NOISE IMPACT ASSESSMENT OF THE PLANNED KRIEL POWER STATION ASH DISPOSAL FACILITY

(July 2017)

REPORT PREPARED BY JONGENS KEET ASSOCIATES

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PROJECT TEAM CREDENTIALS

The noise impact assessment was undertaken by Derek Cosijn who is a partner with Jongens Keet Associates and Calyx Environmental cc. He is a professional engineer, registered with the Engineering Council of South Africa (ECSA). He is a Fellow of SAICE, a Member of the Southern African Acoustics Institute (SAAI) and is also certified as an Environmental Assessment Practitioner of South Africa.

He has had 50 years of professional experience over a wide range of civil engineering, transportation planning, environmental and acoustic engineering projects. He qualified as a civil engineer in 1967 and then studied further to obtain a post-graduate Diploma in Town Planning (both at the University of the Witwatersrand). He has worked in both the planning and construction aspects of the civil engineering profession gaining experience in road construction, road planning, transportation planning, traffic engineering and general environmental and environmental noise issues. He has been directly involved in over 100 environmental and noise related projects since 1975, when he worked in Canada for three years. His area of special expertise is environmental noise (acoustical engineering). The environmental and noise projects have ranged through EIAs and noise impact assessments, policy formulation and procedural guideline development. He has worked with a wide client base, ranging from the National Departments, provincial transportation/road authorities, provincial environmental authorities, the metropolitan authorities and many local councils to private organizations.

This specialist report was compiled for Eskom Holdings SOC Limited on behalf of Jongens Keet Associates. We do hereby declare that we are financially and otherwise independent of the applicant, Eskom Holdings SOC Limited.

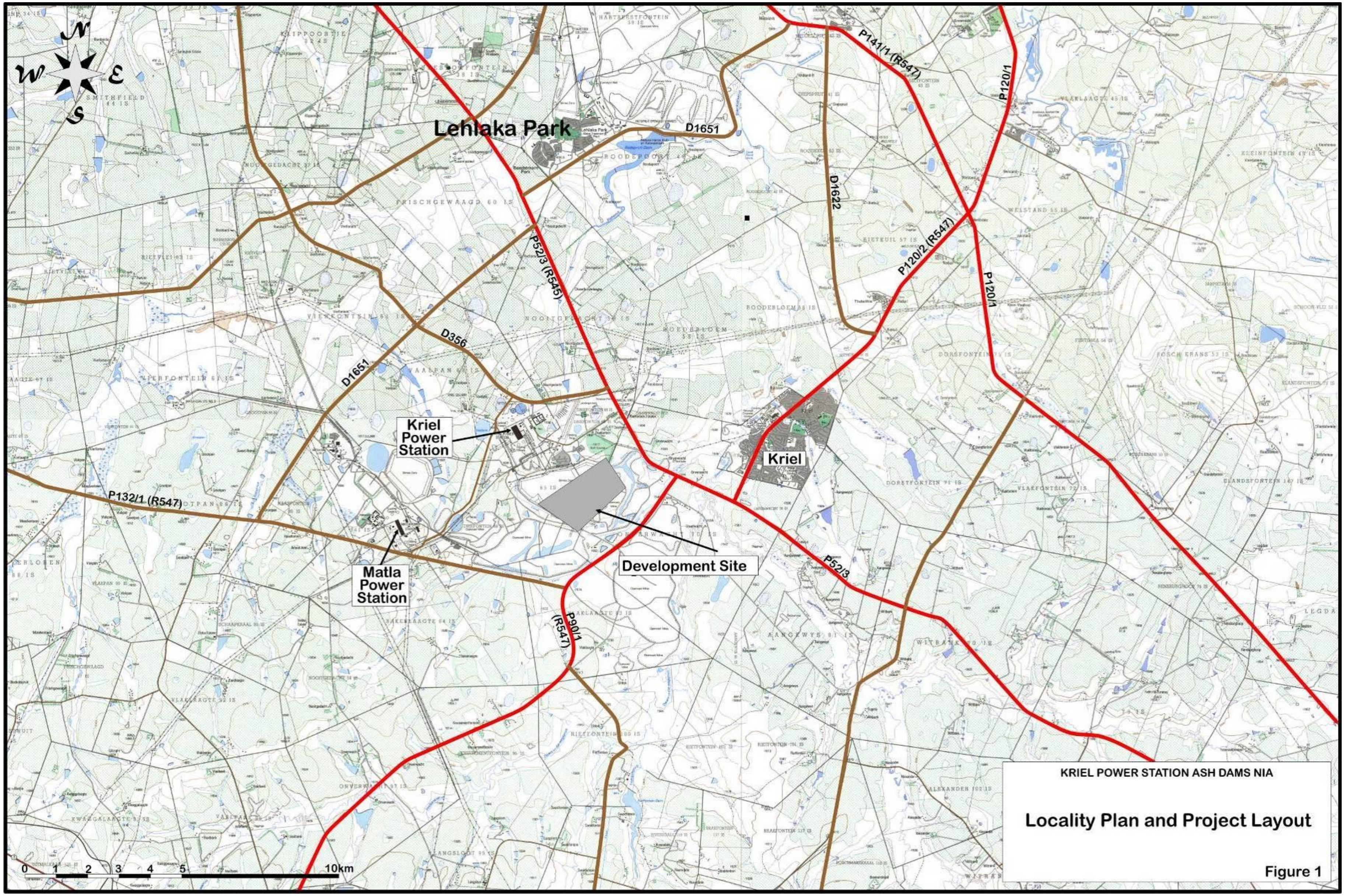
1 INTRODUCTION

1.1 Background

The Kriel Power Station, a coal fired power station owned by Eskom, is located approximately 5 kilometres to the east of the town of Kriel and some 40 kilometres south of eMalahleni (formerly Witbank). Through the burning of coal for the generation of electricity, the power station produces coarse and fine ash that need to be disposed of. Presently use is made of a wet ashing process to dispose of its ash in a series of dams to the south-east of the power station. Recently two of the three existing Ash Disposal Facility reached their capacity, while the third ash dam will reach its capacity by 2016. Eskom is thus proposing to construct two additional ash dams (AD4.1 and 4.2) that would fulfil ash disposal requirements for the remainder of the power station's operational life, i.e. year 2043 plus a five year contingency. Several sites were investigated. Site 10, which lies in the south-eastern sector of the Kriel Power Station property, just south of the existing Ash Disposal Facility (refer to **Figure 1**), has been selected.

Eskom has appointed Aurecon South Africa (Pty) Ltd to investigate the environmental feasibility of the proposed Kriel Power Station Ash Disposal Facility. Noise has been identified as an impact concern and Jongens Keet Associates have been appointed by Aurecon to undertake the noise impact investigation. The work was undertaken by Mr Derek Cosijn and Dr Erica Cosijn. This report documents the details and the findings of the EIA phase of the noise impact investigation.

This noise impact assessment deals with the Kriel Power Station Ash Disposal Facility, the ash water return (AWR) dams, the conveyor/pipeline routes (including transfer houses and pump stations) between the power station and the proposed new Ash Disposal Facility (refer to the lower section of **Figure 2**), and access roads. However, as not all of the details of the new facility are available at this stage, the noise impact assessment (EIA) is to assume that the existing infrastructure to the existing ash dams will be used.


N
W
E
S
Lehlaka Park
D1651
P141/1 (R547)
P120/1
D1622
P120/2 (R547)
P52/3 (R545)
D356
D1651
Kriel
Power
Station
Kriel
P132/1 (R547)
Matla
Power
Station
Development Site
P52/3
P90/1
(R547)
0 1 2 3 4 5 10km
KRIEL POWER STATION ASH DAMS NIA
Locality Plan and Project Layout
Figure 1

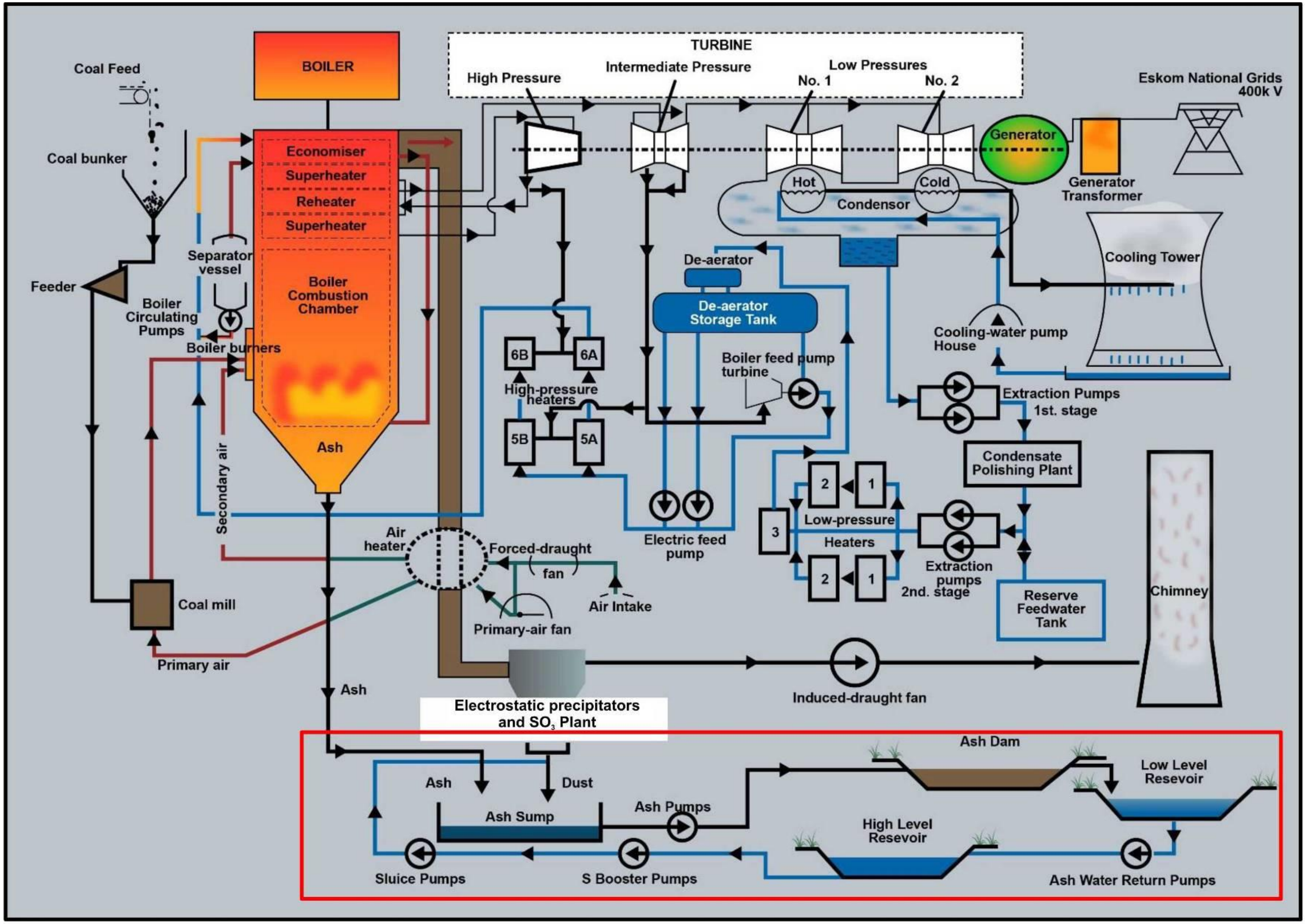


Figure 2: Flowchart of the operation, showing inputs and outputs of the process (including the Ash Disposal Facility in red)

1.2 Terms of Reference

The terms of reference (TOR) are as follows:

i) Establish the existing noise climate of the study area.

ii) A sufficiently detailed quantitative (by measurement) and qualitative assessment was to be undertaken within the area of influence of the planned Kriel Power Station Ash Disposal Facility project in order to enable a full appreciation of the nature, magnitude, extent and implications of the potential noise impact.

iii) This includes the areas affected by traffic generated by the power plant.

iv) One site was selected for final investigation, namely Site 10. The level of investigation was to be that of an EIA. A wet ashing method was to be assessed.

v) All aspects of the investigation were to conform to the requirements of relevant environmental legislation and noise standards.

vi) The potential impacts of the pre-construction, construction and operational phases of the project were to be assessed. The assessment was to indicate the potential cumulative impacts (noise impacts in context of the surroundings).

vii) Where relevant, appropriate noise mitigation measures were to be identified.

1.3 Study Area

The core study area of the noise impact assessment is that within the noise area of influence of the planned Ash Disposal Facility project. The core study area was the area between Kriel Power Station and the town of Kriel. Refer to **Figure 1**.

1.4 The Kriel Power Station Ash Disposal Facility Project

1.4.1 The Existing Situation

At present at Kriel Power Station, the coarse ash is crushed and transferred to sumps from where it is pumped together with the fine ash (fly ash) to the existing Ash Disposal Facility south of the power station. The fine ash is also transported to the existing Ash Disposal Facility but separately via an overland conveyor belt. The coarse fly-ash ash mixture is pumped as slurry through a pipeline to the Ash Disposal Facility.

1.4.2 The Proposed Expansion of the Ash Dam System

Several sites were investigated for the disposal of waste ash and one was selected for more detailed investigation, namely Site 10. The selected site lies just south of the existing ash disposal facility (refer to **Figure 1**).

The ash disposal method which is being considered is a wet ashing method, which is generally related to a pumped system. The coarse ash will be crushed and transferred to sumps from where it will be pumped together with the fine ash (fly ash) to the new Ash Disposal Facility. The coarse fly-ash ash mixture will be pumped as slurry through a pipeline to the Ash Disposal Facility. In wet ashing, dam walls are constructed from earth initially, and then later ash. The walls are raised incrementally, as needed. Ash slurry (coarse ash and fly ash) is then pumped into the dam, where the ash settles out. As the dam fills with ash deposits the walls are raised to contain a incoming ash slurry. This continues until the dam reaches its maximum height. Water is continuously drained from the surface of the dam and piped to a return water dam. Water that seeps through the dam is collected by a leachate system and piped to the return water dam. This water is then pumped back to the power station and reused by mixing it with the ash for transportation to the Ash Disposal Facility.

The developmental infrastructure that would be constructed includes the following:

- An Ash Disposal Facility that would have sufficient capacity for the remaining operational life of the power station until Year 2045 if the ash load is lowered and an expanded Ash Disposal Facility is built.
- An Ash Water Return (AWR) dam from where decant and drained water would be pumped back to the power station for re-use;
- An AWR transfer dam;
- Delivery and return infrastructure, including pipelines, transfer houses, pump stations;
- Powerlines;
- Access roads; and
- Clean and dirty water collection channels/trenches Ash Disposal Facility.

There is existing infrastructure (pipelines, pumps, sumps, etc.) which is to be used in conjunction with the new development. Where necessary, these are to be considered in the EIA assessment.

1.5 Scope and Limitations

Not all of the final specific noise characteristics of the various component plant machinery and equipment to be installed have been finalised. These data will only be available at tender stage. Conservative (worst-case scenario) predictions based on equipment baseline noise levels of typical plant that will be installed have therefore been made. Essentially the infrastructure, specifically the pump stations and conveyor system remains as is for this EIA analysis.

2 DETAILS OF THE STUDY AREA

Only the aspects which have an influence on the potential noise impact are dealt with in this Section.

2.1 Topography

The terrain across the study area is flat to gently rolling. The area is drained from the south to the north by the Steenkoolspruit and the Rietspruit. There are a number of pans in the area.

2.2 Vegetation

The vegetation of the study area belongs to the broad vegetation group of Highveld grassland. Vegetation is sparse.

