AGENDA: COUNCIL: CITY OF TSHWANE METROPOLITAN MUNICIPALITY: 25 APRIL 2024

PART I of the agenda of the Council Meeting of the

CITY OF TSHWANE METROPOLITAN MUNICIPALITY

(FIFTH TERM OF THE CITY OF TSHWANE)

to be held on THURSDAY, 25 APRIL 2024

REPORT OF THE MAYORAL COMMITTEE

03/2024 report 20 MARCH 2024

AGENDA: COUNCIL: CITY OF TSHWANE METROPOLITAN MUNICIPALITY: 25 APRIL 2024

Order of business of the Council Meeting convened in terms of Section 2 (read with Section 8) of the Rules and Orders:

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The Chairperson (Executive Mayor) of the Mayoral Committee or member called upon by the Executive Mayor to do so, submit to Council the reports of the Mayoral Committee, as contained in the respective Parts.

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F. REPORT TO THE COUNCIL

PART I: FROM THE MAYORAL COMMITTEE MEETING: 20 MARCH 2024

Reference no. 35984/1
Koena Nkoko (4586)
COUNCIL: 25 April 2024

1. HEALTH DEPARTMENT
THE CITY OF TSHWANE NOISE MANAGEMENT POLICY
(From the Mayoral Committee: 20 March 2024)

1. PURPOSE

The report intends for Council to take cognisance of the City of Tshwane Noise Management Policy as required by the corporate policy review process.

2. STRATEGIC PRIORITIES

- Prioritisation of the electrical grid and water infrastructure;
- Provide stringent financial management and oversight;
- A business-friendly city that promotes employment and economic growth;
- Enhancing city safety, security and emergency services;
- Maintaining a clean and protected natural environment;
- Maintenance and expansion of road infrastructure and public transportation;
- A caring city that supports the vulnerable and provides social relief;
- Modernisation and digitisation of city processes; and
- Creating a healthy and vibrant city.

3. BACKGROUND

Noise is an inescapable part of urban and suburban living. Residents accept being subjected to numerous noise sources of various levels. Noise management is a highly regulated field, and the City is mandated to develop mechanisms in response to legislation, which includes policies and by-laws. “Noise pollution” is a competency of municipalities that is specifically mentioned in Part B of Schedule 5 of the Constitution of the Republic of South Africa, 1996, which states that noise pollution and management play a vital part in the promotion of a safe and healthy environment.

National legislation prescribes that all organs of state, including local authorities, have a moral obligation and legal requirement to protect the environment and that all necessary measures must be taken to meet these requirements. Legislation on this matter includes the following:

- Constitution of the Republic of South Africa, 1996;
- Environment Conservation Act, 1989 (Act 73 of 1989);

- National Environmental Management Act, 1998 (Act 107 of 1998); and
- Environmental Policy for South Africa.

In 1996, the Minister of National Environmental Affairs and Tourism forwarded model noise control regulations to all nine provinces for review, adoption or amendment (where considered necessary for local conditions) and promulgation as provincial legislation. The basis of authority for regulating noise is entrenched in the Constitution, where noise pollution management is listed as a function of Part B of Schedule 5 (local government matters). The primary enabling source of noise regulation is the Environment Conservation Act, 1989.

Gauteng is one of only two provinces to date that have promulgated their noise regulations, which all local authorities in Gauteng must apply. It is therefore the responsibility of each local authority to control noise pollution in its area of jurisdiction by developing the following:

- Appropriate strategy;
- Policy;
- Noise management systems; and
- By-laws.

The Health Department and the consultant's Calyx Environmental CC developed a noise management policy which was submitted to Council for approval 26 February 2015. This policy is a statement of intent by the City of Tshwane to incorporate a set of guidelines and principles of action for managing and protecting the noise environment in Tshwane. The policy provides a framework that identifies the nature of noise-related issues and indicates the measures required by Council to rectify the situation and/or to take the necessary preventative actions.

4. DISCUSSION

The City of Tshwane has been implementing the Noise Management Policy since its approval in 2015. The Noise Management Policy was reviewed, and it was found that there are no national legislation or regulatory amendments since the previous submission to Council and that the current policy aligns with national and provincial requirements. The current policy, therefore, requires no amendment and will be reviewed as per the corporate guidelines.

5. COMMENTS OF THE STAKEHOLDER DEPARTMENTS

5.1 COMMENTS OF THE CHIEF FINANCIAL OFFICER

Cognisance is taken of the contents of the report.

There are no financial implications emanating as a result of this report for the City of Tshwane as the purpose of this report is for the Mayoral Committee to take cognisance of the City of Tshwane Noise Management Policy as required by the corporate policy review process.

5.2 COMMENTS OF THE CHIEF OF EMERGENCY SERVICES

The purpose of the report intends for the Mayoral Committee to take cognisance of the City of Tshwane Noise Management Policy as required by the corporate policy review process. The Emergency Services Department (ESD) takes note of the contents of the report and further comments as follows:

Having a noise management policy in place, as mandated by the National Environmental Management Act, is vital for the City of Tshwane. This policy serves as a crucial tool for protecting the environment, public health, and the overall quality of life for residents. It sets limits on noise levels, ensuring that noise pollution is kept in check. Additionally, the policy helps resolve conflicts and disputes related to noise, promoting community harmony and preventing economic losses for noise-sensitive businesses. Aligning the noise pollution by-law with the policy is essential for consistency and effectiveness in managing noise pollution, ensuring that regulations reflect the municipality's commitment to noise management.

Finally, the enforcement of noise regulations is pivotal in making the policy effective. It involves designated authorities responding to complaints, investigating violations, and imposing penalties when necessary, thereby fostering a culture of noise responsibility within the community and contributing to the policy's success. Overall, a well-implemented noise management policy is a key component of responsible urban planning and governance in the City of Tshwane.

5.3 COMMENTS OF THE CHIEF OF POLICE

The purpose of the report is to provide the Mayoral Committee with information regarding the Tshwane Noise Management Policy as is required by the Corporate Policy Review Process. The Tshwane Metropolitan Police Department takes note that the current policy is aligned to all relevant legislation and that is not deemed necessary at this stage to amend the said policy. It is however recommended that enforcement protocols and standards are formulated in relation to this policy, as it would ensure unified enforcement across all City regions and departments.

5.4 COMMENTS OF THE GROUP HEAD: GROUP LEGAL AND SECRETARIAT SERVICES

The purpose of the report is for the Mayoral Committee to take cognisance of the City of Tshwane Noise Management Policy as required by the corporate policy review process.

It is noted that the City of Tshwane has been implementing the Noise Management Policy since its approval in 2015. It was reviewed, and it was found that there is no national legislation or regulatory amendments since the previous submission to Council and that the current policy aligns with national and provincial requirements. The current policy, therefore, requires no amendment and will be reviewed as per the corporate guidelines.

Note is further taken that the specialist that developed the Noise Management Policy for the City passed away during the COVID-19 pandemic. As a result, the required expertise will need to be appointed, should fundamental changes need to be applied to the Noise Management Policy in the future.

Having regard to the aforesaid legal framework and with specific reference to the contents of the report, Group Legal and Secretariat Services Department support the approval of the report and its recommendations.

5.5 COMMENTS OF THE GROUP HEAD: CITY STRATEGY AND ORGANISATIONAL PERFORMANCE

The City Strategy and Organisational Performance department (CSOP) takes cognisance of the report on the City of Tshwane Noise Pollution Policy which indicates that no changes in the policy are required as it is still relevant in terms of the current national and provincial legislation and policies.

5.6 COMMENTS OF THE GROUP HEAD: COMMUNICATIONS, MARKETING AND EVENTS

The purpose of the report intends for the Mayoral Committee to take cognisance of the City of Tshwane Noise Management Policy as required by the corporate policy review process.

The Communication, Marketing and Events (CME) Department takes note of the contents or the report, the recommendation and its annexures.

5.7 COMMENTS OF THE GROUP HEAD: COMMUNITY AND SOCIAL DEVELOPMENT SERVICES

This report intends for the Mayoral Committee to take cognisance of the City of Tshwane Noise Management Policy as required by the corporate policy review process. The current policy aligns with the National and Provincial requirements as per the applicable acts and policies.

The Community and Social Development Services Department supports the purpose, contents, and the recommendation of the report for the proposed approval of the current Noise Policy.

5.8 COMMENTS OF THE GROUP HEAD: ENERGY AND ELECTRICITY

Energy and Electricity Department takes cognizance of the report regarding Noise Management Policy in the City of Tshwane. The department supports the report and its recommendations.

6. IMPLICATIONS

6.1 HUMAN RESOURCES

There are professionally qualified officials in the Health Department who implement and monitor noise management and manage the system.

In terms of policy development, the department has dedicated officials who ensure compliance with the resolutions of Council on policy management.

However, it should be noted that the specialist that developed the Noise Management Policy for the City passed away during the COVID-19 pandemic, which means that the required expertise will need to be appointed, should fundamental changes need to be applied to the Noise Management Policy in the future.

6.2 FINANCES

This report has no new financial implications, as the policy is implemented within the existing operating budgets of the relevant departments.

6.3 CONSTITUTIONAL AND LEGAL FACTORS

The Constitution lists noise pollution as a function of Part B of Schedule 5, which means that it is an exclusive provincial legislative competence. Part B sets out matters that fall within the jurisdiction of local government, subject to the condition that the provincial government is responsible for taking effective measures to provide for monitoring and supporting the local government in the province. In addition, provinces also have legislative and executive authority to see the effective performance of functions by municipalities by regulating the exercise of the local government's executive authority. Therefore, the Constitution envisages that local authorities should administer and regulate legislative and other support by the province that is related to noise pollution. The Constitution also sets out other areas that may be pertinent to noise regulation, including airports, public transport, road traffic regulations and provincial roads. These functions are vested in different levels of government.

6.4 COMMUNICATION

The approved policy and the benefits thereof will be communicated to the relevant internal and external stakeholders upon approval and during implementation.

Relevant communication platforms will be used to communicate with internal and external stakeholders, with support from Communication, Marketing and Events.

6.5 PREVIOUS COUNCIL OR MAYORAL COMMITTEE RESOLUTIONS

The City of Tshwane approved the Noise Management Policy on 26 February 2015.

7. CONCLUSION

The Noise Management Policy is a dynamic document that will require regular updating in order to ensure that its standards and procedures remain current within the changing external environmental legislative framework.

IT WAS RECOMMENDED (TO THE MAYORAL COMMITTEE: 20 MARCH 2024):

That it be recommended to Council:

That Council takes cognisance that there were no national legislative or regulatory amendments and that the City of Tshwane Noise Management Policy is aligned with all the stipulated requirements.

During the consideration of the report, it was agreed:

That the recommendation be amended to read as follows:

That Council takes cognisance that, upon review, the City of Tshwane Noise Management Policy is aligned with all the stipulated legislative and regulatory requirements.

In view of the above:

IT WAS RESOLVED (BY THE MAYORAL COMMITTEE: 20 MARCH 2024):

That it be recommended to Council:

That Council takes cognisance that, upon review, the City of Tshwane Noise Management Policy is aligned with all the stipulated legislative and regulatory requirements.

