a result no community/group reaction.

## 5.2 OPERATIONS

The calculated noise contributions and the resulting total ambient noise levels and the increase in ambient noise levels during operations are summarised in Table 5.2.1.

TABLE 5.2.1  
Summary of the results during operations

Location	Noise level, dBA			Increase dB
	Existing ambient	Contribution	Resulting ambient	
Group of buildings	45.0	48.8	50.3	5.3
Farmstead	45.0	41.7	46.7	1.7
Hendrinakrag	50.0	15.4	50.0	0.0

By comparing the results in Tables 5.1.1 and 5.2.1 it is clear that the noise impacts during construction and operations are very much the same. Therefore, the same comments can be made for the operational period.

## 6. CONCLUSIONS

Based on the results of this limited investigation the conclusions that can be drawn are:

- The resulting total ambient noise levels will be within those recommended by SANS 10103<sup>5</sup> and the WHO<sup>9</sup> for 'urban districts' and residential developments, respectively;
- The community/group reaction to the noise impacts will at most be 'little' with 'sporadic complaints' at the location nearest to the new wet ash disposal facility. At the other locations there will be no reaction;
- The noise impacts will only occur during the day; and
- The calculated noise impacts are only relevant when the points of construction of operations are closest to the noise sensitive receptors. The noise impacts will significantly diminish as these activities move further away.

Based on these conclusions the consultant is of the professional opinion that the noise impact caused by the noise emissions during the construction and operation of the proposed new wet ash disposal facility is of low significance.

## 7. REFERENCES

In this report reference was made to the following documentation:

- (1) Environment Conservation Act (Act No. 73 of 1989)
- (2) Model noise regulations published under the Environment Conservation Act, Act 73 of 1989, by the Minister of the Environment in 1997.
- (3) Model air quality management by-law for easy adoption and adaptation by municipalities, 2010, published under the National Environment Management Air Quality Act, Act 39 of 2004, Government Gazette No. 33342, 2 July 2010.
- (4) National Environment Management Air Quality Act, Act 39 of 2004.
- (5) SANS 10103:2008 'The measurement and rating of environmental noise with respect to annoyance and to speech communication', Edition 6, ISBN 978-0-626-20832-5
- (6) ECsoft (Pty) Ltd, Manual 10415-16, Hendrina Ash Dam Operations and Maintenance Manual
- (7) ECsoft (Pty) Ltd, Report 10415-40 rev 2, Hendrina Complex Storage Capacity Assessment, 11 September 2010.

- (8) GHT Consulting Scientists, RVN 557.11/1114, Hendrina Power Station Numerical Pollution Plume Model 2010, November 2010.
- (9) Guidelines for Community Noise, World Health Organisation, Geneva, 1999.



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**APPENDIX A**

**Sound power emission levels**

## 8. APPENDIX A: SOUND POWER EMISSION LEVELS

The sound power emission levels that were used in the calculations are summarised in Table A-1.

TABLE A-1  
Sound power emission levels.

Equipment	Sound power, dB re 1 pW, in octave frequency band, Hz						
	63	125	250	500	1000	2000	4000
Vibrating Roller	107.8	106.4	103.7	104.8	104.1	103.8	97.7
Backhoe loader	113.9	110.2	98.5	94.4	93.7	92.3	86.0
Power Station	113	108	105	103	103	98	98
Bulldozer, D9	100.0	118.0	111.0	109.0	107.0	103.0	97.0
Articulated dump truck	113.0	105.3	100.4	102.6	100.2	99.1	91.0
Tracked excavator	113	106	105	105	101	99	96