2.3 Roads

The main roads (refer to **Figure 1**) influencing the noise climate of the study area are:

- Section P52/3a: Road P52/3 (Route R545) from Nkangala to D618
- Section P52/3b: Road P52/3 (Route R545) from D618 to P120/2.
- Section P52/3c: Road P52/3 (Route R545) from P120/2 to P90/1.
- Section P52/3d: Road P52/3 (Route R545) from P90/1 to D356.
- Section P52/3e: Road P52/3 (Route R545) from D356 to D1651.
- Section P52/3f: Road P52/3 (Route R545) from D1651 (East) to D1652 (West).
- Section P120/1a: Road P120/1 (Route R547) north of P120/2.
- Section P120/2b: Road P120/2 (Route R547) through Kriel.
- Section P90/1a: Road P90/1 (Route R547) south of P52/3.
- Section P90/1b: Road P90/1 (Route R547) south of P132/1.
- Section P132/1: Road P132/1, P90/1 to D1651 (Matla Power Station).
- Section P141/1: North of Kriel.
- Section D1622: North of Kriel, to the west of and providing access to Thubelihle.
- Section D1651: Road D1651 between P52/3 and P132/1.

2.4 Railway Lines

There are no railway lines through the area.

2.5 Land Use

The existing land uses in the area are:

i) Residential:

  a. Residential areas in the town of Kriel, Thubelihle, Rietstroom Park and Lehlaka Park.
  b. Ga-Naka, the residential village at Kriel Power Station.
  c. Various farmhouses and farm labourer residences.
  d. Various formal and informal settlements.

ii) Educational: There are several schools in the area.

iii) Mining: There are several collieries in the area surrounding Kriel Power Station. The mines are both opencast and underground. An ash dam for Matla Power Station is presently being constructed just south of the Kriel Power Station Ash Dams and south of Road R547.

iv) Industrial:
  a. Matla Power Station.
  b. Kriel Power Station.

v) Farming: There are a number of farms in the area that are being actively farmed.

vi) Transportation: A small airfield is located approximately 1 km to the east of the Kriel Power Station.

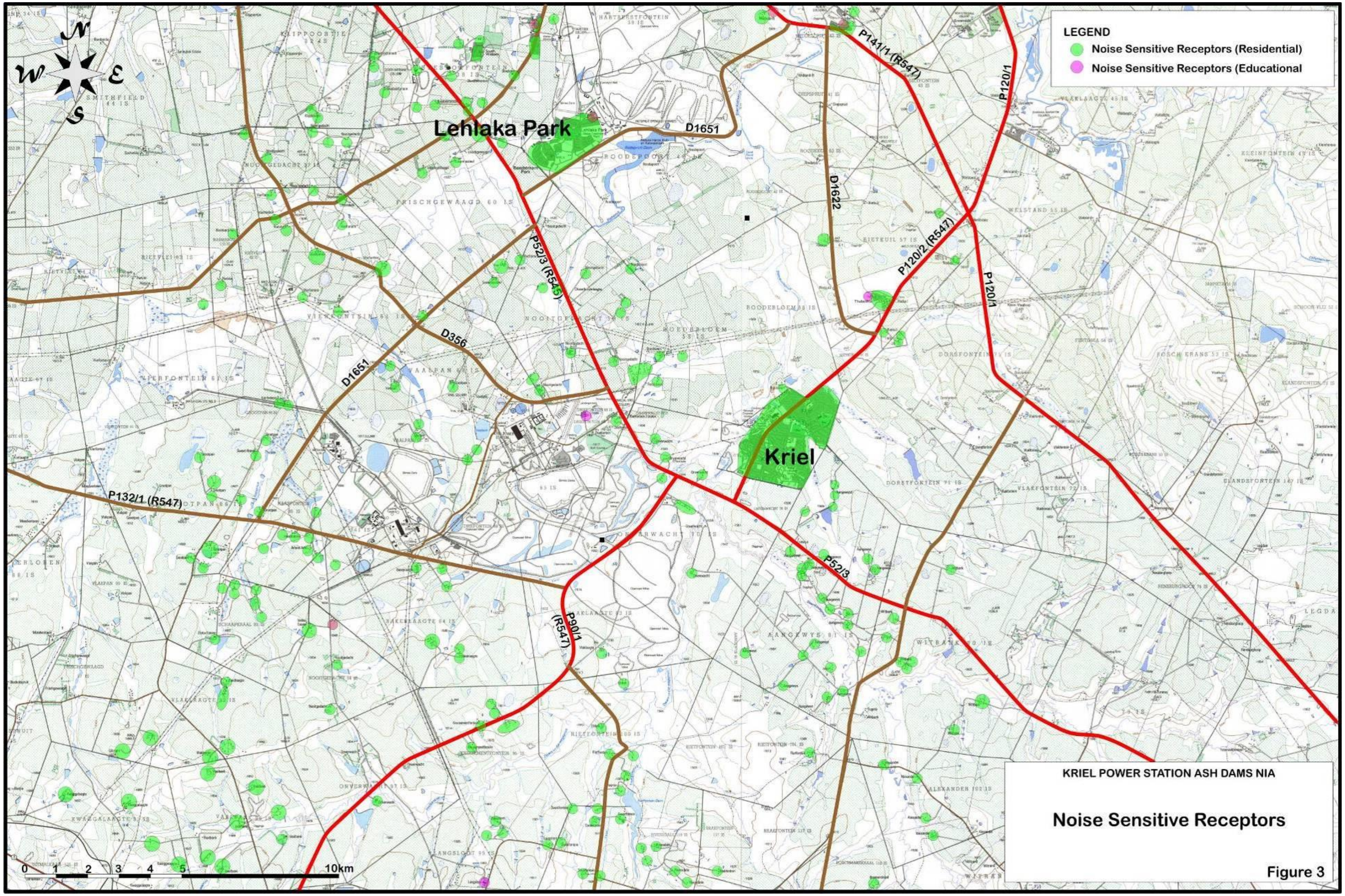
vii) Recreational: The Kriel Golf Club is approximately 2 km to the southeast of the Kriel Power Station.

2.6 Noise Sensitive Receptors

The residences (inclusive of farm houses and farm worker dwellings), hospitals and schools may be defined as noise sensitive land uses in the study area (see **Figure 3**).

For this study, the position of Noise Sensitive Receptors (NSRs) was taken off 1:50 000 topographical cadastral maps and verified as far as possible from a field survey and using Google Earth. Even though the latest editions of the maps were used, the relevant maps are up to 20 years out of date and there may be new dwellings and/or some of the existing shown buildings may be derelict. During the field survey for the noise measurement survey, such aspects were noted where possible. The following 1:50 000 topographical cadastral maps were used:

- SOUTH AFRICA 1:50 000 Sheet 2629AA, OGIES, Third Edition 1995.
- SOUTH AFRICA 1:50 000 Sheet 2629AB, VAN DYKSDRIF, Third Edition 1996.
- SOUTH AFRICA 1:50 000 Sheet 2629AC, EVANDER, Third Edition 1995.
- SOUTH AFRICA 1:50 000 Sheet 2629AD, BETHAL, Third Edition 1996.


LEGEND
Noise Sensitive Receptors (Residential)
Noise Sensitive Receptors (Educational)
Lehlaka Park
Kriel
D1651
D1622
D356
P141/1 (R547)
P120/1
P120/2 (R547)
P52/3 (R545)
P52/3
P132/1 (R547)
P90/1 (R547)
0 1 2 3 4 5 10km
KRIEL POWER STATION ASH DAMS NIA
Noise Sensitive Receptors
Figure 3

2.7 Aspects of Acoustical Significance

There are no prominent topographical features in the area that will significantly influence the propagation of the noise from the new Ash Disposal Facility.

A significant meteorological aspect that will affect the transmission (propagation) of the noise is the wind. The wind can result in periodic enhancement downwind or reduction upwind of noise levels. The wind roses for Kriel Village Ambient Air Monitoring Station were used for assessing the wind conditions in the study area. Records from 2013 to 2015 were used. The wind field is dominated by winds from the north-west; north-east; and, less frequently the south-west. Calm conditions occurred less than 1% of the time. During the day, winds at higher wind speeds occurred more frequently from the easterly sector, with 0.2% calm conditions. Night-time airflow had winds also most frequently from the easterly sector but at lower wind speeds. The frequency of night-time calm conditions increased to 0.9%, relative to day-time. Summer and spring show similar wind direction profiles to the period average, while autumn and winter show the more frequent winds from the south-west. There is an increased frequency of wind speeds of 3 m/s or more in spring.

Atmospheric temperature inversions have a significant effect on the noise propagation character of the area. Temperature inversions tend to increase noise levels at some distance from a source. A temperature inversion is formed when air near the ground is cooler than the air above. This occurs mainly at night or to a lesser extent during cloudy days away from large bodies of water. Stable conditions with high humidity and very low velocity wind conditions are necessary. As cool air is denser than warm air, sound rays are refracted towards the cooler air, that is, towards the ground.

3 METHODOLOGY

3.1 General

The general procedure used to determine the noise impact was guided by the requirements of the Code of Practice SANS 10328 *Methods for Environmental Noise Impact Assessments.* The level of investigation was the equivalent of an EIA. A comprehensive assessment of all noise impact descriptors (standards) has been undertaken. The noise impact criteria used specifically take into account those as specified in the South African National Standard SANS 10103 *The Measurement and Rating of Environmental Noise with Respect to Annoyance and Speech Communication* as well as those in the National Noise Control Regulations. The investigation comprised the following:

i) Determination of the existing situation that is prior to the development of the new Ash Disposal Facility being constructed.

ii) Determination of the situation during the construction phase and the operational phase.

iii) Assessment of the change in noise climate and impact.

iv) Identification of mitigation measures.

3.2 Determination of the Existing Conditions

This phase comprised the following:

i) The relevant technical details of the planned Kriel Power Station Ash Disposal Facility, the details of similar operating Ash Disposal Facilities, the existing traffic patterns and the existing land use in the study area were reviewed in order to establish a comprehensive understanding of all aspects of the project that will influence the future noise climate in the study area.

ii) Using these data, the limits of the study area of the development site were determined and the potential noise sensitive areas, other major noise sources and potential problems in these areas were identified.

iii) Applicable noise standards were established. The National Noise Control Regulations and the SANS 10103 standards were applied.

iv) The existing *noise climate* of the Study Area was determined by means of a field inspection and a noise measurement survey. The measurement survey appropriately covered the whole of the study area, focussing specifically on the identified noise sensitive/problem areas. Measurements were taken at 10 main monitoring sites in the study area. The sound pressure level (SPL) (noise) measurements were taken in accordance with the requirements of the Code of Practice SANS 10103 *The Measurement and Rating of Environmental Noise with Respect to Annoyance and to Speech Communication*. A Type 1 integrating sound level meter was used for the noise measurements. All measurements were taken under dry weather and normal traffic conditions. Refer to Appendix B.

v) On the general field inspection and at the same time as each individual measurement was being taken, the qualitative nature of the *noise climate* in the area of the measurement site was assessed and recorded. This comprised an appraisal of the general prevailing acoustic conditions based on the subjective response to the sounds as perceived by the listener (i.e. *auditory observation* by the surveyor), as well as identifying those noise incidents, which influenced the noise meter readings during that measurement period. This procedure is essential in order to ensure that that there is a *human* correlation between the noise as perceived by the human ear and that which is measured by the meter, as well as to establish any anomalies in the general ambient noise conditions.

vi) The existing noise climates along relevant main roads in the area as related to the current traffic volumes and patterns were established. These traffic noise levels were calculated using the South African National Standard SANS 10210 *Calculating and Predicting Road Traffic Noise* for the main roads in the area. The Year 2010 and 2016 traffic was used as the baseline reference. The calculated 24-hour period noise indicators, as well as those for the daytime period and night-time period provided the main data for the impact assessment were established. The measured data provided a field check of the calculated acoustic conditions. Refer to Section A2 of Appendix A for details of the noise impact criteria used.

3.3 Assessment of Planning/Design Phase and Construction Phase Impacts

Aspects of the pre-design field surveys and construction activities that potentially will have a noise impact were identified and, where appropriate, mitigation measures have been recommended.

3.4 Assessment of Operational Phase Impacts

The main focus of the operational phase assessment was to establish the nature, magnitude and extent of the potential change in *noise climate* in the study area directly related to and within the area of influence of the proposed Ash Disposal Facility. This was done as follows:

i) The impact of the planned Ash Disposal Facility with its ancillary operations was established. Eskom indicated that the design of the facility had not yet been finalised and that the operation of AD4.1 and 4.2 would make use of the existing infrastructure parameters in the analysis.

ii) Baseline noise data of various plant and equipment were determined from measurements at other similar operational sites. The baseline noise profiles of the noisiest plant and equipment were then used to calculate the typical noise conditions generated by the operations at the power station. The South African National Standard SANS 10357 *The Calculation of Sound Propagation by the Concawe Method* was used to model the situation.

iii) The worst situation was modelled. SANS 10357 was used to model the likely attenuation of noise that would be possible. This model covers a method of calculating the propagation of sound over distance under a variety of meteorological and topographical conditions. Aspects such as the atmospheric pressure, temperature, relative humidity of the air, the wind speed and wind direction and nature of the ground surface (vegetation cover) between the source and the receiver are inputs to the modelling. A screening process to assess the worst conditions was applied to a number of meteorological alternatives, namely:

a) Unstable conditions with winds in excess of 6m/s.

b) Stable conditions with temperature inversion conditions.

c) Based on analysis of on the long term meteorological data for Kriel provided by Airshed Planning Professionals (Pty) Ltd, the modelling of the noise footprint for the Ash Disposal Facility and ancillary works were calculated for atmospheric temperature inversion conditions (worst case scenario).

iv) Based on the findings, appropriate noise mitigation measures (site scale) have been investigated and recommendations made. These are conceptual and not detailed to final design level.

3.5 Method of Assessing the Significance of Impact

This section outlines the method that has been used for assessing the significance of the potential environmental impacts. These included both construction and operational phase impacts.

For each impact, the EXTENT (spatial scale), MAGNITUDE and DURATION (time scale) has been described. These criteria have been used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The mitigation described in the Noise Impact Assessment Report represents the full range of plausible and pragmatic measures but does not necessarily imply that they would be implemented. The tables on the following pages show the scale used to assess these variables, and defines each of the rating categories.

TABLE 1.1: ASSESSMENT CRITERIA FOR THE EVALUATION OF IMPACTS

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	**Regional**.	Beyond a 10 km radius of the candidate site
	Local	Within a 10 km radius of the candidate site.
	Site specific	On site or within 100 m of the candidate site
Magnitude of impact (at the indicated spatial scale)	**High**	Natural and/ or social functions and/ or processes are *severely* altered
	Medium	Natural and/ or social functions and/ or processes are *notably* altered
	Low	Natural and/ or social functions and/ or processes are *slightly* altered
	Very Low	Natural and/ or social functions and/ or processes are *negligibly* altered
	Zero	Natural and/ or social functions and/ or processes remain *unaltered*
Duration of impact	**Construction period**	Up to 3 years
	Short term	Up to 5 years after construction
	Medium Term	5-15 years after construction
	Long Term	More than 15 years after construction

The SIGNIFICANCE of an impact was derived by taking into account the temporal and spatial scales and magnitude. The means of arriving at the different significance ratings is explained in **Table 1.2.**

TABLE 1.2: DEFINITION OF SIGNIFICANCE RATINGS

SIGNIFICANCE RATINGS	LEVEL OF CRITERIA REQUIRED
High	i) High magnitude with a regional extent and long term duration ii) High magnitude with either a regional extent and medium term duration or a local extent and long term duration **iii)** Medium magnitude with a regional extent and long term duration
Medium	iv) High magnitude with a local extent and medium term duration v) High magnitude with a regional extent and construction period or a site specific extent and long term duration vi) High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration vii) Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term **viii)** Low magnitude with a regional extent and long term duration
Low	ix) High magnitude with a site specific extent and construction period duration x) Medium magnitude with a site specific extent and construction period duration xi) Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term **xii)** Very low magnitude with a regional extent and long term duration
Very low	xiii) Low magnitude with a site specific extent and construction period duration **xiv)** Very low magnitude with any combination of extent and duration except regional and long term
Neutral	**xv)** Zero magnitude with any combination of extent and duration

Once the significance of an impact was determined, the PROBABILITY of this impact occurring as well as the CONFIDENCE in the assessment of the impact was established using the rating systems outlined in **Table 1.3** and **Table 1.4**, respectively. It is important to note that the significance of an impact should always be considered together with the probability of that impact occurring. Lastly, the REVERSIBILITY of the impact was estimated using the rating system outlined in **Table 1.5**.