The Mayoral Committee on 20 March 2024 resolved to recommend to Council as set out below:

ANNEXURES:

A. Appendix A – Characteristics of Noise
B. Appendix B – Glossary of Terms
C. Appendix C - Activities with the potential for a substantial detrimental effect on the environment
D. Appendix D - Noise Mitigating Measures
E. Appendix E - Pending Noise Related Legislation
F. Appendix F - City of Tshwane Noise Characteristics
G. Appendix G - Additional Noise Standards

RECOMMENDED:

That Council takes cognisance that there were no national legislative or regulatory amendments and that the City of Tshwane Noise Management Policy is aligned with all the stipulated requirements.

CITY OF TSHWANE
NOISE MANAGEMENT POLICY

APPENDIX A

CHARACTERISTICS OF NOISE

APPENDIX A : CHARACTERISTICS OF NOISE

A1. GENERAL

Noise is considered to be unwanted or undesirable sound. It penetrates the work place, and recreational areas, the home and can create a disturbance at all hours of the day. The effects of noise on people are varied. Noise disrupts activity, disturbs sleep and hinders people carrying out their work. It can impede the learning process, psychological development, social activity and verbal communication, and impairs job performance and safety in the workplace and in transport. The extent of the noise impact problem is summarised in Table A1 which indicates the percentage of the UK population disturbed by various noise sources.

TABLE A1: PERCENTAGE OF UK POPULATION AFFECTED BY VARIOUS NOISE SOURCES

Noise Source	% of Population		
	Hear	Bothered by	Biggest nuisance
Road Traffic	89	23	16
Aircraft	83	13	8
Children	72	14	8
Animals	55	16	9
People	53	8	3
Trains	35	2	0.5
Factories	13	4	1
Construction	12	3	0,5

In France 93% of the population indicate that they are bothered by noise in general in their neighbourhood with 46% considering the disturbances severe.

A2. ACOUSTIC TERMS AND CONCEPTS

i) Noise may be defined as any acoustical phenomenon producing any aural sensation perceived as disagreeable or disturbing by an individual or a group. This definition encompasses the three areas of analysis of sonic phenomena, namely:

- their physical (acoustic) effects;
- their physiological effects (those that are directly measurable); and
- their psycho-sociological effects (annoyance and other reactions to noise).

ii) This has been further defined under *noise nuisance* in the Noise Regulations as *any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person.*

iii) A rapid fluctuation of the static air pressure that surrounds us is perceived as sound if the frequency of the fluctuations lies within the human audible range namely from 20 hertz (Hz) to 20 kilohertz (kHz).

iv) The unit which has been adopted for indicating the noise level is the decibel (dB) and it relates on a logarithmic scale to the basic unit of sound pressure, namely the Pascal (Pa). The decibel scale starts at 0 dB for sounds that can just be heard and reaches 130 dB at the onset of aural pain.

v) The human ear is not equally sensitive to all audible frequencies and thus the sensitivity of measuring instruments needs to be adapted at different frequencies so that it reacts in a similar fashion to the human ear. This adaptation is known as *frequency weighting*. The "A" weighting has been found to give the best correlation between perceived and actual loudness and all noise levels are thus defined by their dB(A) value.

vi) The range of typical noise levels encountered in various environments is shown in Table A2.

vii) The basic unit dB(A) gives a measure of sound pressure level at an instant in time. Most noises, however vary in loudness over time and thus some means of *time weighting* is necessary. There are a number of noise descriptors which take this into account, namely:

- Equivalent continuous sound level (L_{eq}): A person's subjective response to noise, including road traffic noise, depends not only on discrete instantaneous sound levels, but even more on the average sound energy received during the time that the noise is emitted. When measured on the A-weighted scale the equivalent continuous sound level is expressed as L_{Aeq} and is defined as that sound level which contains the same quantity of sound energy over a defined time period as the actual time-varying sound level. The Noise Regulations prescribe the use of this descriptor.

- Statistical level (L_N or $L_{N,T}$) represents the sound level that is exceeded N per cent during a period of T hours. ($L_{10,24h}$ for example is the sound level that is exceeded 10 per cent of the time during a 24 hour period.) The statistical level is suited to any stationary random noise, although in the context of transport, it is only freely flowing traffic that falls neatly into that category. This time over which the measurement is made should be long enough for the statistical sampling to be meaningful but not so long that the noise cannot be regarded as stationary. Typically for the measurement of L_{10} which is used as the descriptor in the UK for traffic noise, the measurement period would be 5 to 15 minutes.

TABLE A2: NOISE LEVELS/RANGES TO 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	Peak level of high speed train travelling at 300 km/h at 7,5 metres	
100	Printing press room	Very noisy
95-100	Peak level of passenger train travelling at 200 km/h at 7,5 metres.	
95-100	Peak level of passing freight train (diesel engine) travelling at 100 km/h at 7,5 m	
85-100	Discotheque (indoor)	
75-100	7,5 m from passing motorcycle (50 km/h)	
80-95	7,5 m from passing truck (50 km/h)	
80	Kerbside of busy street	
70	Blaring radio	Noisy
60-80	7,5 m from passing passenger car (50 km/h)	
60	Supermarket/busy office	
50	Average suburban home (day conditions)	Quiet
40	Library	
35-45	Average suburban home (night-time)	
30	Average rural home (night-time)	
25-30	Slight rustling of leaves	
20	Background in professional recording studio	Very quite
0-20	Experienced as complete quietness	
0	Threshold of hearing at 1000 Hz	

- Single event noise exposure level (SEL or L_{AX}) is defined as the continuous sound level which, when maintained for one second contains the same quantity of sound energy as the actual time varying level of the one noise event. It enables, for example, the transient noise level of a vehicle passing by a point to be rated. Its real use is as an aid to calculating L_{eq} over a given time period because L_{AX} defines the energy contribution of the single event and therefore the energy of a number of such unrelated events over a period of time can be logarithmically combined to give the L_{eq} value.

- Day/night equivalent sound level (L_{DN}) is a rating based on L_{eq} which is used in the USA. The sound energy is averaged over 24 hours but the noise level during the night-time period is penalised by the addition of 10 dB(A).

vii) Human perception of the change in sound is subjective and does not bear a close relation to actual change, for example:

- A change in level of 3 dB(A) is just detectable;

- A change in level of 5-6 dB(A) is clearly perceptible; and

- A change in level of 10 dB(A) is perceived roughly as doubling or halving of loudness.

A3. EFFECTS OF NOISE

i) The level at which noise becomes unacceptable to an individual or a community depends on several factors. It is known that excessive noise can be damaging to a person's physical and mental well being. The physiological and psychological effects of noise on a person are both related to the total amount of noise to which he or she is exposed. This means that someone who is exposed to a fluctuating noise of a certain period of time can be expected to react in a similar way to a dosage of noise at a constant level which produces the same energy over the same period of time.

ii) Extremely loud noises from approximately 120 dB(A) are agonising and cannot be tolerated for any duration by a person with normal hearing. Prolonged exposure to noise louder than 85 dB(A)L_{eq} can cause permanent hearing damage. At moderately high levels it can interfere with communication and become a source of intense annoyance to the community. It has been found that the way a community reacts to noise is directly related to the level of noise, measured in dB(A), to which its members are exposed. Noise nuisance can result from either a continuous unacceptable level of noise, from intrusive single events or a combination of both.

Already by the mid 1980s the Organisation of Economic Co-operation and Development (OECD) had established sound pressure level thresholds for noise nuisance during the daytime. These criteria measured as the equivalent noise level (L_{Aeq}) are as follows:

- at 55-60 dB(A) noise creates annoyance;

- at 60-65 dB(A) annoyance increases considerably; and

- above 65 dB(A) constrained behaviour patterns, symptomatic of serious damage caused by noise arises.

iii) Within the South African context, SANS 10103:2003 gives an indication of the criteria for an assessment of annoyance. This scientific approach is complex and it is not appropriate to provide all the details in this Appendix. The reader is however referred to Section 8 of SANS 10103. In overview this Standard indicates that there are likely to be specific responses by communities/groups to given changes in noise level from the residual noise level of an area as indicated in Table A3.

TABLE A3: CATEGORIES OF COMMUNITY/GROUP RESPONSE TO CHANGES IN NOISE LEVEL

Excess $\Delta L_{Req,T}$ dB(A)	Estimated Community/Group Response	
	Category	**Description**
0	None	No observed reaction
0 to 10	Little	Sporadic complaints
5 to 15	Medium	Widespread complaints
10 to 20	Strong	Threats of action
>15	Very strong	Vigorous action

iv) Some of the specific effects of noise are as follows:

a) Sleep disturbance

Sleep disturbance starts at noise levels of 30 dB(A) for steady state continuous noise at the sleeper's ear. In special situations even lower levels may disturb sleep. The most important noise exposure parameter for sleep disturbance however is the maximum peak level of the exposure from the single isolated event. This highlights the importance of avoiding noise from noisy cars, motorbikes, lorries and aircraft in residential areas at night. From many study findings the general conclusion has been drawn that, to ensure undisturbed sleep, the maximum sound pressure level should not exceed 45 dB(A). Field studies indicate deterioration in mood or symptoms such as tiredness, headache and nervous stomach where heavy traffic occurs at night and the recommended values are exceeded.

b) Interference with communication

Noise levels frequently attained in streets, gardens and on balconies interfere with speech. Noise levels inside buildings usually cause occupiers to close windows if they wish to hold a conversation once the external continuous noise level reaches 70 dB(A). It is generally accepted that noise levels in homes should not exceed 40-45 dB(A), levels that are often exceeded by traffic noise even with the windows closed.

c) General annoyance

A less specific, but nevertheless serious effect of environmental noise is that it simply disturbs and annoys people. The feeling of annoyance results not only from sleep disturbance and interference with communication, but also from less well defined feelings of being disturbed and affected during all kinds of activities as well as during periods of rest.

d) Extra-auditory effects

A great number of these extra-auditory effects of noise are psycho-physiological. The most predominant of these manifest themselves in physiological stress responses and, particularly at higher noise levels, in cardio-vascular reactions. Mental health effects and influences on performance and productivity have also been observed. Intensive research on these subjects is still ongoing. It can be generally concluded from the present state of knowledge that exposure to environmental noise induces stress to health as it may lead to measurable changes in blood pressure, heart rate, vasoconstriction and endocrine excretion levels. A correlation has also been found between high exposure to noise and increased admissions to mental hospitals.

A4 NOISE LEVEL CRITERIA

A4.1 INTERNATIONAL NOISE LEVEL CRITERIA

A large degree of international consensus has emerged over the years as what constitutes unacceptable levels of noise exposure and what should be the maximum levels of exposure for certain specific situations. At the international level, the World Health Organisation (WHO) together with the Organisation for Economic Co-operation and Development (OECD) are two of the main bodies that have collected data and developed their own assessments on the effects of the exposure to environmental noise. On the basis of these assessments, guideline values for different time periods and situations have been suggested.

The World Health Organisation has recommended that a standard guideline value for average outdoor noise levels of 55 dB(A) be applied during normal daytime in order to prevent significant interference with the normal activities of local communities. The guideline residual sound levels for various environments are given in Table A4. The ambient sound level is defined as the equivalent continuous A-weighted sound pressure level L_{Aeq} at a specific place and over a specific time inclusive of intruding noises. Intruding noise in this context is defined as noise in spaces that is generated by sources other than those resulting from the intended activities in those spaces.