TABLE 1.3: DEFINITION OF PROBABILITY RATINGS

PROBABILITY RATINGS	CRITERIA
Definite	Estimated greater than 95% chance of the impact occurring.
Probable	Estimated 5 to 95% chance of the impact occurring.
Unlikely	Estimated less than 5% chance of the impact occurring.

TABLE 1.4: DEFINITION OF CONFIDENCE RATINGS

CONFIDENCE RATINGS	CRITERIA
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

TABLE 1.5: DEFINITION OF REVERSIBILITY RATINGS

REVERSIBILITY RATINGS	CRITERIA
Irreversible	The activity will lead to an impact that is in all practical terms permanent.
Reversible	The impact is reversible within 2 years after the cause or stress is removed.

4 FINDINGS AND ASSESSMENT OF IMPACT: GENERAL

The following conditions were observed in the study area and the following aspects were determined from the surveys, calculations of noise indicators and the predictive modelling undertaken for the assessment of the noise impact of the planned project.

4.1 General Details

General aspects of note were as follow:

i) The main sources of noise in the area are from:
   a) Traffic on the main roads.
   b) Matla Power Station.
   c) The ash dam for Matla Power Station that is presently being constructed just south of the Kriel Power Station Ash Dams and south of Road R547
   d) Kriel Power Station.
   e) Various mines and mine linear infrastructure such as overland conveyors.
   f) General farming activities.

ii) The main noise sensitive receptors in the area are (refer also to Figure 3 and Section 2.6):
   a) Residential areas in the town of Kriel, Thubelihle, Rietstroom Park and Lehlaka Park.
   b) The residential village Ga-Naka at the Kriel Power Station
   c) Various farmhouses and farm labourer residences.
   d) Various informal settlements.

e) Various schools in the area.

4.2 The Residual (Existing Ambient) Noise Climate

Measurements and *auditory observations* were taken at 10 main sites in order to establish the ambient noise conditions of the study area. For a detailed description of the main measurement sites and for more technical details of the measurement survey refer to **Appendix B**. Refer also to **Figure B1 in Appendix B**.

4.2.1 Road Traffic Noise

In order to complement the short-term noise measurements in the study area, the existing 24-hour residual noise levels related to the average daily traffic (ADT) flows on the main roads were also calculated. The noise levels at various offsets from the centreline of these roads are of that shown in **Table 2**. Refer to **Table B2 in Appendix B** for details.

TABLE 2: DEGRADED NOISE CLIMATE (AREA POTENTIALLY IMPACTED) ALONGSIDE MAIN ROADS (L_{dn})

Road	Offset Distance (m)	
	Suburban Standards	**Rural Standards**
Road P52/3a	700	1400
Road P52/3b	700	1400
Road P52/3c	600	1250
Road P52/3d	1000	1800
Road P52/3e	100	250
Road P52/3f	200	500
Road P120/1	230	570
Road P120/2	800	1500
Road P90/1a	700	1400
Road P90/1b	400	900
Road P132/1	350	800
Road P141/1	800	1600
Road D1651	400	900

4.2.2 Summary of Baseline Noise Climate

In overview, it was found that residual noise levels across the study area vary significantly:

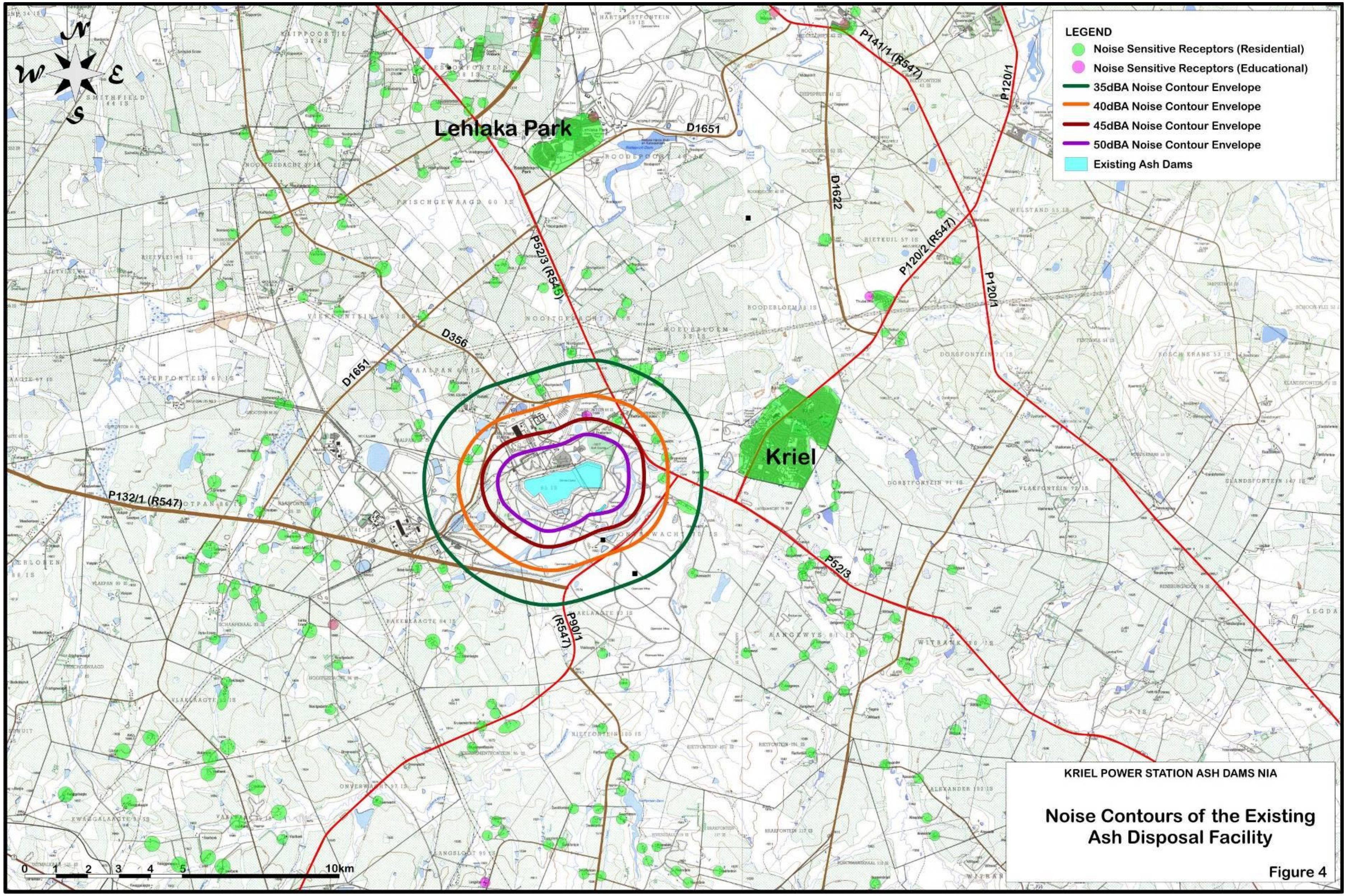
i) The existing residual noise climate in most of the study area is largely typical of a rural/agricultural environment as defined in SANS 10103:2008, that is, areas where ambient noise levels generally do not exceed 45dBA during the daytime period (06h00 to 22h00) and generally do not exceed 35dBA during the night-time period (22h00 to 06h00). Refer to the SANS 10103:2008 standards as given in **Appendix A**.

ii) In the residential area of Kriel, in Thubilihle and Lehlaka Park, Rietstroom Park, Ga-Naka Village at the Kriel Power Station and in the informal settlements the existing residual noise climate is typical of a suburban environment as defined in SANS 10103:2008, that is, areas where ambient noise levels generally do not exceed 50dBA during the day and generally do not exceed 40dBA during the night-time.

iii) There are also areas close to the two power stations and the mines where the ambient noise levels and maximum noise levels exceed that of various adjoining agricultural and residential areas. The noise footprint of the operations at the existing ash dams at Kriel Power Station is shown in **Figure 4** and **Table 3**.

TABLE 3: AMBIENT NOISE CONDITIONS FROM OPERATIONS AT THE EXSITING KRIEL POWER STATION ASH DISPOSAL FACILITY (WET ASHING PROCESS - UNMITIGATED)

Time Period	Sound pressure level at given offset (dBA)						
	500m	1000m	1500m	2000m	2500m	3000m	3500m
Daytime $L_{Req,d}$ (06h00-22h00)	55.3	48.5	44.0	40.7	38.1	35.9	33.9
Night $L_{Req,n}$ (22h00-06h00)	55.3	48.5	44.0	40.7	38.1	35.9	33.9


LEGEND
Noise Sensitive Receptors (Residential)
Noise Sensitive Receptors (Educational)
35dBA Noise Contour Envelope
40dBA Noise Contour Envelope
45dBA Noise Contour Envelope
50dBA Noise Contour Envelope
Existing Ash Dams
Lehlaka Park
Kriel
D1651
D1622
D356
P141/1 (R547)
P120/1
P120/2 (R547)
P52/3 (R545)
P52/3
P132/1 (R547)
P90/1 (R547)
0 1 2 3 4 5 10km
N
W
E
S
KRIEL POWER STATION ASH DAMS NIA
Noise Contours of the Existing Ash Disposal Facility
Figure 4

4.3 Noise Standards/Impact Criteria

From these findings and observations on site it was considered appropriate to apply the following noise standards and impact criteria to the study area:

i) Suburban residential: the noise impact on the residences in Kriel Thubilihle, Rietstroom Park, Lehlaka Park, Ga-Naka and the informal settlements should be determined on the basis of suburban residential district standards (SANS 10103), namely the daytime period ambient noise level should not exceed 50dBA and that for the night-time period should not exceed 40dBA.

ii) Rural residential: the noise impact on the residences on farms in the area should be determined on the basis of rural residential district standards (SANS 10103), namely the daytime period ambient noise level should not exceed 45dBA and that for the night-time period should not exceed 35dBA. Measured levels indicate that parts of the (rural) study area are already severely degraded close to the main sources of noise.

iii) Educational: Noise levels at the schools should not exceed 50dBA (outdoor condition) with the proviso that indoor classroom conditions do not exceed 40dBA.

The above indicates the ideal situation, where noise sensitive receptors are not already degraded by the existing (residual) noise climate. However, it is likely that the residual noise level at some of the noise sensitive receptors already exceeds the recommended maximum (e.g. next to major roads). In order to assess the actual noise impact at any particular site, therefore, the residual noise climate has to be taken into account when determining impact. Where the noise level for a particular site is presently lower than the maximum ambient allowed (as indicated in SANS 10103) the recommended maximum shall not be exceeded by the introduction of the intruding noise. Where the noise level for the site is presently at or exceeds the maximum level allowed, the existing level shall not be increased by more than that indicated as acceptable in SANS 10103 (refer to **Table A3 in Appendix A**).

5 FINDINGS AND ASSESSMENT OF THE PRE-CONSTRUCTION PHASE

Activities during the planning and design phase that normally have possible noise impact implications are those related to field surveys (such seismic testing and geological test borehole drilling for investigation of founding conditions for large plant/equipment). As these activities are usually of short duration and take place during the day, generally they are unlikely to cause any major noise disturbance or nuisance in adjacent areas. It is assumed that the equipment is maintained in good order.

6 FINDINGS AND ASSESSMENT OF THE CONSTRUCTION PHASE

6.1 General

The potential noise climate was established in general for the construction of the works. Construction camps (offices / lay down areas) are planned for on site.

Although not all the layout details have been finalised, general concepts have been used in the noise impact evaluation. These are adequate to provide a sound basis for the analysis of typical noise conditions and impacts that are likely to prevail on the project. Data related to construction have been sourced from various consultants, equipment manufacturers and contractors, British Standard BS 5228 and the experience that JKA has had working on similar sites.

The daily construction related traffic will vary over the period of the construction. It has been estimated that the construction activities at the site will on average generate no more than about 50 vehicle trips (two way trips) daily. A large percentage of the trips will be concentrated in the morning and evening peak periods.

6.2 Construction Noise Conditions

Construction will likely be carried out during the daytime only (07h00 to 18h00 or 20h00). It should however be noted that certain activities may occasionally extend into the late evening period, while others such as de-watering operations may need to take place over a 24-hour period. It is estimated that the basic development of the project will take place over a period of about 12 months. Note that the construction of AD4.1 and 4.2 will in fact be an ongoing activity throughout the life of the operational phase.

6.2.1 Sources of Noise

The following, where relevant, are likely to be the main construction related sources of noise for the project:

i) Construction camp establishment.

ii) Removal and demolition of existing infrastructure that is no longer needed or needs to be replaced.

iii) Earthworks to remove topsoil where relevant at the Ash Disposal Facility site.

iv) Activities related to the relocation of services.

v) Excavation of building foundations and pipeline trenches. Blasting may be required in places but in general pneumatic breakers will be used where rock is encountered.

vi) Erection of shuttering for concrete works.

vii) Fixing of steel reinforcing.

viii) Placing and vibration of concrete. Poker vibrators will be used.

ix) Stripping of shuttering after concrete pour.

x) Finishing operations. Cladding, services installation, etc.

xi) General movement of heavy vehicles such as concrete delivery vehicles, mobile cranes, mechanical dumpers and water trucks (dust suppression) around the site.

xii) During the construction phase, construction teams (maximum three teams per site) would consist of an excavator, two trucks, a compactor and loader with an associated labour force.

xiii) De-watering pumps. A 24-hour operation may sometimes be necessary.

xiv) Road construction equipment. Scrapers, dozers, compactors, etc. (Construction of the access roads).

xv) Site fabrication workshops and plant maintenance workshops, existing facilities will be used.

xvi) Concrete batching plant.

xvii) Construction material and equipment delivery vehicles.

The level and character of the construction noise will be highly variable as different activities with different plant/equipment take place at different times, over different periods, in different combinations, in different sequences and on different parts of the construction site. Typical noise levels generated by various types of construction equipment are given in **Table 4**. These noise levels assume that the equipment is maintained in good order. Conservative attenuation conditions (related to intervening ground conditions and screening) have been applied.

TABLE 4: TYPICAL NOISE LEVELS GENERATED BY CONSTRUCTION EQUIPMENT

Plant/Equipment	Typical Operational Noise Level at Given Offset (dBA)							
	5m	**10m**	**25m**	**50m**	**100m**	**250m**	**500m**	**1000m**
Air compressor	91	85	77	71	65	57	51	46
Compactor	92	86	78	72	66	58	52	46
Concrete mixer	95	89	81	75	69	61	55	49
Concrete vibrator	86	80	72	66	60	52	46	40
Mobile Conveyor belt	77	71	63	57	51	43	37	32
Crusher (aggregate)	90	84	76	70	64	56	50	44
Crane (mobile)	93	87	79	73	67	59	53	47
Dozer	95	89	81	75	69	61	55	49
Loader	95	89	81	75	69	61	55	49
Mechanical shovel	98	92	84	78	72	64	58	52
Pile driver	110	104	97	91	85	77	71	65
Pump	86	80	72	66	60	52	46	40
Pneumatic breaker	98	92	84	78	72	64	58	52
Rock drill	108	102	94	88	82	74	68	62
Roller	84	78	70	64	58	50	44	38
Trucks	87	81	73	67	64	60	57	54

Exact daytime period and night-time period continuous equivalent sound pressure levels are not possible to calculate with certainty at this stage as the final construction site layout, work programme for the various components, work *modus operandi* and type of equipment have not been finalised. Using baseline data from typical construction sites, the ambient noise conditions at various offsets from the following main construction activities are predicted:

- Noise from concrete batching plant.
- General concrete construction.

Refer to **Table 5**.

TABLE 5: PREDICTED AMBIENT NOISE LEVELS AT GIVEN OFFSETS FROM SOME SPECIFIC CONSTRUCTION ACTIVITIES

Equipment	Sound pressure level at given offset(dBA)					
	500m	**1000m**	**1500m**	**2000m**	**2500m**	**3000m**
Concrete Batching Plant	53.6	46.0	41.1	37.5	34.7	32.3
Concreting Operations	57.2	49.1	43.9	40.1	37.1	34.6

6.2.2 Noise Impact

The general nature of the noise impacts from the construction sites is predicted to be as follows:

i) Source noise levels from many of the construction activities will be high. Noise levels from all work areas will vary constantly and in many instances significantly over short periods during any day working period.

ii) Working on a worst case scenario basis, it is estimated that the ambient noise level from general construction activities could negatively affect noise sensitive sites within a distance of 1400 metres of the construction site. Note that this is the offset of the 45dBA noise contour from the construction. Refer to **Table 5**.

iii) Night-time construction could have a significant impact on noise sensitive sites within a radius of 3000 metres of the construction site.

iv) There are some short-term noises that may, at times, be heard beyond the indicated positions of the respective 35dBA contours, for example blasting). There are likely to be some significant noise nuisance effects from these intermittent loud noises on some people living in the area.

v) It has been estimated that the construction activities will on average generate about 50 vehicle trips (two way trips) daily. In general, the construction traffic will have a relatively minor effect on the noise climate alongside the main external roads in the area. Because of the character of the traffic (namely heavy vehicles), there is likely to be some noise nuisance factor with the passing of each vehicle at noise sensitive receptors along the access routes.

vi) There are a number of noise sensitive receptors in the vicinity of the development site that are likely to be affected by construction noise. The nature of the impact will be related to more to noise nuisance (annoyance) than to noise disturbance.

The general nature of the noise impacts from road construction (access roads) activities is predicted to be as follows:

i) The level and character of the construction noise will be highly variable as different activities with different plant/equipment take place at different times, over different periods, in different combinations, in different sequences and on different parts of the construction site.

ii) As no specific construction details or possible locations of major ancillary activity sites are available at this stage, the anticipated noise from various types of construction activities cannot be calculated accurately. In general at this stage, it can be said that the typical noise levels of construction equipment at a distance of 15 metres lie in the range of 75 decibels (dBA) to 100dBA. Refer also to **Table 4**. Based on data from similar "linear" construction sites, a one-hour equivalent noise level of between 75dBA and

78dBA at a point 50 metres from the construction would be typical for the earthmoving phase.

iii) There are no noise sensitive receptors in the vicinity of the development site that are likely to be affected by noise from the road construction.

It should be noted that higher ambient noise levels than recommended in SANS 10103 are normally accepted at the noise sensitive receptors as being reasonable during the construction period, provided that the very noisy construction activities (refer to **Table 4**) are limited to the daytime and that the contractor takes reasonable measures to limit noise from the work site. Note that it has been assumed that construction will generally take place from 06h00 to 18h00 with no activities (or at least no noisy construction activities) at night. From the details presently available, it appears that the construction noise impact is not likely to be severe if good noise management procedures are applied on site and various mitigation measures implemented. **Refer to Section 5**.

7 FINDINGS AND ASSESSMENT OF THE OPERATIONAL PHASE

7.1 Sources of Noise

The main sources of background noise in the area will continue to be from:

i) Traffic on the main roads.
ii) Matla Power Station.
iii) Kriel Power Station.
iv) Various mines and mine linear infrastructure such as overland conveyors.
v) General farming activities.

In general, it is not anticipated that the noise levels from these existing sources will increase significantly in the future, with the exception of road traffic noise.

The noise generated by the new Ash Disposal Facility and its ancillary works will be added to the noise climate prevailing in the area (cumulative effects).

7.2 Noise Sensitive Areas

The existing noise sensitive receptors, which are likely or could possibly be impacted by some or all elements of the proposed new Ash Disposal Facility project operations, are (refer to **Figure 2 and Section 2.6**):

- Various suburban and rural residences.

- Various schools in the study area.

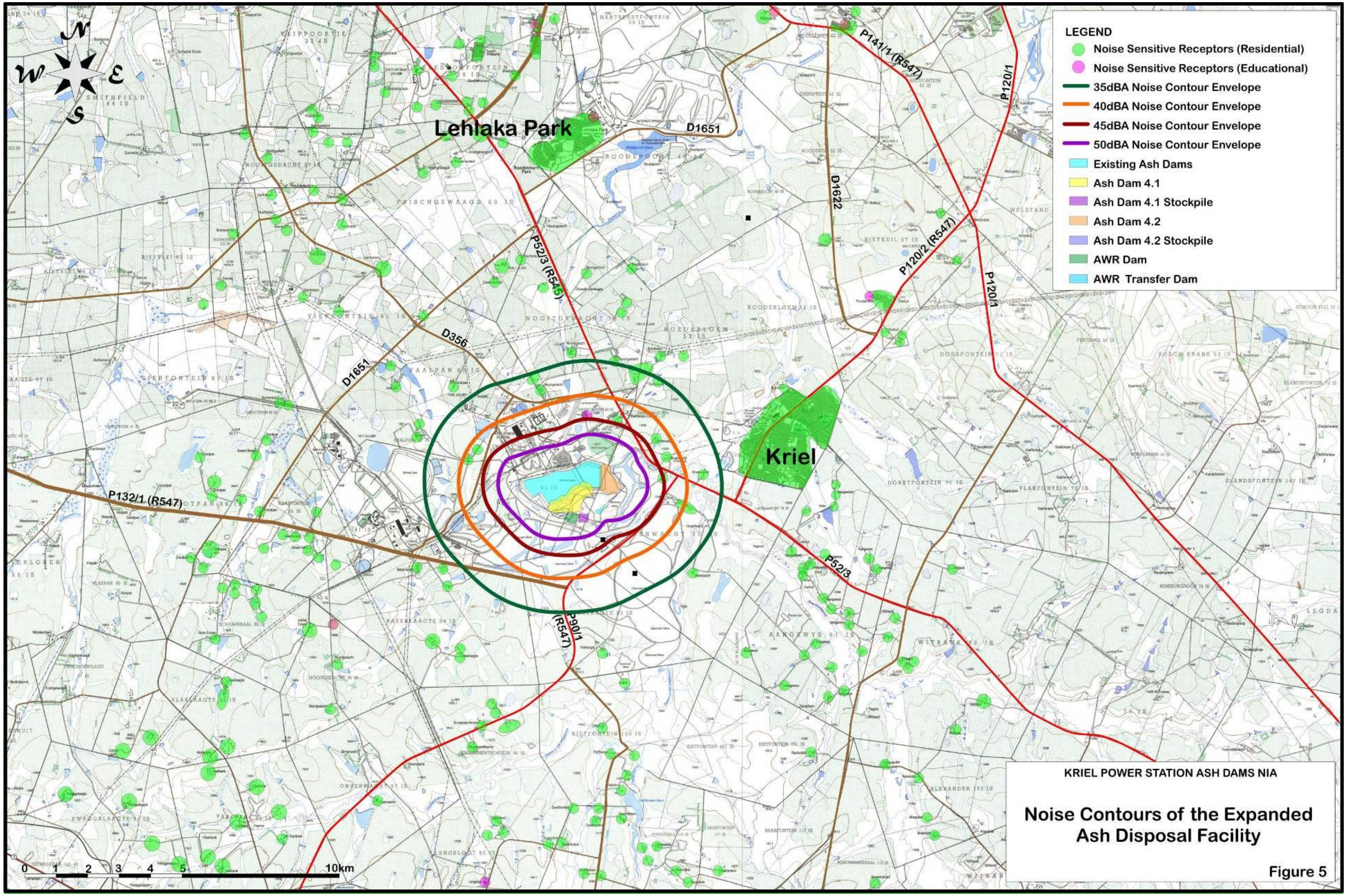
7.3 General

The noise impact analysis of the Ash Disposal Facility is described below. All the calculated noise profiles as shown in **Figure 5** and in **Table 7** reflect a worst condition scenario (conservative) approach. The noise levels given are for unmitigated conditions. In reality there will be greater attenuation with distance than shown where there are houses, other buildings, vegetation and terrain restraints in the intervening ground between the source and the receiver point.

The table below summarises the sources of noise and the relevant sections further in the report are referenced.

TABLE 6: SUMMARY OF NOISE RELATED DETAILS OF THE WET ASH DISPOSAL METHOD

Element of system	**Description of element**	**Comments**	**Reference section**
Sump and ash pump	Entry sump and ash slurry pump to pipeline to wet Ash Disposal Facility	Assumed that existing sump and pump will be used. No additional noise impact.	
Pipeline	Underground pipeline from power station to Ash Disposal Facility	No noise from pipeline during operational phase.	
Wet ash dam	Construction of ash containment wall. Equipment used/sources of noise: FEL, dozer, compactor, empty and loaded haul trucks.	Construction of daywalls takes place at intervals. The pumping of the ash slurry into the dam will be virtually continuous.	Section 7.4. Figure 5 Table 6
Return water dam		No noise associated with drainage of leachate from ash dam to return water dam.	
Return water pumps	Pump system to recycle leachate back to power station	Pump system located on return water dam. Pumps will be the main source of noise.	Section 7.6
Return water pipeline	Underground pipeline from return water dam to power station	No noise from pipeline during operational phase.	


LEGEND
Noise Sensitive Receptors (Residential)
Noise Sensitive Receptors (Educational)
35dBA Noise Contour Envelope
40dBA Noise Contour Envelope
45dBA Noise Contour Envelope
50dBA Noise Contour Envelope
Existing Ash Dams
Ash Dam 4.1
Ash Dam 4.1 Stockpile
Ash Dam 4.2
Ash Dam 4.2 Stockpile
AWR Dam
AWR Transfer Dam
Lehlaka Park
Kriel
D1651
D1622
P141/1 (R547)
P120/1
P120/2 (R547)
P52/3 (R545)
D356
P132/1 (R547)
P52/3
P90/1 (R547)
0 1 2 3 4 5 10km
KRIEL POWER STATION ASH DAMS NIA
Noise Contours of the Expanded Ash Disposal Facility
Figure 5

7.4 Ash Disposal

The construction of each lift of the dams' daywalls will take place in stages as and when needed over the life of the dam.

The ash dam construction operations for the wet ash will not extend at one time over the whole area of the ash dam, but the area will be worked incrementally. This will mean that there will not be a static noise footprint from the facility. As well as moving in plan, the noise levels from the respective sections being worked will also vary as the height of the dam increases. As the height of the dam increases, the overall noise footprint will increase, but at the same time, the noise sensitive sites closer to the dam will be shielded from the noise. This is due to the shielding effect of the sides of the ash dam.

The noise footprint shown is for the operations over the full period for that the ash dam will be worked. It is the ***total*** noise envelope covering the noise generated by the entire dam for ***all situations over the full operational phase of the dam***. It indicates the worst situation that could occur at any specific receiver point. It is for this reason as well as the very conservative (i.e. worst meteorological conditions, hard ground, no barriers, etc) approach to the analysis that the cumulative effects with any of the other noise zones of the Ash Disposal Facility are not plotted. If problems are anticipated at any one noise sensitive site then a more detailed analysis of that specific site will need to be undertaken.

Noise from the wet ashing process will be intermittent, as the dam walls are built in stages. The main sources of noise from the wet ashing process will be from the following plant/equipment, non-exhaustive list (refer also to **Figure 5** and **Table 7**):

- Excavators, front-end loaders and dozers.
- Compactor.
- Loaded trucks as well as empty trucks.

TABLE 7: PREDICTED AMBIENT NOISE CONDITIONS FROM OPERATIONS AT THE KRIEL POWER STATION ASH DISPOSAL FACILITY (WET ASHING PROCESS - UNMITIGATED)

Time Period	Sound pressure level at given offset (dBA)						
	500m	1000m	1500m	2000m	2500m	3000m	3500m
Daytime $L_{Req,d}$ (06h00-22h00)	55.3	48.5	44.0	40.7	38.1	35.9	33.9
Night $L_{Req,n}$ (22h00-06h00)	55.3	48.5	44.0	40.7	38.1	35.9	33.9

7.5 Transportation of Ash

Ash slurry will be pumped through a pipeline directly from the power station to the Ash Disposal Facility, and there will no above-ground noise generated during the operational phase.

7.6 Return water dams

The Ash Disposal Facility will have a return water dam. Water from the Ash Disposal Facility is continuously pumped back to the power station for re-use via the return water dam and pipeline. The main source of virtually continuous noise from the return water dam complex will be from the pumps. The noise footprint of the pump station is relatively small when compared to the noise generated by the ash dam construction (refer to **Table 8**), that is, the pump station 35dBA footprint is contained within the 45dBA footprint of the ash dam. For the underground return pipeline, no noise will be generated above surface.

TABLE 8: PREDICTED AMBIENT NOISE CONDITIONS FROM PUMPS AT THE KRIEL POWER STATION ASH DISPOSAL FACILITY (RETURN WATER DAMS - UNMITIGATED)

Time Period	Sound pressure level at given offset (dBA)						
	100m	200m	300m	400m	500m	600m	800m
Daytime $L_{Req,d}$ (06h00-22h00)	54.4	48.0	44.1	41.3	39.1	37.2	34.2
Night $L_{Req,n}$ (22h00-06h00)	54.4	48.0	44.1	41.3	39.1	37.2	34.2

7.7 Traffic noise

The trips expected to be generated once the Ash Dam is constructed and operational will be related to daily maintenance of the Ash Dam, approximately one vehicle, two to three times per day. The noise generated by this traffic will have a minor effect.

7.8 Assessment of Potential Impact

7.8.1 Ash Disposal Facility

There are several noise sensitive receptors (NSRs) to the east and north-west of the Ash Disposal Facility. Refer to Figure 5. The Ga-Naka Village at the Kriel Power Station lies within the 50dBA noise contour. This village will experience higher noise levels that are allowable for daytime suburban residential conditions (SANS 10103). The rural residential NSRs within the 45dBA contour will be impacted by daytime operations. If night-time operations of dam wall construction are allowed, the suburban residential areas within the 40dBA noise contour and the rural residential areas within the 35dBA contour will be negatively impacted. Essentially the construction of AD4.1 and 4.2 will extend the noise footprint eastwards. Mitigation measures will have to be applied.

The NSRs mentioned above will be impacted by the noise from the construction of the dam wall. Although the noise footprint is larger than that of the dry ash stacking process, the noise will not be continuous.

7.8.2 Pipeline

No details were supplied by Eskom on the use or position of pipelines. If pipelines are to be used, they should be buried as buried pipelines will not generate any noise.

7.8.3 Return Water System

The 35dBA noise contour from the pump station of the return water dam lies well within the 45dBa noise footprint of the ash dam itself. Buried pipelines will not generate any noise.

8 RISK RATING

Based on the procedure described in Section 3.5, the risk rating regarding environmental noise is as shown in Table 9. The noise from the construction, wet ashing operation (pre- and post-mitigation) will be intermittent.