TABLE A4: WORLD HEALTH ORGANISATION GUIDELINE AMBIENT SOUND LEVELS

Environments	Ambient Sound Level L_{Aeq} dB			
	Daytime		Night-time	
	Indoor Space	Outdoor Space	Indoor Space	Outdoor Space
Dwellings	50	55	-	-
Bedrooms	-	-	30	45
Schools	35	55	-	-
Hospitals				
- general	35	-	35	45
- ward rooms	30	-	30	40
Concert halls (4 hour)*	100	-	-	-
Discotheques (4 hours)*	90	-	90	-
* Note: Concert halls and discotheques measured over a 4 hour exposure period				

The OECD's Fifth Environmental Action Programme established a number of broad targets on which to base action up to the year 2000 in night-time L_{Aeq}. These are:

- to phase out average exposure above 65 dB(A);
- to ensure that at no point in time a level of 85 dB(A) should be exceeded coupled with the aim of ensuring that the proportions of the population exposed to average levels between 55 dB(A) and 65 dB(A) should not increase; and
- exposure in quiet areas should not increase beyond 55 dB(A).

The World Bank has compiled a Pollution Prevention and Abatement Handbook which is used by World Bank Group staff and consultants in carrying out its environmental policies. Since July 1998 the guidelines contained in the Handbook apply to all Bank Group funded projects. The Handbook deals with noise control under Industry Sector Guideline. It stipulates that noise abatement measures should achieve either the maximum allowable one-hourly L_{eq} ambient noise levels dB(A) as shown in Table A5 or a maximum increase in background levels of 3 dB(A). Measurements are to be taken at noise receptors located outside the project property boundary.

TABLE A5: WORLD BANK GUIDELINE AMBIENT SOUND LEVELS

Receptor	Maximum Allowable Ambient Noise Levels L_{eq} (Hourly) in dB(A)	
	Daytime 06:00 – 22:00	**Night-time 22:00 – 07:00**
Residential, institutional, educational	55	45
Industrial, commercial	70	70
Note: No interior L_{Aeq} values nor values for rural areas are stipulated.		

A4.2 SOUTH AFRICAN NOISE LEVEL CRITERIA

i) The main controlling criteria to date have been from:

- SANS 10103:2008
- National Noise Control Regulations (now replaced by provincial regulations)
- SANS 10117:2003

ii) SANS 10103:2003, the Code of Practice for *The Measurement and Rating of Environmental Noise with Respect to Annoyance and to Speech Communication* recommends maximum noise levels for residential and non-residential areas. Table A6 taken from this Code of Practice lists the recommended maximum ambient sound levels which should not be exceeded. These sound pressure levels include corrections for tonal character and impulsiveness of the noise. This is also known as the *rating level* for the ambient noise (L_r).

TABLE A6: RECOMMENDED ALLOWABLE AMBIENT SOUND (RATING) LEVELS FOR VARIOUS LAND USE TYPE DISTRICTS

Type of District	Equivalent Continuous Rating Level for Noise ($L_{Req,T}$) (dBA)					
	Outdoors			Indoors with Windows Closed		
	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
Note: Residential buildings such as dormitories, hotel accommodation, residences, etc. should only be allowed in non-residential districts on condition that the calculated anticipated indoor maximum equivalent continuous rating levels ($L_{Req,T}$) values given in Table 1 of SANS 10103 are not exceeded.						

SANS 10103 also gives an indication what the 65 dB(A) noise level represents in the context of every day conversation, namely that it is the noise level at which people must not sit further than 0,7 metres apart in order to have intelligible communication, as well as being the level at which an ordinary telephone conversation starts to become difficult.

iii) The Gauteng Noise Regulations (as enabled by the Environment Conservation Act) have introduced legislation whereby, a local authority may designate *a noise control area* within which noise control measures must be taken. The following circumstances are specified:

(a) A *controlled area* (Gauteng Province) in the case of road transport noise in the vicinity of a road means a piece of land so designated by a local authority where the reading on an integrating impulse sound level meter, taken outdoors at the end of a period of 24 hours while such meter is in operation, exceeds 60 dB(A); or the equivalent continuous A-weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground for a period of 24 hours as calculated in accordance with SANS 10210, titled *Code of Practice for Calculating and Predicting Road Traffic Noise* and projected for a period of 15 years following the date on which the local authority has made

such designation, exceeds 60 dB(A). Refer to note in Table 3.8.2 in Section 3.8.3.

In the North West Province the 18 hour (06h00 to 24h00) the noise levels are not to exceed 65dBA.

(b) A *controlled area* in the case of air traffic noise directly adjacent to an airfield may be so designated where the calculated noisiness index, (NI), projected for a period of 15 years following the date on which the local authority made such designation, exceeds 65dB(A).

(c) A *controlled area* in or adjacent to an industrial area may be designated where with industrial noise the reading on an integrating impulse sound level meter, taken outdoors at the end of a period of 24 hours while such meter is in operation, exceeds 60 dB(A); or the calculated outdoor equivalent continuous "A" weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground for a period of 24 hours exceeds 60 dB(A).

(d) In the case of noise from any other source, a *controlled area* may be designated for adjacent land to that source where the reading on an integrating impulse sound level meter, taken outdoors at the end of a period extending from the time when such source of noise become active until the time when it was no longer active, while such meter was in operation, exceeds 65 dB(A); or the outdoor equivalent continuous A-weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground, as calculated in accordance with the acceptable mathematical/acoustic methods for a period extending from the time when the source of the noise became active until the time when it was not longer active, and projected for a period of 15 years following the date on which the local authority made such designation, exceeds 65 dB(A). The methods of calculation as described in SANS 10328 should be used for this purpose.

iv) SANS 10117:2003, the code of practice for *The Determination and Limitation of Disturbance around an Aerodrome due to Noise from Aeroplanes* indicates the following limits on various land uses:

a) Residential Areas. The total noisiness index should not exceed 65 dB(A) for residential areas.

b) Residential areas having acoustically insulated buildings. The total noisiness index should not exceed 75 dB(A) for residential areas where the buildings are so designed that a reduction of at least 20 decibels is experienced in aeroplane noise (measured in dB(A)) between the outside and inside of the buildings, and where the buildings are so ventilated that the windows and doors can be properly insulated.

c) Industrial areas. The total noisiness index should not exceed 85 dB(A) for industrial areas.

d) Forbidden areas. In areas where the total noisiness index exceeds 85 dB(A), no land development for the purpose of residential, commercial or industrial usage should be allowed.

A5. CHARACTERISTICS OF ENVIRONMENTAL NOISE

The main sources of environmental noise are:

- road traffic
- rail traffic
- air traffic
- industry
- civil engineering and construction site activities
- outdoor equipment
- recreational equipment

These classes differ from a phenomenological point of view and, as the public's attitude to noise from the different sources vary, are perceived differently. In order to provide a better understanding of these noise sources a brief description of each is given in the following sections.

A5.1 ROAD TRAFFIC NOISE

i) Road traffic noise is a complex phenomenon constantly fluctuating in intensity and pitch. It is made up of several components, namely:

- road/tyre interaction (rolling noise);
- vehicle engine noise;
- vehicle transmission noise;
- vehicle aerodynamic noise;
- braking systems;
- vehicle retarder systems.

ii) High volume, free flow condition road traffic is considered as a line source having a continuous area of impact on both sides of and parallel to the road. The nature and level of noise generated from a road is dependent on:

- volume of traffic;
- composition of the traffic;
- traffic speed;
- gradient of the road; and
- surface texture of the road.

iii) Rolling noise is normally of a higher frequency than that from the mechanised noise sources and is the predominant component of the traffic noise at high speeds (above 60 km/h).

iv) Both rolling and mechanical noise are components for the freeflow condition as indicated previously but for stop/start traffic conditions, for example in the vicinity of a traffic signal (at a road junction), mechanical noise is predominant.

v) A doubling or halving of the vehicle speeds will increase or decrease respectively the noise level by approximately 4dBA to 5dBA, while a halving or doubling of traffic volume will lower or raise respectively the noise level by approximately 3dBA.

vi) The noise, as it is perceived at any point removed from the road, is influenced by the following factors:

- It reduces with increasing distance from the source (± 3dBA for each doubling of distance).
- The nature of the ground surface assists in this reduction, i.e. the reduction will be greater over a soft surface (grassland) than a hard one (bare ground, concrete, etc.).
- Weather conditions such as wind, temperature gradient and temperature inversions can increase or reduce the perceived noise level.
- Topography.

vii) Very low volume traffic impact has a different characteristic in that there may be a greater fluctuation of sound level.

viii) Note that these characteristics are of importance when considering what mitigating measures are to be taken.

A5.2 RAILWAY NOISE

i) This section presents a general overview of the noise and vibration produced by various types of trains for a variety of conditions. The task is complicated by the wide variety of train types and operating conditions, since trains can operate in subway, at-grade or an elevated structure over a range of speeds and propulsion types. However, an attempt has been made to characterise these various conditions for both inter-city and mainline railway and transit trains.

ii) Most mainline railroad operations are on at-grade ballast and tie track with operations in tunnels or over bridges usually comprising only a small percentage of route length. This is in contrast to urban rail transit operations where a greater proportion of the operations occur either in subway or on elevated structures.

iii) Rail traffic is considered as a line source of noise with a continuous area of impact both sides of and parallel to the railway line. Railway related noise is general acoustically characterised by high noise levels of relatively short duration. The wayside noise radiated into a community is the function of a number of different factors, namely:

- interaction of wheels and rails;
- the vehicle or locomotive propulsion system;
- auxiliary equipment;
- noise radiated from vibrating structures;
- train speed;
- train length;
- aerodynamics (for high speed operations);
- locomotive warning devise or horn noise.

iv) There will also be components of noise from:

- ancillary equipment;
- stations;
- ground-borne noise and vibration;
- railway maintenance operations;
- bridge noise;
- tunnel portal enhancement.

v) Noise radiated from train operations and track structures generally constitute the major noise sources from transit systems. The noise and vibration from different transit train operations can take different paths depending on the type of support structure. Airborne noise is radiated from at-grade and elevated operations, while groundborne noise and vibration is of primary concern for subway operations. However, problems with groundborne noise and vibration have also occurred with transit trains operating at-grade or on elevated structures.

vi) There are four basic sources of wayside airborne noise:

- Wheel/rail noise: this is the noise that is radiated directly from the vibrating wheels and rails.
- Propulsion equipment: this includes noise from traction motors, and reduction gears.
- Auxiliary equipment: compressors, motor generators, brakes, ventilation systems and any other car-mounted equipment.
- Elevated structure noise: this is the noise radiated by vibration of the transit structure components that are excited by a train pass-by.

vii) Each of these noise sources can dominate the wayside noise level for specific conditions. At very low speeds (i.e. less than 15 km/h) auxiliary equipment may predominate. At speeds up to approximately 50 km/h, wheel/rail noise predominates, while at speeds greater than 50 km/h, the propulsion equipment noise predominates, particularly if the traction motor is self-ventilated. For older system with lightweight steel elevated structures, the structure noise can predominate at all speeds above 15 km/h.

viii) Aerial structures can be divided into two broad classes, namely lightweight steel elevated structures and those of higher mass construction. Train operation on light-weight steel structures creates one of the most severe environmental noise problems facing transit systems, as the rail tie and support structure acts as a large sounding board with potentially very high noise levels radiated to the wayside community and into transit cars. The second category of aerial structures is constructed of higher mass materials such as concrete or concrete/steel composites. These structures typically have ballast trackbeds or concrete decks with resilient rail fasteners. With appropriate noise control treatments, these structures can be placed even in noise-sensitive residential areas without adverse noise impact.