TABLE 9: NOISE IMPACT RISK ASSESSMENT FOR THE CONSTRUCTION AND OPERATIONAL PHASES (PRE- AND POST-MITIGATION) OF THE KRIEL POWER STATION ASH DISPOSAL FACILITY PROJECT

Criteria	**Rating**		
	Construction Phase	**Operational Phase (Pre-mitigation)**	**Operational Phase (Post-mitigation)**
Extent	Local	Local	Local
Magnitude	Medium	Medium	Medium
Duration of Impact	Medium term	Long term	Long term
Significance	Medium	Medium	Medium
Probability	Definite	Definite	Definite
Confidence	Certain	Certain	Certain
Reversibility	Reversible	Reversible	Reversible

9 MITIGATION MEASURES

Potential noise mitigation measures for the project were assessed.

9.1 Pre-construction Phase

Local residents should be notified of any potentially noisy field survey works or other works during the planning and design phase and these activities should be undertaken at reasonable times of the day. These works should not take place at night or on weekends.

During this phase, consideration must be given to the noise mitigation measures required during the construction phase and which should be included in the tender document specifications and the design.

9.2 Construction Phase

The noise mitigation measures to be considered during the construction phase are as follows:

i) Construction site yards and other noisy fixed facilities should be located well away from noise sensitive areas adjacent to the development sites.

ii) All construction vehicles and equipment are to be kept in good repair.

iii) Where possible, stationary noisy equipment (for example compressors, pumps, pneumatic breakers,) should be encapsulated in acoustic covers, screens or sheds. Proper sound insulation can reduce noise by up to 20dBA. Portable acoustic shields should be used in the case where noisy equipment is not stationary (for example drills, angle grinders, chipping hammers, poker vibrators).

iv) Construction activities, and particularly the noisy ones, are to be contained to reasonable hours during the day and early evening, i.e. 07:00 to 18:00.

v) With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the power station should liaise with local residents on how best to minimise the impact.

vi) Machines in intermittent use should be shut down in the intervening periods between work or throttled down to a minimum.

vii) In general, operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993).

viii) Construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA should wear ear protection equipment.

9.3 Operational Phase

The following noise mitigation measures, which will need to be considered where appropriate, are indicators of what needs to be done to reduce or control the noise generated by the operations at the proposed ash dam project:

i) The design of all major plant for the project is to incorporate all the necessary acoustic design aspects required in order that the overall generated noise level from the new installation does not exceed a maximum equivalent continuous day/night rating level (L_{Rdn}), namely a noise level of 70dBA (just inside the *property projection plane*, namely the property boundary of the power station and the boundary of the pipeline/conveyor servitude) as specified for industrial districts in SANS 10103. Refer to **Appendix A**.

Notwithstanding this provision, the design is also to take into account the maximum allowable equivalent continuous day and night rating levels of the potentially impacted sites outside the power station property and the boundary of the pipeline/conveyor servitude. Where the noise level at such an external site is presently lower than the maximum allowed, the maximum shall not be exceeded. Where the noise level at the external site is presently at or exceeds the maximum, the existing level shall not be increased by more than indicated as acceptable in SANS 10103.

ii) The latest technology incorporating maximum noise mitigation measures for components of the project should be designed into the system. When ordering plant and machinery, manufacturers should be requested to provide details of the sound power level (SPL). Where possible, those with the lowest SPL (most quiet) should be selected.

iii) The design process is to consider the insulation of particularly noisy plant and equipment.

iv) All plant, equipment and vehicles are to be kept in good repair.

v) Where possible, very noisy activities should not take place at night (between the hours of 18h00 to 07h00).

It should be noted that any mitigation measures taken at the development sites will limit the impacts in the specific areas designed for, but will not necessarily contribute to improving the degraded noise climates in adjacent areas where there is already a problem.

10 CONCLUSIONS

i) The sections of the proposed project outside the Kriel Power station property are located primarily in a rural agricultural area surrounded by more intensive residential, mining and industrial activities.

ii) Residual noise levels across the study area vary significantly.

iii) The ambient noise levels alongside the main roads exceed the acceptable maximum ambient noise level standards as recommended in SANS 10103 with respect to rural, suburban and urban residential living and for other noise sensitive land uses. The noise climates in these areas can be defined as being severely degraded for these land uses.

iv) Other than the road traffic noise, the main noise sources in the area are the collieries, the Kriel and Matla Power Stations and the Matla Power Station Ash Dam.

v) There are numerous noise sensitive receptors in the study area that potentially might be impacted by the various sections of the project.

vi) The noise from the wet ashing operation will be intermittent.

vii) There are mitigation measures that could be introduced to reduce or prevent some of the impacts.

11 RECOMMENDATIONS

The following are recommended:

i) The National Noise Control Regulations and SANS 10103 should be used as the main guidelines for addressing any future noise issues on this project.

ii) Various measures to reduce the potential noise impact from the Ash Disposal Facility and ancillary works are possible, and the mitigation measures indicated in Section 9 need to be considered.

iii) The noise mitigation measures will need to be designed and/or checked by an acoustical engineer in order to optimise the design parameters and ensure that the cost/benefit of the measure is optimised.

iv) Once the details of the scheme is finalised and the actual sound power levels of plant and equipment are known, the position of the noise contours should be checked.

v) At commissioning of the scheme, the noise footprint of each discrete element should be established by measurement in accordance with the relevant standards, namely SANS ISO 8297:1994 and SANS 10103. The character of the noise (qualitative aspect) should also be checked to ascertain whether there is any nuisance factor associated with the operations.

12 REFERENCES

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APPENDIX A

GLOSSARY OF TERMS
AND
NOISE IMPACT CRITERIA

APPENDIX A: GLOSSARY OF TERMS AND NOISE IMPACT CRITERIA

A1. GLOSSARY OF TERMS

In order to ensure that there is a clear interpretation of this report the following meanings should be applied to the acoustic terminology:

- **Ambient sound level** or **ambient noise** means the totally encompassing sound in a given situation at a given time, and usually composed of sound from many sources, both near and far. Note that ambient noise includes the noise from the noise source under investigation. The use of the word *ambient* should however always be clearly defined (compare with *residual noise*).
- **A-weighted sound pressure, in Pascals**: The root-mean-square sound pressure determined by use of frequency-weighting network A.
- **A-weighted sound pressure level (SPL) (noise level) (L_{pA}), in decibels**: The sound pressure level of A-weighted sound pressure is given by the equation:

  $L_{pA} = 10 \log (p_A/p_o)^2$ where:

  p_A is the A-weighted sound pressure, in Pascals; and

  p_o is the reference sound pressure (p_o = 20 micro Pascals (μPa))

  Note: The internationally accepted symbol for sound pressure level, dB(A), is used.
- **Controlled areas** as specified by the National Noise Control Regulations are areas where certain noise criteria are exceeded and actions to mitigate the noise are required to be taken. Controlled areas as related to roads, airports and factory areas are defined. These Regulations presently exclude the creation of *controlled areas* in relation to railway noise.
- **dB(A)** means the value of the sound pressure level in decibels, determined using a frequency weighting network A. (The "A"-weighted noise levels/ranges of noise levels that can be expected in some typical environments are given in Table A2 at the end of this appendix).
- **Disturbing noise** means a noise level that exceeds the outdoor equivalent continuous rating level for the time period and neighbourhood as given in Table 2 of SANS 10103:2004. For convenience, the latter table is reproduced in this appendix as Table A1.
- **Equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$)** means the value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, has the same mean-square sound pressure as a sound under consideration whose level varies with time.
- **Equivalent continuous rating level ($L_{Req,T}$)** means the equivalent continuous A-weighted sound pressure level during a specified time interval, plus specified adjustments for tonal character and impulsiveness of the sound and the time of day.

- **Equivalent continuous day/night rating level ($L_{R,dn}$)** means the equivalent continuous A-weighted sound pressure level during a reference time interval of 24-hours, plus specified adjustments for tonal character and impulsiveness of the sound and the time of day. (An adjustment of +10dB is added to the night-time rating level).
- **Integrating sound level meter** means a device that integrates a function of the root mean square value of sound pressure over a period of time and indicates the result in dBA.
- **Noise** means any acoustic phenomenon producing any aural sensation perceived as disagreeable or disturbing by an individual or group. Noise may therefore be defined as any *unwanted* sound or sound that is *loud, unpleasant or unexpected*.
- **Noise climate** is a term used to describe the general character of the environment with regard to sound. As well as the ambient noise level (quantitative aspect), it includes the qualitative aspect and the character of the fluctuating noise component.
- **Noise Control Regulations** means the regulations as promulgated by the National Department of Environmental Affairs.
- **Noise impact criteria** means the standards applied for assessing noise impact.
- **Noise level** means the reading on an integrating impulse sound level meter taken at a measuring point in the presence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation, and, if the alleged disturbing noise has a discernible pitch, for example, a whistle, buzz, drone or music, to which 5dBA has been added. (The "A"-weighted noise levels/ranges of noise levels that can be expected in some typical environments are given in Table A2 at the end of this appendix).
- **Noise nuisance** means any sound which disturbs or impairs or may disturb or impair the convenience or peace of any reasonable person considering the location and time of day. This applies to a disturbance which is not quantitatively measurable such as barking dogs, etc. (compared with disturbing noise which is measurable).
- **Residual sound level** means the ambient noise that remains at a position in a given situation when one or more specific noises are suppressed (compare with *ambient noise*).
- **Sound** means the aural sensation caused by rapid, but very small, pressure variations in the air. In quantifying the subjective aural sensation, "loudness", the letters dBA after a numeral denote two separate phenomena:
    - "dB", short for *decibel*, is related to the human's subjective response to the change in amplitude (or largeness) of the pressure variations.
    - The "A" denotes the ear's different sensitivity to sounds at different frequencies. The ear is very much less sensitive to low (bass) frequency pressure variations compared to mid-frequencies.

  The level of environmental sound usually varies continuously with time. A human's subjective response to varying sounds is primarily governed by the total sound energy received. The total sound energy is the average level of the fluctuating sound, occurring during a period of time, multiplied by the total time period. In order to compare the effects of different fluctuating sounds, one compares the average sound level over the time period with the constant level of a steady, non-varying sound that will produce the same energy during the same time period. The average energy of sound varying in amplitude is thus equivalent to the continuous, non-varying sound. The two energies are equivalent.

- **Sound exposure level or SEL** means the level of sound accumulated over a given time interval or event. Technically the sound exposure level is the level of the time-integrated mean square A-weighted sound for stated time or event, with a reference time of one second.
- **Sound (pressure) level** means the reading on a sound level meter taken at a measuring point.
- **SANS 10103** means the latest edition of the South African National Standard SANS 10103 titled *The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and to Speech Communication*.
- **SANS 10210** means the latest edition of the South African National Standard SANS 10210 titled *Calculating and Predicting Road Traffic Noise*.
- **SANS 10328** means the latest edition of the South African National Standard SANS 10328 titled *Methods for Environmental Noise Impact Assessments*.
- **SANS 10357** means the latest edition of the South African National Standard SANS 10357 titled *The Calculation of Sound Propagation by the Concawe Method*.
- Refer also to the various South African National Standards referenced above and the Noise Control Regulations for additional and, in some instances, more detailed definitions.

TABLE A1: TYPICAL NOISE RATING LEVELS FOR AMBIENT NOISE IN DISTRICTS (NOISE ZONES)

Type of District	Equivalent Continuous Rating Level for Noise ($L_{Req,T}$) (dBA)					
	Outdoors			Indoors with open windows		
	Day-night ($L_{R,dn}$)	Daytime ($L_{Req,d}$)	Night-time ($L_{Req,n}$)	Day-night ($L_{R,dn}$)	Daytime ($L_{Req,d}$)	Night-time ($L_{Req,n}$)
a) Rural districts	45	45	35	35	35	25
b) Suburban districts (little road traffic)	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts (some workshops, business premises and main roads)	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

TABLE A2: NOISE LEVELS/RANGES OF NOISE LEVELS THAT MAY BE EXPECTED IN SOME TYPICAL ENVIRONMENTS

Noise Level dB(A)	Typical Environment	Subjective Description
140	30m from jet aircraft during take-off	
130	Pneumatic chipping and riveting (operator's position)	Unbearable
>120	Hearing damage possible even for short exposure	
120	Large diesel power generator	
105-120	Low level military aircraft flight	
110-120	100 m from jet aircraft during take-off	
110	Metal workshop (grinding work), circular saw	
105-110	High speed train at 300 km/h (peak pass-by level at 7,5m)	
90-100	Printing press room	Very noisy
95-100	Passenger train at 200km/h (peak pass-by level at 7,5m).	Very noisy
95-100	Freight train at 100 km/h (peak pass-by level at 7,5 m)	Very noisy
90-100	Discotheque (indoors)	
75-100	7,5 m from passing motorcycle (50 km/h)	
75-80	10 m from edge of busy freeway (traffic travelling at 120 km/h)	
80-95	7,5 m from passing truck (50 km/h)	
80	Kerbside of busy street	
70	Blaring radio	Noisy
70	3 m from vacuum cleaner	Noisy
60-80	7,5 m from passing passenger car (50 km/h)	
65	Normal conversation	
65	Large busy office	
60	Supermarket/small office	
50	Average suburban home (day conditions)	Quiet
40	Library	
40-45	Average suburban home (night-time)	
30-35	Average rural home (night-time)	
25-30	Slight rustling of leaves	
20	Background in professional recording studio	Very quiet
20	Forest (no wind)	
0-20	Experienced as complete quietness	
0	Threshold of hearing at 1000 Hz	

A2. NOISE IMPACT CRITERIA

The international tendency is to express noise exposure guidelines in terms of absolute noise levels. These guidelines imply that in order to ascertain an acceptable living environment, ambient noise in a given type of environment should not exceed a specified absolute level. This is the approach provided by the environmental guidelines of the World Bank and World Health Organisation, which specify 55dBA during the day (06:00 to 22:00) and 45dBA during the night (22:00 to 06:00) for residential purposes, determined over any hour. SANS 10103 conforms to the described international tendency. The recommended standards to be applied are summarised in Table A1.

Communities generally respond to a change in the ambient noise levels in their environment, and the guidelines set out in SANS 10103 provide a good indication for estimating their response to given increases in noise. The suggested severity criteria for the noise impacts are summarised in terms of the above guidelines in Table A3.

TABLE A3: CATEGORIES OF COMMUNITY/GROUP RESPONSE (CRITERIA FOR THE ASSESSMENT OF THE SEVERITY OF NOISE IMPACT)

Increase in Ambient Noise Level (dBA)	Estimated Community/Group Response	
	Category	**Description**
0 – 10	Little	Sporadic complaints
5 – 15	Medium	Widespread complaints
10 - 20	Strong	Threats of community/group action
Greater than 15dBA	Very strong	Vigorous community/group action

Changes in noise level are perceived as follows:

- *3dBA:* For a person with average hearing acuity, an increase in the general ambient noise level of 3dBA will be just detectable.
- *5dBA:* For a person with average hearing acuity an increase of 5dBA in the general ambient noise level will be significant, that is he or she will be able to identify the source of the intruding noise. According to SANS 10103 the community response for an increase of less than 5dBA will be ‘little’ with ‘sporadic complaints’. For an increase of equal or more than 5dBA the response changes to ‘medium’ with ‘widespread complaints’.
- *10dBA:* A person with average hearing will subjectively judge an increase of 10dBA as a doubling in the loudness of the noise. According to SANS 10103 the estimated

community reaction will change from 'medium' with 'widespread complaints' to 'strong' with 'threats of community action'.

In the National Noise Control Regulations which are applicable in Mpumalanga Province, an intruding noise is defined as 'disturbing' if it causes the ambient noise level to rise by 7dBA or more.