ix) The levels of wayside noise vary significantly between different transit systems. Modern systems with welded rails, resilient rail fasteners, and wheels and rails in good condition are much quieter than many of the older systems. There can also be significant variations within the same transit system, depending on the wheel and rail condition and on the type of transit car used. In general,

trains operating on lightweight steel elevated structures produce the highest levels of wayside noise, while trains on ballast and tie track with smooth rails, the lowest.

x) The noise from a train pass-by is generally characterised by a high noise level during the locomotive pass-by with lower noise levels of different character during pass-bys of the cars (carriages). The noise from the diesel-electric locomotive is normally dominated by exhaust noise from the generators. This source of noise is independent of the pass-by speed of the train, but dependent on engine load and throttle setting. An electric locomotive usually produces a somewhat lower wayside noise level. The principal source is general the propulsion system (i.e. electric motors, cooling fans and sometimes gearing) which is dependent on the passing speed.

xi) The major noise from the trailing cars is produced by the interaction of the wheels and rails. Rail/wheel interaction is dependent on speed, wheel condition, rail condition and whether the track is jointed or welded.

xii) Table A7 gives a summary of typical maximum A-weighted wayside noise levels taken from mainline freight and passenger train operations. The levels have been normalised to a distance of 30 metres from track centre-line. Typical maximum wayside noise levels at 30 metres from track centre-line range from 100dBA to 110dBA.

xiii) If the railway is electrically powered from overhead electrical lines, at-grade substations are usually located at intervals along the line. The noise from the substations varies considerably depending on power requirements and installation details, however, most are not enclosed and in this condition can generate noise levels of 40dBA to 45dBA at 30 metres from the edge of the substation installation. Although this is a relatively low noise level, substation noise can have significant pure-tone components which can constitute a problem.

xiv) Most frequently used mainline rail routes have regularly scheduled track maintenance including ballast cleaning, tamping and rail grinding. Noise levels from maintenance activities obviously depend on the exact activity occurring, however the noise character and levels are typical of diesel, hydraulic and pneumatic equipment used at heavy construction projects.

TABLE A7: TYPICAL WAYSIDE NOISE LEVELS FROM MAINLINE FREIGHT AND PASSENGER TRAIN OPERATIONS ON BALLAST AND TIE TRACK 30m FROM TRACK CENTRE-LINE

Conditions	Speed (km/h)	Noise Level (dBA)
Idling 2000 Hp general-purpose locomotive	0	61-66
Idling 3000 Hp general-purpose locomotive	0	65-68
Passenger train: Electric locomotive Cars	132	 90 84-88
Passenger train: Electric locomotive Cars	64	 92 88
Passenger electric locomotive	160	86
Freight train – 0% grade: Diesel locomotive Cars	108	 92 82-89
Freight train – 0% grade: Diesel locomotive Cars	45	 92 75-85
Freight train – 0% grade: Diesel locomotive Cars	93	 91 82-91

xv) Yard and workshop noise can be a major contributor to wayside noise in community areas adjacent to the yards. Marshalling or classification years are located at intervals along mainline railroad routes and major repair and maintenance facilities are often located within the year. These classification and maintenance activities are varied and the noise levels and their duration are dependent on the particular activities, year layout and operational patterns. Yards typically receive incoming trains and redistribute the freight cars to new outgoing trains bound for new destinations. In many yards the cars are shuttled to different tracks by switching locomotives, in which case the major noise sources are the locomotive and the impacts from the cars coupling together. The impact noise is typically 20dBA to 30dBA)or more above the ambient noise, in the range of 95dBA to 100dBA at 30 metres from track centre-line. Most large classification yards are *hump* yards. For this type of yard, cars to be classified are pushed to the top of a hump and are released so that the cars coast through switches and onto one of many classification tracks. The speed of the car is controlled by an active pneumatic or electric retarder which applies pressure to a retarding show. The retarding shoe contacts the freight car wheels and, while in contact with the wheels, usually causes a squeal or screech often consisting of multiple pure tone. The maximum level of the squeal noise is in the range of 100dBA to 105dBA at 30 metres.

xvi) Another aspect of transit noise is that produced in rail based mass transit (RBMT) stations and the following main noise sources can be identified:

- trains approaching, leaving and passing through the stations;

- ancillary equipment, such as heating, ventilation and air conditioning equipment and escalators;
- commuters;
- public address systems.

A5.3 AIR TRAFFIC NOISE

i) Air traffic noise is a complicated phenomenon and is influenced by many factors such as the nature of the airport operation, the types of aircraft using the airport, volume of air traffic, etc.

ii) Aviation noise has the most impact during take-off and landing. Aircraft have to use high or full power at take off and are then at their noisiest. At some airports, they will have climbed to a sufficient height before crossing any residential area for noise not to be especially serious, but action will be necessary where residential and other sensitive communities exist close to the runway. People living under an approach route to an airport are similarly subject to aircraft noise although, on approach to landing, the power plants (engines) are operating at much lower settings than at take-off. The rate of descent is a critical factor but this must be kept within safe limits.

iii) Aviation noise impact is normally contained to a limited area around an airport/airfield/ military airbase. An assessment of the extent of the main impact area is generally made through the calculation of a set of noise exposure contours known as the noisiness index contours. These comprise what is often termed the *noise footprint* of the airport. The calculation of the air traffic noise is influenced by variables such as the height of the aircraft, the noise emission characteristics of the engines and the flight track of the aircraft.

iv) Aircraft ground operations can also cause noise nuisance to communities living close to airports. The sources of ground operation noise include engine testing and run-up prior to taxiing including the start of roll point, standing aircraft noise on apron and terminal stands, and cargo and maintenance area noise.

Methods of modifying the impacts caused by these operations include, for run-up noise, re-orientating the aircraft, relocating the aircraft more remotely from noise-sensitive areas and/or the use of run-up suppressors and barriers. The control of other sources of ground operations include the use of space to separate noisy operations, such as start of roll, from sensitive areas, and the use of building and screens to contain the noise to within the airport boundary.

A5.4 OTHER NOISE SOURCE DATA

i) Noise from industrial installations, construction sites and fixed recreation facilities radiates from a point source and the shape of the exposure area is general a circular area around the source. The radiated noise is general related to the installed power of the installation and other acoustically relevant parameters. Depending on the nature of the installation noise from these sources may be steady for long periods or fluctuate considerably.

ii) The noise caused by outdoor equipment such as that used on construction sites is not related to a fixed piece of infrastructure like road or industrial noise. The equipment may be used in different

places and at different times by different people, all of which makes regulation of the noise caused by such equipment more difficult.

iii) The noise character from many recreational activities has the potential to have a disturbing effect. Activities such as the following apply:

- motorboats and power skis
- micro-light aircraft
- model power aircraft
- sports stadiums/sports grounds.

CITY OF TSHWANE
NOISE MANAGEMENT POLICY

APPENDIX B

GLOSSARY OF TERMS

APPENDIX B : GLOSSARY OF TERMS

For purpose of this Policy the meanings to the following words or expressions shall apply:

In order to ensure that there is a clear interpretation of this Policy and any subsequent legislation in the form of by-laws, it is essential that there should be a concise and unambiguous definition of all words and expressions contained herein.

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*).

Animal means all wild and domestic animals kept as pets, as well as farm animals and shall include birds and poultry;

A-weighted sound pressure, in Pascals: The root-mean-square sound pressure determined by use of frequency-weighting network A (see IEC 651).

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, dBA, is used throughout this Policy.

Controlled area (also called a Noise Control Area and for this Policy called a *supplementary controlled area*) means a piece of land which is so designated by the Council:

- Where (for the Gauteng Province), in the case of road traffic noise such a piece of land is directly adjacently to a road and the reading on an integrating impulse sound level meter, taken outdoors at the end of a period of 24 hours while such meter was in operation, exceeds 60dBA; or the outdoor equivalent continuous A-weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground for a period of 24 hours as calculated in accordance with SANS 10210, and projected for a period of 15 years following the date on which the local authority has made such designation, exceeds 60dBA. Refer to Note in Table 3.8.3, Section 3.8.3 of the Policy.

- Where (for the North West Province), in the case of road traffic noise such a piece of land is directly

adjacently to a road and the reading on an integrating impulse sound level meter, taken outdoors at the end of a period from 06h00 to 24h00 hours while such meter was in operation, exceeds 65dBA; or the outdoor equivalent continuous A-weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground for a period from 06h00 to 24h00 as calculated in accordance with SANS 10210, and projected for a period of 15 years following the date on which the local authority has made such designation, exceeds 65dBA. Refer to Note in Table 3.8.3, Section 3.8.3 of the Policy.

- Where, in the case of air traffic noise such a piece of land is directly adjacent to an airfield and the calculated noisiness index, projected for a period of 15 years following the date on which the local authority made such designation, exceeds 65dBA.

- Where, in the case of industrial noise such a piece of land is directly adjacent to an industry and the reading on an integrating impulse sound level meter, taken outdoors at the end of a period of 24 hours while such meter was in operation, exceeds 60dBA; or the calculated outdoor equivalent continuous A-weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground for a period of 24 hours, exceeds 60dBA.

- Where, in the case of noise from any other source directly adjacent to such a piece of land, the reading on an integrating impulse sound level meter, taken outdoors at the end of a period extending from the time when such source of noise became active until the time when it was no longer active, while such meter was in operation, exceeds 65dBA; or the outdoor equivalent continuous A-weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground, as calculated in accordance with acceptable mathematical/acoustic methods for a period extending from the time when the source of noise became active until the time when it was no longer active, and projected for a period of 15 years following the date on which the local authority made such designation, exceeds 65dBA. The methods of calculation as described in SANS 0328:2000 should be used for this purpose.

This is one of the three possible regulating area definitions to be used by Council to define where specific noise standards are applicable.

Council means City of Tshwane Metropolitan Municipality Council.

dBA means the value of the sound pressure level in decibels, determined using a frequency weighting network A.

Disturbing noise means a noise level that exceeds the ambient sound level of the *noise zone* as measured continuously at the same measuring point according to SANS 10103:2003.

Environment means the external circumstances, conditions and objects the affect the existence and/or development of an individual, organism or group. These circumstances include biophysical, social, economic, historical, cultural and political aspects.

Environmental impact assessment (EIA) means a detailed study of the environmental consequences of a proposed course of action. An environmental assessment or evaluation is a study of the environmental

effects of a decision, project, undertaking or activity. It is often used within the Integrated Environmental Management (IEM) planning process as a decision support tool to compare different options.

Environmental impact means a change in the socio-economic and/or biophysical characteristics caused directly or indirectly by some human action whether adverse or beneficial.

Environmental management programme means documented description of the requirements and procedure for achieving environmental objectives and targets.

Environmental management system *(EMS)* means documented procedures drawn up as described in a South African Bureau of Standards (SABS) code of practice to implement the requirements of ISO 14000. Operating, emergency, data collection and documentation procedures are set out, along with procedures for training, the transfer of information and all the elements of a complete management and quality control system.

Environmentally sensitive area means any natural area having significant natural resource value, of and/or important ecological function, any agricultural land or any land uses in urban areas which are susceptible to disturbance from human activities, inclusive of areas of cultural/historical value.

Environmental sustainability means the ability of an activity to continue indefinitely, at current and projected levels, whilst maintaining or substituting for social, cultural and natural resources required to meet present and future needs.

Equivalent continuous sound level *(L_{eq})* means that sound level which contains the same quantity of sound energy over a defined time period as the actual time varying sound level.

Erect also means alter, convert, extend or re-erect.

Exempted vehicle means a vehicle listed in Annex A to SANS 10281.

IEC 651 means International Electro technical Commission publication No 651 titled *Sound Level Meters.*

IEC 804 means international Electro technical Commission publication No 804 titled *Integrating Averaging Sound Level Meters.*

IEC 942 means International Electro technical Commission publication No 942 titled *Sound Calibrators.*

Integrating sound level meter means a device that integrates a function of the root means square value of sound pressure over a period of time and indicates the result in dBA.

Integrating impulse sound level meter means an integrating sound level meter set on *I*-time weighting.

Land-use zones shall mean the land uses as defined in the City of Tshwane Town Planning Scheme and as designated by Council

Measuring point, related to-

- a piece of/and from which an alleged disturbing noise emanates, means a point outside the property projection plane where an alleged disturbing noise shall be measured in accordance with current standard practice;

- a building with more than one occupant, means a point in or outside the building where an alleged disturbing noise shall be measured in accordance with current standard practice, namely SANS 10103:2003;

- a stationary vehicle, means a point as described in SANS 10181 where a measuring microphone shall be placed.

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. It includes the qualitative aspect as well as the ambient noise level and character of the fluctuating noise component.

Noise control officer means a person with a qualification equivalent to a senior certificate plus three years tertiary education in engineering, physical sciences or health sciences and who is registered with a professional council.

Noise district means a defined generalised land use area for which permissible maximum sound pressure level criteria are prescribed. It is one of the three possible regulating area definitions to be used by Council to define where specific noise standards are applicable.

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.

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).

Noise sensitive area means any area where a *disturbing noise* or *noise nuisance* will have a detrimental impact on the residents or users of facilities in that area and/or will have a detrimental impact on any fauna, either domestic or wild, in that area.

Noisiness index means a number value expressed in dBA as defined in SANS 10117.

Noise zone means a defined area based on specific land use types for which prescribed maximum sound

pressure level criteria are prescribed. It is one of the three possible regulating area definitions to be used by Council to define where specific noise standards are applicable.

Non-exempted vehicle means a vehicle not listed in Annexure A to SANS 10281.

Plant means electro-mechanical equipment such as a refrigeration machine, air-conditioner, fan system, compressor power generator, pumps, etc.

Property projection plane means a vertical plane on, and including, the boundary line of a piece of land defining the boundaries of such piece of land in space.

Rating level (L_r) 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.

Recreational vehicle means –

- an off-road vehicle, scrambler, dune buggy or ultra-light aircraft;
- a model aircraft, vessel or vehicle;
- any aircraft or helicopter used for sport or recreational purposes;
- a vessel used on water; or
- any other conveyance, vessel or model used for sport or recreational purposes.

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*).

SANS 10328 means the South African National Standard titled, *Sound Impact Investigations for Integrated Environmental Management.*

SANS 10117 means the South African National Standard titled *Determination and Limitation of Disturbance around an Aerodrome due to Noise from Aeroplanes.*

SABS 0181 means South African Bureau of Standard titled *Measurement of Noise Emitted by Road Vehicles when Stationary.*

SANS 10210 means the South African National Standard *Code of Practice for Calculating and Predicting Road Traffic Noise.*

SANS 10281 means the South African National Standard titled *Engine Speed (S values), Reference Sound Levels and Permissible Sound Levels of Stationary Road Vehicles.*

Sound (pressure) level means the reading on a sound level meter taken at a measuring point.

Sound level meter means a device measuring sound pressure while it is set on *F*-time weighting and indicates the result in dB(A).

Supplementary controlled area see ***controlled area.***

Target area means a demarcated area on which the noise impact is being assessed.

The Act means the Environment Conservation Act, 1989,(Act No 73 of 1989) and/or the National Environmental Management Act, 1998 (Act No 107 of 1998).

Zone sound level means a derived dBA value determined indirectly by means of a series of measurements, calculation or application of desirable standards and/or as designated by Council for an area.

Refer also to the various Glossary of Terms and Definitions in the Acts and Standards given in the references (Section 5 of the Policy) if more specific aspects are required.

APPENDIX C

ACTIVITIES WITH THE POTENTIAL FOR A SUBSTANTIAL DETRIMENTAL EFFECT ON THE ENVIRONMENT

(AS IDENTIFIED UNDER SECTION 21 OF THE ENVIRONMENT CONSERVATION ACT, 1989 (ACT NO 73 OF 1989))

APPENDIX C: ACTIVITIES WITH THE POTENTIAL FOR A SUBSTANTIAL DETRIMENTAL EFFECT ON THE ENVIRONMENT (AS IDENTIFIED UNDER SECTION 21 OF THE ENVIRONMENT CONSERVATION ACT, 1989 (ACT NO 73 OF 1989))

The following *activities* which are listed in Schedule 1 have been identified by the Minister of Environmental Affairs and Tourism as being those which in general may have substantial detrimental effect on the environment. These were published in the Government Gazette No 18261 of 5 September 1997. The implications regarding noise related to the fact that many of these *activities* have a noise component which will require evaluation if an EIA is undertaken.

SCHEDULE 1

1. The construction or upgrading of:

   (a) facilities for commercial electricity generation and supply;

   (b) nuclear reactors and installations for the production, enrichment, reprocessing and disposal of nuclear fuels and wastes;

   (c) transportation routes and structures, and manufacturing, storage, handling or processing facilities for any substance which is dangerous or hazardous and is controlled by national legislation;

   (d) roads, railways, airfield and associates structures outside the borders of town planning schemes;

   (e) marinas, harbours and all structures below the high-water mark of the sea;

   (f) cableways and associates structures;

   (g) structures associated with communication networks, other than telecommunication lines and cables, as well as access roads leading to these structures;

   (h) racing tracks for motor-powered vehicles and horse racing, excluding indoor tracks;

   (i) canals and channels, including diversion of the normal flow of water in a river bed and water transfer schemes between water catchments and impoundments;

   (j) dams, levees or weirs affecting the flow of a river;

   (k) reservoirs for public water supply;

   (l) schemes for the abstraction or utilisation of ground or surface water for bulk supply purposes;

(m) public and private resorts and associates infrastructure;

(n) sewage treatment plants and associates infrastructure; and

(o) buildings and structures for industrial and military manufacturing and storage of explosives or ammunition or for testing disposal of such explosives for ammunition.

2. The change of land-use from:

(a) residential use to industrial or commercial use; (deleted 27 March 1998);

(b) light industrial use to heavy industrial use; (deleted 27 March 1998);

(c) agricultural or undetermined use to any other land-use;

(d) use for grazing to any other form of agricultural use; and

(e) use for nature conservation or zoned open space to any other land-use.

3. The concentration of livestock in a confined structure for the purpose of mass commercial production.

4. The intensive husbandry of, or importation of, any plant or animal that has been declared a weed or an invasive alien species.

5. The release of any organism outside its natural area of distribution that is to be used for biological pest control.

6. The genetic modification of any organism with the purpose of fundamentally changing the inherent characteristics of that organism.

7. The reclamation of land below the high-water mark of the sea and inland water including wetlands.

8. The disposal of waste in terms of Section 20 of the Environment Conservation Act, 1989 (Act No 73 of 1989).

9. Scheduled processes listed in the Second Schedule to the Atmospheric Pollution Prevention Act, 1965 (Act No 45 of 1965).

APPENDIX D

NOISE MITIGATING MEASURES

APPENDIX D: NOISE MITIGATING MEASURES

The nature of the potential impacts related to noise is complex and the range and scale of measures which may be taken to prevent or reduce such impacts are also numerous. It is therefore impractical in a document such as this to provide a detailed approach to all aspects of noise impact mitigation as specialist background knowledge and a clear appreciation of all the specific aspects and problems related to a project/situation are essential for the formulation of an adequate solution. Some background and some basic principles, however, have been indicated hereafter.

D1 GENERAL

Measures to control or attenuate noise from any noise generating source may be implemented in three forms, namely:

- Control of the noise at source.
- Control of the noise in the area of impact (receiver position).
- Control of the noise at some convenient intermediate location (i.e. along the transmission path) between the source and impacted receiver.

D2 NOISE CONTROL MEASURES

D2.1 LAND-USE PLANNING

A pro-active approach to noise control in the land-use planning process can be one of the most effective ways in which to prevent or minimise noise impact. This may be effected through:

i) Ensuring that noise generators are separated from noise sensitive land uses as far as is practical.

ii) Rezoning are carefully assessed to ensure that any changes will not adversely affect adjacent properties.

D2.2 ROADS AND RAILWAYS

With regard to roads and railways and traffic on these facilities the methods to control noise at source can be subdivided into the following basic categories:

i) Limiting vehicle noise emissions (refer to Section D2.2.1).

ii) Limiting train noise (refer to Section D2.2.2).

iii) Limiting the noise from transportation nodes (refer to Section D2.2.2).

iv) Road traffic control measures (refer to Section D2.2.4).

v) Roadway design (refer to Section D2.2.5).

vi) Railway and track design (refer to Section D2.2.6).

Noise control in the area between source and receiver may be effected by:

i) Land-use planning (refer to Section D2.2.7).

ii) Noise attenuation barriers (refer to Section D2.2.9).

D2.2.1 Motor Vehicle Noise Control

This aspect of noise reduction relates more to manufacturer design, effective maintenance of vehicles by owners and driving techniques. Thus, the control thereof falls more into the realm of enforcement. Noise emission standards are laid down in relevant SABS Codes of Practice and in the Noise Control Regulations (refer to Section 5, References of this Policy).

D2.2.2 Noise Control from Trains

This aspect also relates to manufacturer design and effective maintenance of the propulsion units and rolling stock of the various types of trains (goods trains and rail based mass transit). This aspect cannot be dealt with further as there are no noise emission criteria which are enforced in South Africa and rail operations are excluded at present from the Noise Regulations. However, reference should be made to the US Environmental Protection Agency, the US Federal Railroad Administration and the US Department of Transportation guidelines.

D2.2.3 Noise Control from Transportation Nodal Developments

Here essentially architectural measures are required (refer to Section D2.2.8). The careful selection of the location and the sensitive design of transportation nodal facilities (stations, taxi ranks, railway mashalling yards, etc.) can also assist appreciably in the reduction of noise from these facilities.