APPENDIX B:

DETAILS OF THE NOISE MEASUREMENT SURVEY AND EXISTING NOISE CLIMATE CONDITION ASSESSMENT

APPENDIX B: DETAILS OF THE NOISE MEASUREMENT SURVEY AND EXISTING NOISE CLIMATE CONDITION ASSESSMENT

B1. GENERAL

The technical details of the noise measurement survey and the general *noise climate* investigation related to the potential noise impact of the proposed a new ash dam for the Kriel Power Station near Kriel in Mpumalanga Province are dealt with in this Appendix.

The noise impact assessment was undertaken in accordance with the requirements of the South African National Standard SANS 10328 *Methods for Environmental Noise Impact Assessments*. Noise measurements were taken at ten monitoring sites at appropriate locations in the study area in order to establish the residual (existing) *noise climate*.

B2. STANDARDS AND MEASUREMENT EQUIPMENT

The sound pressure level (SPL) (noise) measurements were taken in accordance with the requirements of the South African National Standard SANS 10103:2008, *The Measurement and Rating of Environmental Noise with Respect to Annoyance and Speech Communication*. A Type 1 Integrating Sound Level Meter, a Rion NA-28, was used for the noise measurements. The meter was calibrated at an accredited acoustical laboratory within the last 12 months. The calibration status of the meter was also checked before and after completion of the total measurement period of the day. A calibrated signal with a sound pressure level of 94,0dB at 1 kHz was applied to the meter. A Rion Sound Calibrator NC-74 was used.

For all measurements taken to establish the ambient noise levels, the equivalent noise level (L_{Aeq}), the maximum sound pressure level (L_{Amax}) and the minimum sound pressure level (L_{Amin}) during that measurement period were recorded. The frequency weighting setting was set on “A” and the time weighting setting of the meters were set on *Impulse* (I). Measurement periods of a minimum of 10 minutes were used. In addition, the variation in instantaneous sound pressure level (SPL) over a short period was also measured at some of the Sites. For these latter measurements the time weighting setting of the meter was also set on *Impulse* (I).

At all the measurement sites, the meter was set up with the microphone height at 1,3 metres above ground level and well clear of any reflecting surfaces (a minimum of 3 metres clearance). For all measurements, a standard windshield cover (as supplied by the manufacturers) was placed on the microphone of the meter.

At the same time as each individual measurement was being taken, the qualitative nature of the *noise climate* in the area of the measurement site was assessed and recorded. This comprised an appraisal of the general prevailing acoustic conditions based on the subjective response to the sounds as perceived by the listener (i.e. *auditory observation* by the surveyor), as well as identifying those noise incidents, which influenced the noise meter readings during that measurement period. This procedure is essential in order to ensure that that there is a *human* correlation between the noise as perceived by the human ear and the noise, which is measured by the meter, as well as to establish any anomalies in the general ambient noise conditions.

Various aspects of the weather were monitored, including wind speed, during each noise measurement. A Kestrel 4000 Pocket Weather Tracker is set up in the vicinity of the sound level meter and the following data were recorded.

- Wind speed.
- Temperature.
- Humidity
- Barometric pressure.
- Altitude.

The following are also recorded:

- Wind direction: this was checked by means of a compass.
- Cloud cover: noted by direct observation.

A Garmin GPSMAP 60CSx was used to record the GPS co-ordinates of each measurement site, and these are also used when determining distances between measurement sites and other objects, such as roads and other sources of noise.

B3. MEASUREMENT SITES

Noise measurements to establish current ambient noise conditions were taken at ten (10) main sites in the study area, as indicated in Figure B1 and Table B1.

B4. MEASUREMENT DATES/TIMES

General observation of the noise conditions in the study area as well as the site specific sound pressure level (noise) measurements and observations were taken on Saturday, 17 September 2016.

B5. NOISE MEASUREMENT DETAILS

B5.1. Summary of the Residual Sound Pressure Level Measurements

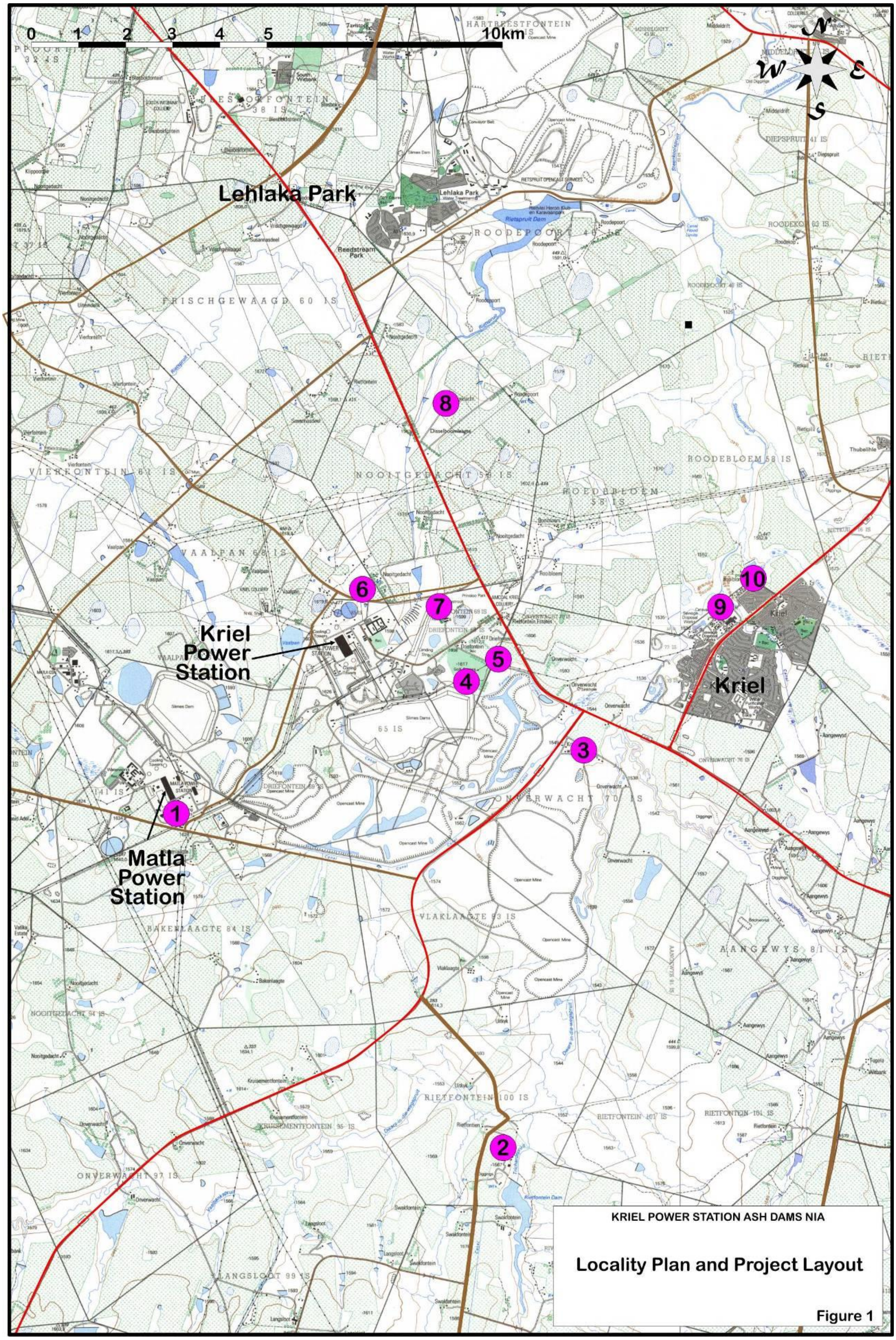
The results of the residual noise condition measurement survey are summarised in Table B1. The equivalent sound pressure (noise) level (L_{Aeq}), the maximum sound pressure level (L_{Amax}) and the minimum sound pressure level (L_{Amin}) are indicated. Note that the equivalent sound pressure (noise) level may, in layman's terms, be taken to be the average noise level over the given period. This "average" is also referred to as the residual noise level (excluding the impacting noise under investigation) or the ambient noise level (if the impacting noise under investigation is included).

The weather conditions on the survey days were such that the measurements to establish the ambient noise levels were not adversely affected and no specific corrective adjustments needed to be made.

TABLE B1: MEASURED EXISTING NOISE LEVELS IN THE KRIEL POWER STATION ASH DAM STUDY AREA (YEAR 2016)

Site No	Location Description	GPS Co-ordinates	Measured Sound Pressure Level (dBA)			Estimated Sound Pressure Level* (dBA)		
			Daytime Period			Night -time Period *		
			L_{Aeq}	L_{max}	L_{min}	L_{Aeq}	L_{max}	L_{min}
1	On the southern boundary of Matla Power Station approximately 170 metres north of Road P132/1.	S26°17.314’ E29°08.545’	54.1	70.7	46.7	51	-	45
2	At entrance to the farm Rietfontein on Road D503 near the Rietfontein pump station.	S26°20.851’ E29°12.558’	44.1	57.8	36.1	40	-	40
3	Shop and residences just to the east of Road P90/1	S26°16.372’ E29°13.506’	58.3	67.2	35.5	50	-	40
4	Just outside entrance to Ga-Naka Village at Kriel Power Station	S26°15.594’ E29°11.553’	51.7	67.2	36.1	50	-	<40
5	At entrance to general parking area for Kriel Power Station	S26°15.001’ E29°10.886’	55.9	59.1	53..3	50	-	40
6	Northern entrance to Kriel Power Station, off Road D356	S26°14.797’ E29°10.982’	59.1	75.7	42.8	50	-	<40
7	At Kwanala Primary School at Kriel Power Station. No school day.	S26°15.036’ E29°11.974’	45.2	57.5	25.1	-	-	-
8	On road to and approximately 400m south of farmhouse on Farm Roodebloem 58 IS. The site is north-east of Kriel Power Station.	S26°14.167’ E29°13.233’	41.7	57.1	25.0	35	-	<30
9	Western side of Kriel town, overlooking the Steenkoolspruit.	S26°14.914’ E29°15.363’	51.2	71.8	39.6	45	-	<35
10	Just north of Silver Fleur Retirement Village, on the north-western side of Kriel town overlooking the Steenkoolspruit.	S26°14.485’ E29°15.866’	44.7	57.9	33.5	38	-	<35

* Refer to Section B5.2.



0 1 2 3 4 5 10km
Lehlaka Park
Kriel Power Station
Matla Power Station
Kriel
1
2
3
4
5
6
7
8
9
10
KRIEL POWER STATION ASH DAMS NIA
Locality Plan and Project Layout
Figure 1

B5.2. Determination of Night-time Noise

No night-time measurements were taken. The typical night-time residual noise conditions were established from night-time general *acoustic observations* in the area, the minimums of the daytime measurements, from previous measurements in similar areas, and from the traffic noise calculations (refer to Section B5.3).

The farming areas relatively far from the main roads and the other major noise sources are generally very quiet. The ambient noise levels are of the order of 30dBA to 35dBA during the late evening period and at night.

The suburban areas of Kriel and Thubelihle that are fairly remote from the major roads display ambient noise climates of between 40dBA and 45dBA at night.

B5.3. Noise Climate Related to the 24 hour Road Traffic

The existing (Year 2016) 24-hour residual noise levels related to the average daily traffic (ADT) flows on the following road sections were established (refer to Figure 1). Both the Provincial Road Number and the Route Number of the road section are indicated, where relevant:

- Section P52/3a: Road P52/3 (Route R545) from Nkangala to D618
- Section P52/3b: Road P52/3 (Route R545) from D618 to P120/2.
- Section P52/3c: Road P52/3 (Route R545) from P120/2 to P90/1.
- Section P52/3d: Road P52/3 (Route R545) from P90/1 to D356.
- Section P52/3e: Road P52/3 (Route R545) from D356 to D1651.
- Section P52/3f: Road P52/3 (Route R545) from D1651 (East) to D1652 (West).
- Section P120/1a: Road P120/1 (Route R547) north of P120/2.
- Section P120/2b: Road P120/2 (Route R547) through Kriel.
- Section P90/1a: Road P90/1 (Route R547) south of P52/3.
- Section P90/1b: Road P90/1 (Route R547) south of P132/1.
- Section P132/1: Road P132/1, P90/1 to D1651 (Matla Power Station).
- Section P141/1: North of Kriel.
- Section D1622: North of Kriel, to the west of and providing access to Thubelihle.
- Section D1651: Road D1651 between P52/3 and P132/1.

The traffic data were obtained from the Mpumalanga Department of Transport. The estimated Year 2016 traffic data are given in Table B2.

TABLE B2: YEAR 2016 TRAFFIC

Road	Traffic Data	
	ADT	% Heavy
P52/3a	2340	35
P52/3b	2178	41
P52/3c	3645	29
P52/3d	5067	21
P52/3e	3725	25
P52/3f	4417	32
P120/1	2945	10
P120/2	4735	14
P90/1a	3264	19
P90/1b	1595	39
P132/1	3485	31
P141/1	2381	15
D1622	376	39
D1651	1066	30

The noise levels generated from the traffic on these roads were calculated using the South African National Standard SANS 10210 *Calculating and Predicting Road Traffic Noise*. The noise levels at various offsets from the centreline of the main roads were established and are summarised in Table B3. Typical situations were used for the calculation site. The Year 2016 traffic data were used as the baseline for the calculations. These calculated noise values provide an accurate base for the SANS 10103 descriptors.

The noise descriptors used are those prescribed in SANS 10103:2008, namely:

i) Daytime equivalent continuous rating (noise) level ($L_{Req,d}$) (L_d used in Table), namely for the period from 06h00 to 22h00).

ii) Night-time equivalent continuous rating (noise) level ($L_{Req,n}$) (L_n used in Table), namely for the period from 22h00 to 06h00).

iii) Day-night equivalent continuous rating (noise) level ($L_{R,dn}$) (L_{dn} used in Table), namely for the 24 hour period from 06h00 to 06h00).

The noise levels given are for generalised and the unmitigated conditions. There will be greater attenuation than shown with distance where there are houses, other buildings and terrain restraints in the intervening ground between the source and the receiver point.