D2.2.4 Road Traffic Control Measures

The main factors affecting the noise generated by road traffic are the total number of vehicles, the percentage of heavy commercial vehicles in the traffic flow, the traffic speed and the operational characteristics (the latter relating to whether the traffic is free flowing or subject to interrupted operation as at traffic lights and junctions where vehicle interactions occur).

i) The most obvious way to reduce traffic noise in noise sensitive areas is to divert as much traffic as possible away from these areas. However, closing sections of road or traffic calming measures should not prejudice the access of local traffic. Note also that traffic calming measures may also increase localised noise levels. The effect of traffic volume

controls depends not only on the proportion of traffic removed but also on the volume of traffic both before and after the traffic restrictions. Halving the traffic flow or a doubling of the volume will respectively reduce or increase the L_{eq} levels by approximately 3dBA provided other parameters do not change. However, traffic volume and speed are generally highly correlated and so a reduction in volume is normally associated with an increase in traffic speed with the result that the optimum benefits expected from the reduced flow are not achieved. Furthermore, removing traffic from one road produces an increase in noise on other roads in the network. The fact that traffic noise level and traffic flow are logarithmically related can be used to good effect. Diverting traffic from a lightly used road and placing it on an already heavily used road will place little additional noise burden on the heavily used road, particularly if it is designed for high flow, but the benefits achieved on the lightly used road can be substantial.

ii) Restricting the numbers of heavy trucks using *sensitive* routes is another method used to reduce the noise from traffic. Heavy vehicles should be prevented from entering a prescribed district with the restriction being either in the form of a total ban on all commercial vehicles above a certain capacity or in the form of time entry restrictions, usually at night and over the weekend. The only exemption to the banning of trucks from entering an area would be where they are needed to collect or deliver goods in that area.

iii) The designation of special truck routes is a means of containing the noise problem in certain areas.

iv) Theoretically, the reduction of traffic speed is one of the most effective traffic measures controlling traffic noise levels. On high speed roads, halving the average vehicle speed could lead to a noise level reduction of between 5dBA and 6dBA. However, reductions of vehicle speed cannot easily be achieved in practice. In built-up areas it is clear that the design of the traffic speed restriction method is very important and the measures taken should introduce sufficient restraint on the motorist to introduce speed changes without affecting gear changing which could result in a net increase in noise levels. The methods adopted should also ensure that traffic flows freely through the site to encourage a non-aggressive style of driving.

Under high speed free flow conditions, however, other factors come into play, that is at high speeds the main component of the noise emanates from the tyre/road surface interaction whereas at low speeds and where steep gradients are involved mechanical noise from the vehicles tends to predominate. Therefore, the advantage obtained from the reduction of speed could well be offset by the increase in mechanical noise.

D2.2.5 Roadway Design

The noise radiated by traffic can be influenced by both the vertical and horizontal alignment of the road and also by the type of road surface used.

i) The variable of horizontal alignment of the road should be used to achieve a pleasing, safe and comfortable ride for the driver as well as giving the designer flexibility to position the road so as to avoid severe topography and to achieve an economic design. This latitude when designing can be used further to ensure adequate separation between the highway and sensitive land-uses as well as aligning the facility to use topography to shield such areas.

ii) Flexibility in the vertical alignment should also, where possible, be used to assist in the screening of sensitive areas. For example by placing the road in cut the walls of the excavation would act as noise attenuation barriers.

iii) Well designed road junctions provide the means to further control noise. Noise from individual vehicles can increase substantially during acceleration, particularly when the initial vehicle speed is low and the subsequent load on the engine is high. Vehicle interactions involving stop/start manoeuvres and vehicle acceleration and deceleration occur at, and on the approach to junctions. In order to reduce noise, therefore, it is important to consider, in the design of the junction, how best to smooth the flow of traffic to minimise the number of vehicle accelerations. Fortunately, this objective is also the objective of traffic management plans which are designed primarily to reduce journey times and collisions.

Linked and synchronised or demand-controlled traffic light systems should be installed. Unfortunately, the beneficial effect on traffic noise of these measures has been found to be less than expected partly because the improvements in flow resulting from these control systems tend to create an increase in capacity of the system which is rapidly filled and/or the speed of the traffic is increased. The overall benefits are generally small and in most cases are less than 2dBA.

Traffic circles (roundabouts) tend to produce fewer noise problems than signalised intersections. In general, studies of the noise at traffic circles have indicated that the increased noise from accelerating vehicles is within 1 dB(A) of the free flow level on the approach roads and that noise from the decelerating stream is equal or less than the free flow level. Overall, the noise at traffic circles may be increased above the level from an equivalent free flow traffic stream by approximately 1dBA to 2dBA and this increase is generally confined to within 50 metres of the centre of the traffic circle.

iv) Designing the road surface to control noise. The level of noise generated by a vehicle's tyres rolling over the road surface depends primarily on the speed of the vehicle and the design of the tyre and the road surface. Studies of tyre noise have established that while some benefits can be obtained by appropriate design of the tyre tread patters and tyre structure, the design of substantially quieter tyres conflicts with the overriding need to maintain safety, cool running and economy. Consequently, greater scope for reducing tyre/road surface noise lies with the possible alternative designs for the road surface.

The road surface parameters which are important in governing surface noise are the road surface texture and whether the surface is a bituminous material with a random texture pattern or a concrete surface with a predominantly transverse texture. There is generally however a conflict between the specifications for low noise surfaces and good high speed safety standards, namely that a smooth road surface can be relatively quiet but is clearly unsafe for the motorist in wet weather. There are road surfaces, however, which offer the combined advantage of both low noise and good skidding resistance performance. These surfaces generally have an open texture which is pervious to surface water but which also offers good acoustic absorption. It has been found that the noise levels recorded from the open texture surfaces are all lower than the noise generated on conventional surfaces at equivalent skidding resistance values. The average reduction in peak noise level is 4dBA for light vehicles while for heavy vehicles, the reduction in noise will be slightly less, at approximately 3dBA. Consequently, the noise from traffic running on open texture road surfaces can be reduced by between 3dBA and 4dBA on average depending upon the number of heavy vehicles in the traffic and these benefits are achieved without any need to reduce the safety standards provided by the surface texture.

The pervious macadam material has been found to retain its noise reduction properties during the effective life of the surface material and, due to its rapid drainage properties it lessens the incidence of splash noise during wet weather.

In summary it may be said that perhaps the safest surface is that of a concrete road with deep transverse grooving but it is also one of the noisiest. Less noisy, but also less durable under the action of heavy traffic, is a transversely brushed concrete surface. The least noisy concrete road is one with a texture formed by longitudinal grooving or burlap drag. Drawbacks such as less effective surface drainage, tendency to rapid wear and the fact that it may cause vehicles to follow in the track of the texture pattern must be carefully weighed up when this type of surface texture is considered.

When compared on the basis of equal skid resistance, bituminous roads are on the whole less noisy than concrete roads. The general rule that noise levels increase with coarseness of surface texture also applies to bitumen bound road surfacings. Amongst these roads, those sealed with a surface dressing of stone chippings generate the loudest noise. Less noisy are asphaltic surfacings with in rolled chips, followed by smooth asphalt surfaces. The surfacing generally regarded to be the least noisy is a rubber bitumen open graded asphalt.

For the designer there is a wide range of publications on the subject.

D2.2.6 Railway Line and Track Design

There is generally less flexibility in design for railway lines compared to roads due to more rigid standards of horizontal and vertical alignment:

i) Wherever feasible in the horizontal alignment design, the position of the railway line should be kept away from noise sensitive areas.

ii) Likewise, the design of the vertical alignment should be sensitive to areas which need to be protected from high noise levels and, where practical, the track should be in cutting through these areas.

iii) In the design of aerial structures the emphasis should be towards the use of higher mass materials such as concrete or concrete/steel composite structures.

iv) A welded rail system laid on ballasted track bed or on concrete decks with resilient rail fasteners should be used.

v) Ancillary equipment should be designed to meet the noise criteria of the area in which it can be installed.

D2.2.7 Land-Use Planning and Noise Control

When a new transportation route is planned through an existing urban area much of the existing flanking development will remain unaltered. Under these circumstances the layout of the road or railway line and design of the facility itself becomes crucial in minimising the noise impact resulting from the traffic. Where a road or railway line passes through an area that is, as yet, undeveloped or scheduled for redevelopment noise impact control by appropriate management of the adjoining land-use should also be considered. Opportunities for successful acoustical site planning are determined by the size of the available space, the terrain and the zoning policy applied. Appropriate techniques include:

- Placing as much distance as possible between the noise source and the noise-sensitive area (spatial separation).

- Placing noise-compatible activities such as parking areas, open spaces and commercial facilities between the noise source and the noise-sensitive areas.

- Using buildings and, to a lesser extent, plantings as barriers to screen sensitive areas.

i) Zoning and spatial separation

a) Although dwellings can often be protected from traffic noise by setting them well back from the source of noise, this approach is generally not considered by designers because it is assumed to be an uneconomical use of valuable land. Although this premise is generally correct as high noise levels prevail close to major highways or railway lines, spatial separation should always be evaluated as a possible solution. Mixed developments which include high-rise apartment blocks, cannot be easily screened by barriers and should, therefore, be located as

far from the road or railway line as the site allows. On such sites the remainder of low-rise dwellings can often be protected by some form of roadside barrier or by reliance on ground attenuation. A balanced approach is necessary though as the high-rise buildings can often be used to screen the other buildings.

b) One way of ensuring that spatial separation is given full consideration is for the local administration to impose a zoning policy whereby land adjoining a major road has development restricted to non-noise sensitive activities (e.g. commerce, agriculture, industry). While such a technique does offer the advantages of clearly defined development policy, unfortunately there is usually not enough demand for such noise-compatible land-use to afford adequate protection for every community exposed to noise. Furthermore, this type of strip zoning may not be compatible with other plans for the orderly growth and development of the community, or it could be in direct conflict with the development patterns of adjacent communities. Where areas blighted by traffic noise are not adapted to noise-compatible uses, the land involved can become dreary, useless patches of waste-land which are often too expensive to maintain.

c) The rezoning of highly impacted residential areas to allow alternative use of premises may also provide a feasible option for some of the houses in an area. Allowance for the use of the residential premises by professional firms such as lawyers, engineers, planners, etc., is the type of restructuring suggested. This alternative will require careful review by town planners who will need to assess compatibility with the residential area, additional traffic generation, etc.

ii) Buildings and plantings as noise shields

a) Additional noise protection can be achieved by arranging the site plan to use buildings as noise barriers. A long building, or a row of buildings parallel to a highway can shield other more distant structures or open areas from noise. It is possible for a two-storey building to reduce noise levels on its far side from the roadway noise source by approximately 13 dB(A). Further rows of buildings may only produce a small additional benefit of approximately 1 dB(A) to 2 dB(A) beyond the second row. (This aspect forms part of the consideration of noise attenuation barriers as indicated in Section D2.2.9.)

b) Although trees, bushes and plants are of great value in improving the aesthetics of road environment, the noise attenuation provided by vegetation is generally overestimated. Though attenuation mechanisms are very difficult to isolate because of the complex interaction between the ground, the vegetation and atmosphere, some theoretical explanation for screening by vegetation can be made.

Vegetation will affect the propagation of low-frequency sound by ground absorption which can be enhanced in wooded areas because of the high porosity of

the ground resulting from tree roots and fallen leaves, etc. High frequency propagation is affected by scattering by tree trunks, branches and partly by leaf absorption. It is difficult, however, to provide descriptions of vegetation which can be used to gauge the attenuation of noise. Tree height, vegetation type, depth of planting and particularly density of planting appear to be dominant variables. Generalisations to dB(A) attenuation values per unit distance introduce a greater spread in the observed results.

c) Even though no precise description of the effect of vegetation has yet been determined, some general conclusions can be drawn:

- Plantings which are high and dense enough to obscure the traffic visually will provide more attenuation than provided by the mere distance which the buffer strip represents. An attenuation of approximately 1dBA to 3dBA per 10 metre depth of extremely dense planting can be expected. Shrubs or other ground cover are necessary in this respect to provide the required density near the ground. Excess attenuation with respect to grassland of the order of 0,5dBA to 1,5dBA per 10 metres of dense vegetation depth have been found. Evergreen plantings are necessary.

- The psychological effect of planting is significant, as it has been found that by removing the noise source from view, plantings reduce human annoyance to noise. The fact that people cannot see the road or railway line generally reduces their awareness of it even though the noise remains.

iii) Cluster and mixed use development

A conventional grid subdivision of land affords no real noise protection from the adjacent highway since the first row of houses bears the full impact of the noise. In contrast, cluster developments enable the whole space to be planned as a single entity taking into account the required density of housing depending upon noise exposure and the use of both space and noise-compatible development as buffers.

The above aspects are dealt with in some detail in *The Audible Landscape – A Manual for Highway Noise and Land-Use.*

D2.2.8 Architectural Acoustic Design of Buildings

The specific architectural issues of sound insulation of buildings have not been considered in this report as the technical details are of a specialist nature. In principle, measures to insulate houses/buildings from noise penetration is a practical means of reducing noise impact, although there are limitations, especially for houses and other residential premises in the South African context, namely that the sealing of dwellings (windows, doors, etc.) requires the installation of forced ventilation systems. It should be noted that the present construction procedures and

standards for houses in South Africa make the residential dwellings extremely difficult to insulate effectively at low cost.

The location and the careful design of stations can appreciably assist in the reduction of noise from these facilities.

Acoustic treatment is an important aspect in the design of subway stations for rail transit systems. Without such treatment, subway stations tend to be highly reverberant, resulting in excessive train and patron activity noise as well as poor speech intelligibility. Acoustic treatment is generally incorporated in stations by adding sound-absorbing material to ceiling, wall and under-platform surfaces. The main purposes of this treatment are:

- to reduce noise from train arrivals and departures
- to prevent focusing of train noise at patron commuter locations
- to reduce reverberation in order to provide good hearing conditions for public address system announcements
- to limit noise radiating out from the station into surrounding community.

D2.2.9 Noise Attenuation Barriers

The concept of intervening vertical walls or earth mounds (or buildings, as indicated in Section D2.2.7(ii)) as noise attenuation barriers is a sound one and these have proved to be successful when certain conditions are met. They may not be effective, however, where all the necessary data input to the design has not been adequately appreciated. Many different types of road barriers have been experimented with since the early 1970s and various wall shapes and construction materials have been used to find the most effective solution to specific problems. Much has been learned by practical experimentation and by using an empirical approach to the development and application of different types of barriers. Barriers may be classified into one of the following types:

- wall
- earth berm
- wall / berm combination.

Barriers have been constructed from the following materials and where required various surface treatments have been used to increase the acoustic absorbency of the structure:

- concrete wall
- wooden wall
- brick wall
- metal wall

- glass and perspex
- natural material such as earth-berm and living plants woven into screens
- Combinations of earth fill and retaining structures.

Barriers must be carefully integrated into the design of the road. The design objectives for a successful noise barriers are that it must possess sufficient mass to attenuate the sound, it must be relatively maintenance free once installed, and must not result in an increased risk of accident or injury. Other objectives are that it should be economical to erect and have an acceptable visual appearance. Also in order to provide the maximum degree of protection, the barrier should be sited as near to the noise source or as close to the position to be protected as possible and should completely obscure the receiver's view of the noise source. It is also important that all gaps in the barrier are properly sealed. A hole or gap in the barrier fabric may substantially reduce the screening potential of the barrier but also, because of resonance effects created by the hole, the character of the transmitted sound can be altered from a broad band noise to one with discrete tones which are generally far more disturbing.

The sound energy generated by a transportation source can be reflected by a barrier wall, thus affecting receivers located on the source side of the barrier. Where there are barriers on both sides of the road and these do not have acoustically absorbant surfaces a further problem may occur, namely that of multiple reflections between the barrier walls which may be diffracted over the barriers.

In the United Kingdom the height of most roadside barriers is limited to 3 metres whereas in Canada, the USA and some European countries much higher barriers are permitted. Barriers higher than 4 metres are generally considered to be visually unacceptable to residents. Apart from the height, the shape of the barrier is also important. A simple wall has generally been found to be less effective than an earth berm of similar height. The location of barriers on overpass bridges and viaducts need special considerations to protect vehicles and/or pedestrians passing underneath from falling debris resulting in the event of a vehicle impact. The barrier must not deteriorate rapidly under the action of sunlight and other weathering effects.

CITY OF TSHWANE
NOISE MANAGEMENT POLICY

APPENDIX E

PENDING NOISE RELATED LEGISLATION

APPENDIX E: PENDING NOISE RELATED LEGISLATION

As at 1 July 2004 the following legislation which has noise management implications has been drafted and is awaiting promulgation pending review:

i) EIA Regulations in terms of the National Environmental Management Act, 1998. These will supersede the existing EIA Regulations promulgated in terms of the Environment Conservation Act, 1989.

ii) Gauteng Noise Control Regulations.

iii) Air Quality Act. This has reached the *bill* stage.

APPENDIX F

CITY OF TSHWANE NOISE CHARACTERISTICS

APPENDIX F: CITY OF TSHWANE NOISE CHARACTERISTICS

The data provided in this Appendix form the initial base for the "Noise Attribute Map" which is prepared as a general indication of the noise sensitive areas and noise generators in the City of Tshwane.

F1. General Noise Problem Causal Factors in the City of Tshwane

In general, the following factors can be identified as the basis of the growing noise problem in the City of Tshwane:

i) An historical development of incompatible land-uses adjacent or near to each other. Specifically, the following relationships have resulted in or potentially may result in some degree of noise impact:

   (a) Residential areas related to major transportation facilities. World-wide surveys have shown that transportation/traffic sources have major noise impact and particularly road traffic noise is experienced as the worst source of disturbance.

   (b) Residential areas adjacent to retail complexes where there is electro-mechanical equipment such as refrigeration compressors, air conditioning units, etc.

   (c) Residential areas related to noisy recreational and sporting facilities.

   (d) Residential areas related to industry and mining operations.

   (e) Residential areas related to schools/crèches.

   (f) Schools/education facilities related to any major noise generating land-use/facility/operation.

   (g) Retirement homes related to any major noise generating facility/operation.

   (h) Hospitals/rehabilitation centres/hospices related to any major noise generating facility/operation.

   Note that for certain land uses such as *residential* there may only be a night-time and weekend noise problem while for others such as retirement homes, hospitals, etc. there is often a 24 hour problem.

ii) The rapid growth of road traffic on all roads in the City of Tshwane and vehicles travelling at high speeds.

iii) New developments have been allowed to take place without adequate investigation of potential noise impact being undertaken and controls being placed on the development.

iv) Rezoning and special consent uses have been allowed to take place without adequate investigation of potential noise impact being undertaken and controls being placed on the development.

v) Many of the major noise sources are not controllable by Council, as they lie within the jurisdiction of other authorities/agencies. These are:

(a) Construction of, maintenance works on, and traffic operations on national and provincial authority roads.

(b) Railway noise.

(c) Military airbase noise.

(d) Civil airport noise.

(e) Noise from helipads at hospitals and other emergency service centres.

A number of these agencies have been exempted from applying the Noise Control Regulations (refer to Section 3.7.3.2).

vi) Construction sites in general have a disturbance/nuisance factor.

vii) Many vehicles exceed specified noise emission measurement standards.

viii) Within the Council there are several departments which are responsible for planning and/or work which have potential noise impact implications. There is not guiding policy for or comprehensive co-ordination between those Departments. Only two departments, namely Environmental Health and the Metropolitan Police Department, are presently specifically tasked with aspects of noise control. Application of effective noise management and control has also been limited by the lack of a comprehensive legal base and enabling procedures.

F2. Main Noise Sources in the City of Tshwane

The main sources of environmental noise and thereby potential sources of noise disturbance and/or noise nuisance are as follows:

i) Road traffic:

(a) Traffic on the freeways passing through the City of Tshwane's area of jurisdiction:

- National Route N1 from the Samrand interchange in the south to the Hammanskraal interchange in the north.
- National Route N4.
- National Route N14/Route R28 from the Laezonia interchange (Route R511) in the west to Brakfontein interchange (National Route N1/Route R28), and thence northwards from the Brakfontein interchange to the interchange with Jan Smuts Drive (Route R101) in the southern sector of the Pretoria CBD.

(b) Traffic on the main arterial routes, primarily Class 2 and Class 3 routes:

- provincial routes;
- municipal routes.

(c) Traffic on lower order roads where posted speeds are exceeded and/or vehicles exceed the maximum noise emission standards.

(d) The areas where traffic calming measures are applied there is a potential for an increase in noise levels.

ii) Passenger trains and freight trains on railway lines passing through or immediately adjacent to the boundaries of the City of Tshwane.

iii) Major public transport stops and termini:

(a) Railway stations.

(b) Bus stops.

(c) Taxi stops/ranks.

iv) Airfields:

(a) Waterkloof Military Airbase.

(b) Zwartkops Military Airbase.

(c) Wonderboom Airport.

v) Helipads:

vi) Mining and quarrying operations:

vii) Industrial areas.

viii) Sporting venues.

ix) Office blocks, shopping centres, etc. where electro-mechanical equipment such as air-conditioning units, refrigeration compressors, etc. is mounted externally to buildings.

x) Venues where musical entertainment is allowed, such as restaurants, taverns, discotheques, halls, stadiums, etc.

F3. Potential Major Sources of Noise

i) Council has identified the following planned major infrastructure elements related to the future development of the City of Tshwane, namely:

(a) There are several freeways and major arterial routes planned by Gautrans which will have a severe impact on existing noise sensitive land-uses, as well as any such land uses which are allowed to develop adjacent to the reserves of these roads.

(b) The Gautrain High Speed Rail Link.

F4. Noise Sensitive Areas/Activities

i) In general, the main noise sensitive land-uses/activities in Centurion are as follows:

(a) Residential areas;

(b) Schools/educational facilities.

(c) Hospitals, hospices and rehabilitation centres.

(d) Senior citizens' retirement homes.

(e) Passive recreation areas:

- river valley areas
- potential and existing parkland;
- parks; and
- national monument areas.

ii) The following areas, and specifically the residential or other noise sensitive area, are potential *Noise Control Areas* as presently defined in the Gauteng Noise Control Regulations. Note that in this Policy these areas are termed *supplementary controlled areas*:

(a) In Gauteng, areas alongside freeways and major arterial roads where the measured existing 24-hour equivalent sound pressure (noise) level (L_{eq}) or the noise level calculation for the 15-year traffic projection exceeds 60dB(A). Refer to the note in Table 3.8.3, Section 3.8.3.

(b) In the North West province, areas alongside freeways and major arterial roads where the measured existing 18-hour (06h00 to 24h00) equivalent sound pressure (noise) level (L_{eq}) or the noise level calculation for the 15-year traffic projection exceeds 65dB(A).

(c) Areas affected by air traffic noise, where the calculated *noisiness index* (NI) contour around an airport/airfield, projected for a period of 15 years, exceeds 65dB(A). The situation that military airbases and civil airports are presently excluded from any form of control by the Noise Control Regulations is a major

concern.

(d) Areas adjacent to industrial areas (including quarries and open-cast mines) where the 24-hour L_{eq} exceeds 60 dB(A).

(e) Areas adjacent to any other type of noise source where the L_{eq} over the period that the noise source was active exceeds 65 dB(A). (The South African National Standard SANS 10103:2003 applies with regard to the measurement period).

(f) Areas adjacent to railway lines where the daytime (06h00 to 22h00) equivalent continuous noise level is equal or greater than 60dBA and/or the night-time (22h00 to 06h00) equivalent continuous noise level is equal or greater than 50dBA. Refer to Appendix G.