TABLE B3: EXISTING NOISE CLIMATE ADJACENT TO THE MAIN ROADS IN THE KRIEL POWER STATION ASH DAMS STUDY AREA (YEAR 2016 TRAFFIC)

Road	Noise Climate Alongside the Main Roads at Given Offset from Centreline (SANS 10103 Indicator) (dBA) 2016 Traffic Data supplied by ITS																																
	25m Offset			50m Offset			100m Offset			250m Offset			500m Offset			1000m Offset			1500m Offset			2000m Offset			2500m Offset			3000m Offset			4000m Offset		
	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}
P52/3a	62.2	57.1	64.5	59.2	54.1	61.5	56.0	50.9	58.3	51.6	46.5	53.9	47.8	42.7	50.1	43.3	38.2	45.6	40.2	35.1	42.5	38.0	32.9	40.3	36.1	31.0	38.4	34.7	29.6	37.0	32.2	27.1	34.5
P52/3b	62.3	57.2	64.6	59.3	54.2	61.6	56.1	51.0	58.4	51.7	46.6	54.0	47.9	42.8	50.2	43.4	38.3	45.7	40.3	35.2	42.6	38.1	33.0	40.4	36.2	31.1	38.5	34.8	29.7	37.1	32.3	27.2	34.6
P52/3c	63.6	58.5	65.9	60.6	55.5	62.9	57.4	52.3	59.7	53.0	47.9	55.3	49.2	44.1	51.5	44.7	39.6	47.0	41.6	36.5	43.9	39.4	34.3	41.7	37.5	32.4	39.8	36.1	31.0	38.4	33.6	28.5	35.9
P52/3d	64.3	59.2	66.6	61.3	56.2	63.6	58.1	53.0	60.4	53.7	48.6	56.0	49.9	44.8	52.2	45.4	40.3	47.7	42.3	37.2	44.6	40.1	35.0	42.4	38.2	33.1	40.5	36.8	31.7	39.1	34.3	29.2	36.6
P52/3e	63.3	58.2	65.6	60.3	55.2	62.6	57.3	52.2	59.6	54.3	49.2	56.6	51.3	46.2	53.6	48.3	43.2	50.6	45.3	40.2	47.6	42.3	37.2	44.6	39.3	34.2	41.6	36.3	31.2	38.6	33.3	28.2	35.6
P52/3f	64.7	59.6	67.0	61.7	56.6	64.0	58.7	53.6	61.0	55.7	50.6	58.0	52.7	47.6	55.0	49.7	44.6	52.0	46.7	41.6	49.0	43.7	38.6	46.0	40.7	35.6	43.0	37.7	32.6	40.0	34.7	29.6	37.0
P120/1	60.6	55.5	62.9	57.6	52.5	59.9	54.4	49.3	56.7	50.0	44.9	52.3	46.2	41.1	48.5	41.7	36.6	44.0	38.6	33.5	40.9	36.4	31.3	38.7	34.5	29.4	36.8	33.1	28.0	35.4	30.6	25.5	32.9
P120/2	63.2	58.1	65.5	60.2	55.1	62.5	57.0	51.9	59.3	52.6	47.5	54.9	48.8	43.7	51.1	44.3	39.2	46.6	41.2	36.1	43.5	39.0	33.9	41.3	37.1	32.0	39.4	35.7	30.6	38.0	33.2	28.1	35.5
P90/1a	62.1	57.1	64.4	59.1	54.1	61.4	55.9	50.9	58.2	51.5	46.5	53.8	47.7	42.7	50.0	43.2	38.2	45.5	40.1	35.1	42.4	37.9	32.9	40.2	36.0	31.0	38.3	34.6	29.6	36.9	32.1	27.1	34.4
P90/1b	60.8	55.7	63.1	57.8	52.7	60.1	54.6	49.5	56.9	50.2	45.1	52.5	46.4	41.3	48.7	41.9	36.8	44.2	38.8	33.7	41.1	36.6	31.5	38.9	34.7	29.6	37.0	33.3	28.2	35.6	30.8	25.7	33.1
P132/1	63.6	58.5	65.9	60.6	55.5	62.9	57.4	52.3	59.7	53.0	47.9	55.3	49.2	44.1	51.5	44.7	39.6	47.0	41.6	36.5	43.9	39.4	34.3	41.7	37.5	32.4	39.8	36.1	31.0	38.4	33.6	28.5	35.9
P141/1	60.3	55.2	62.6	57.3	52.2	59.6	54.1	49.0	56.4	49.7	44.6	52.0	45.9	40.8	48.2	41.4	36.3	43.7	38.3	33.2	40.6	36.1	31.0	38.4	34.2	29.1	36.5	32.8	27.7	35.1	30.3	25.2	32.6
D1622	54.6	49.5	56.9	51.6	46.5	53.9	48.4	43.3	50.7	44.0	38.9	46.3	40.2	35.1	42.5	35.7	30.6	38.0	32.6	27.5	34.9	30.4	25.3	32.7	28.5	23.4	30.8	27.1	22.0	29.4	24.6	19.5	26.9
D1651	56.3	51.2	58.6	53.3	48.2	55.6	50.1	45.0	52.4	45.7	40.6	48.0	41.9	36.8	44.2	37.4	32.3	39.7	34.3	29.2	36.6	32.1	27.0	34.4	30.2	25.1	32.5	28.8	23.7	31.1	26.3	21.2	28.6

B6. Existing Ambient Noise Climate

In overview, the existing situation with respect to the *noise climates* in the study area was found to be as follows:

i) The main sources of noise in the study area are from:
   - Traffic on the main roads.
   - Matla Power Station.
   - Kriel Power Station.
   - Various mines and mine linear infrastructure such as overland conveyors. An ash dam for Matla Power Station is presently being constructed just south of the Kriel Power Station Ash Dams and south of Road R547.
   - General farming activities.

ii) The main noise sensitive receptors in the area are (refer also to Figure 2 in the main report):
   - Residential areas in the town of Kriel, in Thubelihle, Rietstroom Park and in Lehlaka Park.
   - Residential Ga-Naka Village at the Kriel Power Station.
   - Various informal settlements.
   - Various farmhouses and farm labourer residences.
   - Various schools in the area.

iii) The development site lies within the Kriel power station property. There are residential and mining land uses to the south-east.

iv) There are varied and conflicting (from a noise standpoint) land uses in the study area.

v) The areas relatively far from the main roads and the other major noise sources are generally very quiet.

vi) The existing residual noise climate throughout most of the study area is typical of a rural/agricultural environment as defined in SANS 10103:2008, that is, areas where ambient noise levels generally do not exceed 45dBA during the daytime period (06h00 to 22h00) and generally do not exceed 35dBA during the night-time period (22h00 to 06h00). Refer to the SANS 10103:2008 standards as given in Appendix A.

vii) In the residential areas of Kriel, Thubilihle, Lehlaka Park, Ga-Nala and the informal settlements the existing residual noise climate is typical of a suburban environment as defined in SANS 10103:2008, that is, areas where ambient noise levels generally do not exceed 50dBA during the day and generally do not exceed 40dBA during the night-time.

viii) The pipeline and conveyor routes to Site 10 would be aligned through the southern portion of the power station property (industrial).

ix) The main roads whose traffic affect the study area are listed in Section B5.3. The ambient noise levels alongside these roads exceed the acceptable levels as recommended in SANS 10103 with respect to rural and suburban residential living and other noise sensitive land uses. The noise climates in these areas can be defined as being severely degraded for these land uses. The areas next to the main roads are in some areas degraded for up to the following distances:

TABLE B4: DEGRADED NOISE CLIMATE ALONGSIDE MAIN ROADS

Road Section	Offset Distance (m)	
	Suburban Standards	**Rural Standards**
P52/3a	700	1400
P52/3b	700	1400
P52/3c	600	1250
P52/3d	1000	1800
P52/3e	100	250
P52/3f	200	500
P120/1	230	570
P120/2	800	1500
P90/1a	700	1400
P90/1b	400	900
P132/1	350	800
P141/1	800	1600
D1651	400	900

APPENDIX C:

CURRICULUM VITAE: DEREK COSIJN

CURRICULUM VITAE

DEREK COSIJN

Personal Details:

Date of Birth: 13 December 1944

Nationality: South African

ID Number: 441213 5090 085

Contact Details:

Telephone/Fax: (012) 460-4481

Cell phone: 082 600 6347

Address: 207 Albert Street, Waterkloof, Pretoria, 0181.

Summary of Key Qualifications and Experience:

I have 50 years of professional experience covering a wide range of civil engineering, transportation planning, environmental and acoustic engineering projects. I qualified as a civil engineer in 1967 and then studied further to obtain a post-graduate Diploma in Town Planning in 1974. Both degrees were obtained at the University of the Witwatersrand. I have worked in both the planning and construction fields of the civil engineering profession gaining experience in road construction, road planning, transportation planning, traffic engineering, general environmental and environmental noise issues. Over the last 45 years I have focused on aspects of transportation planning with specific emphasis, *inter alia*, on environmental and noise management and control. I have worked on a wide spectrum of planning projects related to the transportation and development industry, with clients ranging from the National Department of Transport, provincial transportation/road authorities, provincial environmental authorities, the metropolitan authorities and many local councils to private organizations the mines and consultants.

I have been actively involved in numerous environmental projects since 1975, when I worked in Canada for three years. My area of special expertise is environmental noise (acoustical engineering). The environmental projects have ranged through Environmental Impact Assessments (EIAs) and noise impact assessments, to policy formulation and guideline development.

In 2001 I started my own consultancy, Calyx Environmental cc, specialising in environmental and noise impact assessments. At the same time (Year 2001), I formed a partnership/working association with Jongens Keet Associates.

I am a professional engineer, (now a retired member) registered with the Engineering Council of South Africa (ECSA), a Fellow of the South African Institution Civil Engineering, a Member of the Southern African Acoustics Institute, a member of the International Association for Impact Assessment (IAIA), South African Chapter and have also been certified as an Environmental Assessment Practitioner of South Africa. During the design and construction phases of the Gautrain Rapid Rail Link project, I was appointed by the Gauteng Provincial Government as the Manager Noise and Vibration.

Education:

- BSc (Civil) Engineering, University of the Witwatersrand, 1967
- Post graduate Diploma in Town Planning, University of the Witwatersrand, 1974
- Several short courses on various aspects of environmental management and noise control (listed later).

Experience:

1a. Partner, Jongens Keet Associates, (April 2001 – Present)

As a partner with JKA, I have been responsible for the following projects:

- The Noise Management Programme for Centurion Town Council.
- Pier Café Noise Impact Assessment.
- Centurion Land Use Noise Zoning Data Base.
- N4 Toll Route: Toll Plaza Noise Impact Assessment.
- Gautrain Noise Impact Study.
- N17 Noise Impact Study.
- N1/N3 Buccleuch Interchange Noise Impact Assessment.
- N1 Noise Impact Assessment (Louis Trichardt).
- Waterhaven Clay Target Shooting Range Noise Impact Assessment.
- City of Tshwane Noise Management Policy.
- Road R50 Re-alignment (Delmas) Noise Impact Assessment.
- Road R513 (Cullinan) Noise Impact Assessment.
- Tutuka Power Station Coal Supply Railway Noise Impact Assessment.
- Majuba Power Station Coal Supply Railway Noise Impact Assessment.
- Gauteng Freeway Congestion SEA: Noise Impact Assessment.

- Usutu Coal Mine (Camden Power Station) Noise Impact Assessment.
- Olifants River Water Resources Development Project Noise Impact Assessment.
- Montecasino Phase 2 Development Noise Impact Assessment.
- Mercedes Workshops (Centurion) Noise (OH&S Act) Investigation.
- Cabanga Conference Centre Noise Impact Assessment.
- Road K139 (Derdepoort Link) Noise Impact Assessment.
- Samancor Middelburg Ferrochrome Plant Noise Impact Assessment.
- Impala Platinum (Springs) Oxygen Plant Noise Impact Assessment
- Gauteng Provincial Government Precinct (Johannesburg CBD) Noise Impact Study.
- Motaganeng Township Development Project (Burgersfort) Noise Impact Assessment.
- Olievenhoutsbosch Residential Township Noise Impact Assessment.
- Matimba B (Medupi) Power Station Noise Impact Assessment..
- Implats Springs Base Metals Refinery Expansion Noise Impact Assessment.
- KwaZulu Natal Peaking Power Plants (2) Noise Impact Assessment.
- Mafube Mine - Arnot Power Station Conveyor Belt Noise Impact Assessment.
- Sishen South Iron Ore Mine Project Noise Impact Assessment.
- Staatsartillerie Road (Tshwane) Noise Impact Assessment.
- Olievenhoutbosch Township Noise Attenuation Barrier Design.
- Northern Golf Courses Estate Noise Impact Assessment.
- Rua Vista Township Noise Attenuation Barrier Design.
- Holcim Roodepoort Cement Factory Expansion Noise Impact Assessment
- Impala Rustenburg Platinum Mine #17 Shaft Noise Impact Assessment.
- Eskom Concentrating Solar Power Generation Plant (Upington) Noise Impact Assessment.
- N17 (Brakpan) Overlay Noise Impact Assessment.
- N1 Overlay Noise Impact Assessment at Matoks.
- Witbank (Kendal) Area Power Station Noise Impact Assessment.
- African Renaissance Township Development Noise Impact Assessment.
- Erasmia Ext 10 Township Noise Impact Assessment.
- Northern Free State Area Power Station Noise Impact Assessment.
- Veremo Mine (Roossenekal) Noise Impact Assessment.
- JG Strijdom Road Noise Impact Assessment.
- Newmarket Racecourse Redevelopment Noise Impact Assessment.

- Steelpoort Pumped Storage Scheme Noise Impact Assessment.
- Ruighoek Mine (Rustenburg) Noise Impact Assessment.
- Lethlakeng Calcrete Mine (Botswana) Noise Impact Assessment (Preliminary).
- Sheba's Ridge Mine (Groblersdal) Noise Impact Assessment.
- Wesizwe Mine (Rustenberg) Noise Impact Assessment.
- Petronet Multi-Product Pipeline (Kendal-Waltloo) Noise Impact Assessment.
- Petronet Multi-Product Pipeline (Jameson Park-Langlaagte) Noise Impact Assessment.
- Centenary Way Re-alignment (Modderfontein) Noise Impact Assessment.
- Mafube North (Arnot) Coal Mine Noise Impact Assessment.
- PWV3 Frontage Road System (Modderfontein) Noise Impact Assessment.
- Morupule Power Station (Botswana) Noise Impact Assessment.
- Majuba CCGT Power Station Noise Impact Assessment.
- Lynnwood Junction Development Noise Impact Assessment.
- Atterbury Towers Noise Impact Assessment.
- Heineken Brewery Noise Impact Assessment.
- Groot Letaba River Water Resources Project Noise Impact Assessment.
- Merensky Motocross Track (Tzaneen) Noise Impact Assessment.
- N1 Freeway Noise Barrier Design (Atterbury Road to Kings Highway, Pretoria).
- Etruscan Diamond Mine Noise Impact Assessment.
- Karibib Cement Factory and Quarry Noise Impact Assessment (Namibia).
- Kruger National Park Marula Region Strategic Environmental Assessment (Noise).
- Gautrain: Construction Noise Audit.
- Kruger National Park: Skukuza Conference Centre Noise Impact Assessment.
- SARCC Rhodesfield Station Noise Impact Assessment.
- Brooklyn Traffic Circle Upgrading Noise Impact Assessment.
- Koornfontein Colliery Expansion Noise Impact Assessment.
- Makhado Colliery Noise Impact Assessment.
- Waterberg Power Stations (Matimba / Medupi PS area) Noise Impact Assessment.
- Vele Colliery Noise Impact Assessment.
- Noise monitoring Guidelines for Vele Colliery.
- Mulilo Power Station Noise Impact Assessment.
- Johannesburg BRT Route 6 (Oxford Road-Rivonia Road) Noise Impact Assessment.
- Tubatse Chrome (Steelpoort) Water Treatment Plant Noise Impact Assessment.

- Burnstone Gold Mine Noise Impact Assessment.
- Claudius Ext 3 Noise Impact Assessment.
- Msukaligwa Landfill Noise Impact Assessment. (Ermelo).
- The Villa Mall Noise Impact Assessment. (City of Tshwane).
- Komati Water Scheme Water Augmentation Project Baseline Noise Survey.
- Hartebeestfontein Water Care Works Noise Impact Assessment.
- Bliss Chemicals Wadeville Factory Noise Impact Assessment.
- Welgedacht Water Care Works Noise Impact Assessment.
- Onderstepoort X25 Noise Impact Assessment.
- Kuka Aerial Ropeway (Lydenburg) Noise Impact Assessment.
- Mooi-Mgeni Water Transfer Scheme Noise EMP.
- Vlakfontein Colliery (Ermelo) Noise Impact Assessment.
- Kosmosdal X85 Township Noise Impact Assessment.
- Concentrating Solar Power Plant (Upington) Noise Impact Assessment.
- Van Ouds Colliery (Ermelo) Noise Impact Assessment.
- Aquarius Hoogland Expansion (Everest South Platinum Mine) Noise Impact Assessment.
- Pebble Rock Eskom Substation Noise Impact Assessment (City of Tshwane).
- SolAfrica CSP Power Station (Groblershoop N Cape Prov) Noise Impact Assessment.
- N1/N12 Misgund Interchange Upgrading Noise Impact Assessment.
- Eastwood Junction Noise Impact Assessment (Arcadia, City of Tshwane).
- Dogtown SA/Barking Mad Animal Shelter, Noise Impact Assessment.
- Hillside Offices (Lynnwood, City of Tshwane) Noise Baseline Assessment.
- Khanyisa Power Station (Witbank) Noise Impact Assessment.
- Humansrus CSP Power Station (Postmasburg N Cape Prov) Noise Impact Assessment.
- Rooipunt Solar Park (Upington N Cape Prov) Noise Impact Assessment.
- Kobong Pumped Storage Scheme Power Station (Lesotho) Noise Impact Assessment.
- Hatfield Erf 704 Development (Hatfield, City of Tshwane) Noise Impact Assessment.
- Tivani Iron Ore Mine (Tzaneen, Limpopo Province) Noise Impact Assessment.
- Makhado Colliery (Makhado, Limpopo Province) Noise Impact Assessment.