A *Noise control area* needs to be proclaimed by the local authority and within such an area there are certain requirements and restrictions.

iii) The following uses/activities, which, although having a high noise disturbance value, are excluded from the requirements of the Noise Control Regulations at present:

(a) Military airbases.

(b) Civil airports.

(c) Railway operations (refer to Section F4.2 ii f).

These need to be included as facilities which require a related *noise control area* definition. Council considers that it is specifically relevant to establish the extent of the area adjacent to such facilities which is adversely affected by the noise generated by their activities.

APPENDIX G:
ADDITIONAL NOISE STANDARDS

APPENDIX G: ADDITIONAL NOISE STANDARDS

Noise standards not dealt with in other sections of this Policy are provided in this Appendix. Three categories of noise standards are reviewed, namely:

- Noise standards related to railway noise.
- Assessment criteria for ground-borne (re-radiated) noise impact.
- Guideline assessment criteria for construction noise impact.

G1. STANDARDS RELATED TO RAILWAY NOISE

G1.1. South Africa

As there are no railway related noise impact criteria and standards in South Africa it has been necessary for this project to review the situation and to make recommendations for appropriate standards to be used as the reference base. The following were some of the basic considerations for the recommended:

i) The noise impact standards needed to be realistic.

ii) The railway noise impact criteria needed to take into consideration the underlying rationale of the Gauteng and North West Provinces' Noise Control Regulations in order to allow for their future assimilation into these Regulations with minimal, if any, changes.

iii) International railway noise criteria have been tested in practice and are considered to be applicable as the basis for the recommendations.

The following South African legislation (Acts, Regulations and Codes of Practice) form the noise related legislative background that has been used to guide the formulation of the railway noise impact criteria:

- Environment Conservation Act, 1989 (Act No 83 of 1989).
- Environmental Management Policy for South Africa.
- Bill of Rights in the Constitution of the Republic of South Africa Act, 1996 (Act No 108 of 1996).
- National Environmental Management Act (Act No. 107 of 1998).
- The Standards Act, 1982 (Act No 30 of 1982).
- The Occupational Health and Safety Act, 1993 (Act No 85 of 1993).
- National Transport Policy.
- The Environmental Impact Assessment (EIA) Regulations.
- Noise Control Regulations (Gauteng Provincial Government), August 1999.
- South African National Standard SANS 10103:2003, *The Measurement and Assessment of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication*.
- South African National Standard SANS 10328:2003, *Methods for Environmental Noise Impacts*.
- International Standards Organisation Code of Practice ISO 3095, *Measurement of Noise Emitted by Railbound Vehicles*.

Although there are references to railway noise in the South African legislation (either directly or implied) this is non-specific. There are also conflicts in this legislation on the requirements for

environmental impact assessments of railway projects in general versus the requirements for the noise impact assessment of such projects, namely:

i) The EIA Regulations identify *railways* as an *activity with the potential for a substantial detrimental effect on the environment* and the construction of any new facility will require a comprehensive environmental investigation. Refer to Schedule 1, Item 1(d) of the Regulations.

ii) The Gauteng and North West Provinces' Noise Control Regulations, however, either explicitly or by omission exclude railways as an aspect for consideration in the management and control of noise by the Province itself or the local authorities within their respective areas of jurisdiction. This may be due to the fact that the former South African Transport Services operated from a National para-statal level. It should be noted that the National Noise Control Regulations, even before being devolved to provincial level, also did not deal with railway noise issues.

G1.2. International Railway Noise Impact Criteria

The current approach taken to determining land use noise impact criteria as related to rail transport in the United Kingdom (UK), European countries, the United States of America (USA), Australia, Japan, Korea and Hong Kong are all similar in that the *noise sensitivity* of various land use type areas are used to provide the primary indicator of an acceptable noise impact level. Specific maximum noise levels (L_{max}) or sound exposure levels (SEL) and equivalent noise levels (L_{Aeq}) for given periods of the day as related to these noise sensitive areas are specified. These time periods normally relate to a daytime and a night-time period, although an evening period is also used as a control period in some countries.
Railway noise level impact criteria have been legislated or specified in all the aforementioned countries and these are indicated in Table G1. All the values given are exterior noise levels at the receptor sites.

G1.3. Recommended Railway Noise Impact Criteria

The basic rationale behind the proposed railway noise impact criteria is one that will ensure the adequate protection of existing sensitive land uses. At the same time these criteria should be of a nature that will not detract from stimulating a complementary land use change along and within the area of influence of the railway corridors.

These criteria are focussed directly on the land use component and thus only indirectly on the train, track and infrastructure technical specifications, and the operational specifications. Noise emissions from the train will however need to be of an appropriately low value to meet the land use noise impact criteria either directly or by means of the implementation of appropriate attenuation measures in the intervening ground between track and noise sensitive receptor sites.

TABLE G1: RAILWAY NOISE IMPACT CRITERIA

COUNTRY	PERIOD (T)	L_{Amax} (dBA)	$L_{Aeq,T}$ (dBA)
Australia	06h00 – 06h00	85	60
Austria	06h00 – 22h00 22h00 – 06h00		60 50
Denmark	06h00 – 06h00	88	60
France	06h00 – 22h00 22h00 – 06h00		60 55
Germany	06h00 – 22h00 22h00 – 06h00		59 49
Hong Kong	07h00 – 23h00 23h00 – 07h00		65 - 70 55 - 60
Italy	06h00 – 22h00 22h00 – 06h00		55 45
Japan	07h00 – 22h00 22h00 – 07h00	70 70	60 55
Netherlands	07h00 – 19h00 19h00 – 23h00 23h00 – 07h00	73 73 73	55 (60) 50 45 (50)
Norway	06h00 – 06h00		60
South Korea	06h00 – 22h00 22h00 – 06h00		65 55
Sweden	06h00 – 06h00		63
Switzerland	06h00 – 22h00 22h00 – 06h00		55 – 60 45 – 50
UK	06h00 – 24h00 24h00 – 06h00	85 85	68 63
USA	1hr 06h00 – 06h00		67 55 (L_{dn})

The following maximum sound pressure levels are therefore proposed as the railway noise impact criteria for the defined noise sensitive land uses along the project corridors with the railway reserve boundary (that is at the interface between the reserve and the first row of impacted properties) as reference control point:

Period of Day (T)	$L_{Aeq,T}$ (dBA)	L_{Amax} (dBA)
• 06h00 – 22h00 (daytime/evening):	60	85
• 22h00 – 06h00 (night-time):	50	85

The defined noise sensitive areas are:

i) Outdoor noise sensitive areas:
- Parks.
- Historic sites used for interpretation.
- Amphitheatres.
- Recreation areas.
- Playgrounds.
- Cemeteries.

ii) Residences:
- Single family residences.
- Multifamily residences (apartment buildings, simplex and duplex housing complexes).

iii) Indoor noise sensitive areas:
- Places of worship.
- Educational facilities (schools, universities, technicons, other places of instruction).
- Creches.
- Hospitals/hospices.
- Concert halls/auditoriums/theatres.
- Libraries.
- Recording/broadcast studios.
- Museums and specific historic buildings.
- Hotels/motels/B&B establishments.

G2. ASSESSMENT CRITERIA FOR GROUND-BORNE (RE-RADIATED) NOISE IMPACT

Ground–borne noise is a direct result of ground-borne vibration. The ground-borne noise impact criteria used in the USA are as indicated in Table G2.

TABLE G2: GROUND-BORNE NOISE IMPACT CRITERIA

Land Use Type/ Type of Building or Room	Ground-borne Noise Impact Level (dBA)	
	Frequent Events	Infrequent Events
Residences and buildings where people normally sleep	35	43
Institutional land uses with primarily a daytime use	40	48
Buildings where vibration could interfere with interior operations	N/A[(a)]	N/A[(a)]
Concert halls	25	25
TV and recording studios	25	25
Auditoriums	30	38
Theatres	35	43

Notes:

i) *Frequent Events* is defined as more than 70 vibration events per day.
ii) *Infrequent Events* is defined as fewer than 70 vibration events per day.
iii) (a) Vibration-sensitive equipment is not sensitive to ground-borne noise.

The reason why the limits for ground-borne noise impact criteria are set at lower (more stringent) levels than those for the airborne noise is that, in using the A-weighted sound level (the only effective descriptor of community noise assessment), sounds dominated by low frequency components (as is typical of ground-borne noise) are perceived to be louder than broadband sounds that have the same A-weighted level.

B5. GUIDELINE ASSESSMENT CRITERIA FOR CONSTRUCTION NOISE IMPACT

Construction sites have special characteristics compared with other major noise generators. Construction is in the open, is usually of a temporary duration, and the noise is produced by several different types of noise source. Noise levels created by operating construction equipment can vary greatly and depend on factors such as type of equipment, the specific model, the operation being performed, and the condition of the equipment. The equivalent sound level of the construction activity also depends on the fraction of time that the equipment is operated over the time period of construction. Construction equipment operates in two modes, namely stationary and mobile. Stationary equipment operates in one place for one or more days at a time, with either fixed power operation (pumps, generators, compressors) or a variable noise operation (pile drivers, pavement breakers). For these, noise is assumed to emanate from a single point of operation. Mobile

equipment moves around the construction site with power applied in a cyclic fashion (bulldozers, loaders), or to and from the site (trucks).

Besides having daily variations in activities, major construction is accomplished in several different phases with each phase having a specific equipment mix dependant on the work to be accomplished during that phase.

There are no standardised criteria for assessing construction noise impact and consequently such criteria must be determined on a project specific basis. Once construction methods for the project are finally identified, the situation to limit the noise impact will need to be reviewed. The project construction noise criteria should take into account the existing noise environment, the absolute noise levels during construction activities, and the adjacent land use. The following provide guidelines as to the criteria that practically should be considered for this project.

In the USA, the criteria that are suggested as the basis of assessment of construction noise impact are given in Table G3 (General Assessment Criteria) and Table G4 (Detailed Assessment Criteria).

TABLE G3: CRITERIA FOR GENERAL ASSESSMENT OF CONSTRUCTION NOISE

Land Use	**One-hour L_{Aeq}(dBA)**	
	Day	**Night**
Residential	90	80
Commercial	100	100
Industrial	100	100
Note: Estimate of combined noise level of the 2 noisiest items of plant on site operating at the same time over 1-hour period.		

TABLE G4: CRITERIA FOR DETAILED ASSESSMENT OF CONSTRUCTION NOISE

Land Use	**8-hour L_{Aeq}(dBA)**		**L_{dn}(dBA)**
	Day	**Night**	**30-day Av**
Residential	80	70	75 [(a)]
Commercial	85	85	80 [(b)]
Industrial	90	90	85 [(b)]
Notes: (a). In urban areas with very high ambient noise levels (L_{dn}> 65dB), L_{dn} from construction noise should not exceed existing ambient by +10dB. (b). 24-hour L_{Aeq} not L_{dn}.			

The following are recommended:

i) The USA criteria should be used as guidelines for assessing impact.

ii) Specific noise sensitive land uses will need to be taken into account in the construction programme.

iii) Construction times on surface in general should for noisy activities be limited to the hours between 06h30 and 20h00 on weekdays and between 07h00 and 14h00 on Saturdays. No noisy construction work should be allowed in noise sensitive areas on Sundays. Quiet construction activities would be allowed at all times.

iv) Night-time construction may be allowed in areas where impact is limited.

v) The effect of the selected tunnelling construction method on the noise climate should be adequately assessed before allowing construction activities outside the hours indicated for surface construction.