- Arriesfontein Solar Power Station, Danielskuil, Northern Cape Noise Impact Assessment.
- Kusile Photovoltaic Power Plant (Mpumalanga) Noise Impact Assessment.
- Rustenburg Photovoltaic Power Plant (North West Province) Noise Impact Assessment.
- Kriel Power Station Ash Dams (Mpumalanga) Noise Impact Assessment.
- York Timbers Sawmill (Sabie) Noise Impact Assessment.
- Little Mooi River Gauging Weir (Rosetta) Noise Impact Assessment.
- Kobong Pumped storage Scheme (Lesotho) Noise Impact Assessment.
- Grootegeluk Coal Mine (Lephalale) Noise Impact Assessment.
- Mafube Coal Mine (Belfast) Noise Impact Assessment.
- Ruighoek Mine (Rustenburg) Noise Impact Assessment.
- Overvaal Coal Mine (Ermelo) Noise Impact Assessment.
- Paardeplaats Coal Mine (Belfast) Noise Impact Assessment.
- Canyon Springs Mine Noise Impact Assessment.
- Goedegevonden (GGV) Colliery Expansion Noise Impact Assessment.
- Matimba Power Station Ash Dump Noise Impact Assessment.
- Tshwane Bus Rapid Transport (BRT) Noise Impact Assessment.
- Koi-Koi Quarries Noise Impact Assessment.
- Jagersfontein Dumps Reclamation Project Noise Impact Assessment.
- Wayland Iron Ore Mine Noise Impact Assessment.
- Rondebult Housing Development Noise Impact Assessment.
- Sefateng Chrome Mine Noise Impact Assessment.
- Kalkaar Solar Power Project Noise Impact Assessment.
- Vlakfontein East Block Noise Impact Assessment.
- Fuleni Anthracite Coal Project Noise Impact Assessment.
- Hazeldean Boulevard Noise Impact Assessment.
- Erf 852 Menlo Park Rezoning Noise Impact Assessment
- York Timbers (Sabie) Extension Project Noise Impact Assessment
- Shumba Power Station Botswana Noise Impact Assessment
- Taung Filling Station Noise Impact Assessment
- Khanyisa 600MW Upgraded Power Station Noise Impact Assessment
- Isundu Substation Noise Impact Assessment

1b. Partner, Calyx Environmental cc, (April 2001 – Present)

As a partner with Calyx Environmental, I have been responsible for the following projects:

- Tambo Memorial Hospital Medical Waste Incinerator Environmental Scoping Study.
- Tembisa Hospital Medical Waste Incinerator Environmental Scoping Study.
- Medical Waste Incinerator Standard Operating, Maintenance and Safety Manual.
- Nietverdiend Police Station Upgrading: Environmental Issues.
- Morokweng Police Station Upgrading: Environmental Issues.
- Lwala Mine Traffic Environmental Impact Assessment.
- Mac-West Mine Noise Impact Assessment.
- Tutuka Power Station Coal Supply Railway Construction Traffic Impact Assessment.
- Majuba Power Station Coal Supply Railway Construction Traffic Impact Assessment.
- City of Tshwane Noise Zone Demarcation and Definition.
- NCP Chlorchem Expansion Traffic Environmental Assessment.

2. Associate, Booz Allen & Hamilton, (February 2000 – March 2001)

While working for BAHSA, I was responsible for the following projects:

- The development of Guidelines for the Environmental Management of Transportation Projects for the City Council of Pretoria.
- The Noise Management Programme for Centurion Town Council.
- The preparation of a Traffic Calming Policy for Kempton Park Town Council.
- Pretoria Defence Clay Target Shooting Club (Lyttelton) Noise Impact Study.
- Medical Waste Incinerator Environmental Scoping Study (preliminary assessment).

3. Associate, Stanway Edwards Ngomane Associates (Pty) Ltd, (1986-2000)

As an Associate with the firm, I was responsible for the project management and technical investigation of the following types of projects:

- *Environmental and Noise Management:*
    - Environmental impact assessment (EIA)
    - State of the environment reporting
    - Noise impact assessment studies
    - Noise management policy development
    - Outdoor advertising policy development
    - Transportation environmental management procedure formulation

- Environmental management plans/programmes
- Professional review of environmental reports.

- *Traffic Engineering and Transportation Planning*
  - General transportation analysis
  - Traffic impact studies
  - Parking and loading policy development
  - Traffic operation safety assessment
  - Road traffic management systems
  - Transportation demand management
  - Road hierarchy definition
  - Traffic calming
  - Road traffic sign policy development
  - Professional review of transportation investigation and research reports.

Specific projects were as follows:

- *General Environmental and Noise Related Projects*

N1 and N12 Freeway Noise Study (DoT); Noise Attenuation Barrier Evaluation Study (DoT); Costing Analysis of Freeway Traffic-generated-noise Attenuation Barriers (DoT); Pretoria Central Area Freeway/Light Rail Noise Evaluation; Sandown Mews Traffic Noise Impact; Inanda Access Road Noise Evaluation Study; Transportation Environmental Management Manual; Consultant to Centurion Town Council on Noise Management; Samancor Mine Noise Zoning; MoAfrica Development- Noise and Air Pollution Assessment; Centurion Noise Management Policy; Springs' Outdoor Advertising Policy; Centurion Speed Hump Noise Evaluation; Rooihuiskraal Road / N14 Interchange Noise Impact Study; GPMC Road Environmental Assessment; Charles Street Corridor Noise Impact Study; Environmental Plan for the Khayalami Metropolitan Council's Integrated Transport Plan; and the following Environmental Impact Assessment (EIA) / Public Involvement Programme Co-ordination Projects:

- *Transportation Planning*

Vosloorus Transportation Study; N OFS Transportation Study; Vosloorus Road Modelling; Transportation Sketch Planning in ORMET (Daveyton, Duduza, Kwa-Thema, Tsakane, Tokoza, Wattville); Public Transport Evaluation in Springs/Kwa-

Thema, Brakpan/Tsakane and Tembisa; Nellmapius Area Public Passenger Transport Needs Study (Pretoria).

- *Road and Traffic Studies*

Ridge School Parking Study; DoT Road Traffic Management System; Road Network Management Study; Transportation Demand Management Guidelines; Road Network Planning in Tembisa, Springs, Midrand, Nigel and Brakpan; Harare Traffic Management Study; National Route 2/8X Operational Safety Assessment; Arterial Road K60 Needs Evaluation; various road and traffic safety assessments.

- *Miscellaneous Projects and Activities*
  - ORMET Parking and Loading Policy Study.
  - South African Road Traffic Signs Manual, Volume 2 (responsible for drafting six Chapters).
  - Developed the "Guidelines for Public Participation in the Planning of Civil Engineering Projects" for SAICE.
  - Provided assistance to the Department of Transport for the setting up and running of their Road Traffic Management System.
  - CSRA/CUTA Working Group for Outdoor Advertising along Roads.
  - Traffic and Road Problem Identification System – Data Base for NDoT.
  - Presented short course on Integrated Environmental Management (IEM) and EIA to the Department of Civil Engineering, University of the Witwatersrand (1993).

4. Director, Gericke Construction, 1981-1986

I was the Director-in-Charge of the technical aspects of construction (projects were civil- and building-related).

5. Associate, De Leuw Cather Associates, 1971-1981 (inclusive of 3 years with De Leuw Cather Canada, now DELCAN)

I was the project manager on numerous projects related to geometric design of roads, traffic engineering, transportation and environmental issues during this period. Projects included:

- *General Environmental and Noise Related Projects*
  - Alberta Surface Transportation Noise Attenuation Study (Canada).

- University of Alberta Area Transportation/Environmental Study (Edmonton, Canada)
- Environmental aspects related to the basic planning of provincial and urban roads.

- *Transportation Planning*

  Fort Saskatchewan Transportation Study (Alberta, Canada); St Albert SE Sector Transportation Study (Alberta, Canada); University of Alberta Area Transportation Study (Edmonton, Canada); Edmonton North West Industrial Area Rail Access Study.

- *Road and Traffic Studies*

  Camrose Central Traffic and Parking Study (Alberta Canada); Planning of roads: PWV16, K110, K123, K126, Rivonia Road (Sandton) and Carse O'Gowrie Road (Parktown); Planning of several rural provincial roads; Numerous traffic impact studies; Parkmore Traffic Signals; Rivonia Road Traffic Signal Synchronisation Scheme; Modderfontein Parking Study; Benoni South Industrial Area Access Study.

6. Training Courses

The following environmental and noise management related training courses have been attended:

- Delcan in-house basic introduction to acoustics and transportation noise (Delcan/BBN/ LNG/ University of Calgary, 1976)
- Risk Assessment (IAIAsa 1998 Pre-Conference Course)
- IAIA and Poverty (IAIAsa 1999 Pre-Conference Course)
- Social Impact Assessment, Planning with People in Mind (IAIAsa 2000 Pre-Conference Course)
- A Practical Approach to Environmental Due Diligence in South Africa (IAIAsa 2000 Pre-Conference Course)
- Public Participation: from Theory to Practice (IAIAsa2000 Pre-Conference Course)

In addition, I have since 2001 been privately researching various aspects of transportation related acoustic aspects. Much of this work has been related to the Gautrain Rapid Rail project.

Chronological Work History:

1968-1971:	Site and Design Engineer	Roberts Construction
1971-1975:	Design/Traffic Engineer	De Leuw Cather & Associates Inc. (SA)
1975-1977:	Transportation/ Environmental Planner	De Leuw Cather (Canada)
1978-1981:	Associate	De Leuw Cather & Associates Inc. (SA)
1981-1986:	Director	F C Gericke (Pty) Ltd. Construction,
1986-1997:	Associate	Stanway Edwards Associates (Pty) Ltd
1997-2000:	Associate	Stanway Edwards Ngomane Associates (Pty) Ltd
2000-2001:	Associate	Booz·Allen & Hamilton (South Africa) Ltd
2001 to Present	Partner	Jongens Keet Associates
	Partner	Calyx Environmental cc

Professional Affiliations:

- Registered Professional Engineer (Pr Eng), the Engineering Council of South Africa (Retired).
- Certified Environmental Assessment Practitioner of South Africa (EAPSA)
- Fellow of the South African Institution of Civil Engineering
- Member of the International Association of Impact Assessment (SA Chapter)
- Member of the Southern African Acoustics Institute.

Publications:

- Cosijn D, *Parking and Loading Policy for ORMET.* Annual Transportation Conference 1988.
- Cosijn D, *Road and Traffic Environmental Manual.* Annual Transportation Conference 1990.
- Herhold L and Cosijn D, *Growth Management and Transportation Planning - A Means to Restructure Our Urban Areas*. Annual Transportation Conference 1994. **(#)**
- Cosijn D, *Comprehensive Environmental Management of Transportation Projects.* SAICE Environmental Conference 1994.
- Cosijn D, *Transportation Demand Management* - A Means for Relieving Congestion. Annual Transportation Conference 1995.
- Cosijn D, *Severance as a Factor in Linear Transportation Facility Planning.* SAICE Environmental Conference 1996.

- Cosijn D, *Environmental Investigation of the Alternatives for the PWV9 Freeway Crossing of the Daspoortrant.* SAICE Environmental Conference 1999.
- Cosijn D and Slater R, *Summary of the Operational Safety Assessment of the National Route N2 Approaches to Knysna.* South African Transportation Conference, 1999.
- Cosijn D, *Transportation: Is the Environmental Message being Driven Home Successfully?* IAIAsa2000 Conference.
- Cosijn D, *Environmental Noise: A Case for Sound Management.* IAIAsa2001 Conference.
- Cosijn D and Van Niekerk JL, *Noise and Vibration Impact Assessment of the Gautrain High Speed Rail Link.* Southern African Transport Conference (SATC) 2003.
- Van Niekerk JL, Morgan JPL and Cosijn D, *Gautrain Tunnels: Surface Vibration and Ground-borne Noise.* Journal of the South African Institute of Mining and Metallurgy, Volume 104, No 4, May 2004. **(#)**

  (#) - See Awards

Awards

1. The Paper by Van Niekerk JL, Morgan JPL and Cosijn D, *Gautrain Tunnels: Surface Vibration and Ground-borne Noise,* Journal of the South African Institute of Mining and Metallurgy, Volume 104, No 4, May 2004 was awarded the Certificate of Merit (Alec Wilson Memorial Award) by the South African Institute of Mining and Metallurgy on 16 August 2006.

2. The Paper L Herhold and Cosijn D, *Growth Management and Transportation Planning - A Means to Restructure Our Urban Areas,* Annual Transportation Conference 1994 was selected as one of the best papers of the Conference. The authors were invited to a banquet hosted by and were presented to HRH Princess Anne.

Professional Activities

1989 to 1993	Member of convening committee for Annual Transportation Conference
1991 to 1999	Member of SAICE Transportation Division Committee
1994 to 1999	Member of SAICE Environmental Division Committee
1994 to 1996	Member of convening committee for SAICE Environmental Conference 1994 and 1996

References:

1. Name: Mr Mark Freeman

Position: Director

Address: SSI/Bohlweki Environmental (Pty) Ltd
PO Box 867
GALLO MANOR, 2052

Tel.: (011) 798-6001

Fax: (011) 798-6005

Cell-phone: 082 554 4130

2. Name: Mr John Wates

Position: Director

Address: Fraser Alexander Ltd.
PO Box 14700
WHITFIELD

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Fax: (011) 397-4607

Cell-phone: 083 626 5420

Yours faithfully

DEREK COSIJN

Pr Eng, BSc (Civil Eng), EAPSA (Certified), FSAICE, MSAAI.

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

INTEGRATED ENVIRONMENTAL IMPACT ASSESSMENT:
PROPOSED EXPANSION OF ASH DISPOSAL FACILITY, KRIEL POWER STATION, MPUMALANGA

Specialist:	Jongens Keet Associates		
Contact person:	Derek Cosijn		
Postal address:	P O Box 2756, Brooklyn Square		
Postal code:	0075	Cell:	082 600 6347
Telephone:	012 460 4481	Fax:	
E-mail:	dcosijn@ghmail.com		
Professional affiliation(s) (if any)	MSAAI, FSAICE, EAPSA Certified, PrEng		

Project Consultant:	Aurecon South Africa (Pty) Ltd		
Contact person:	Franci Gresse		
Postal address:	PO Box 494, Cape Town, South Africa		
Postal code:	8000	Cell:	082 8912384
Telephone:	021 5266022	Fax:	086 7231750
E-mail:	Franci.Gresse@aurecongroup.com		

4.2 The specialist appointed in terms of the Regulations

I, Derek Cosijn, declare that –

General declaration:

I act as the independent specialist in this application;

I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;

I declare that there are no circumstances that may compromise my objectivity in performing such work;

I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;

I will comply with the Act, Regulations and all other applicable legislation;

I have no, and will not engage in, conflicting interests in the undertaking of the activity;

I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

all the particulars furnished by me in this form are true and correct; and

I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Jongens Keet Associates

Name of company (if applicable):

27 July 2017

Date: