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Environmental Noise Report

Proposed Ingula Bridge

Preliminary Report

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EXECUTIVE SUMMARY

A replacement higher level bridge is proposed on an existing dirt road over a flood channel to increase the peak capacity of that flood channel. The investigation's purpose was to assess the impact of the construction of the new bridge on the existing ambient noise climate of the area, which is primarily rural with sparse settlement. It is noted that there is not expected to be a significant change in traffic volumes after construction and that the road will remain unsurfaced. All calculations and predictions were carried out in accordance with the relevant SANS Standard Codes of Practice (Refs. 1 & 2), and as required by the regulations of the DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM.

The expected response from the community to the noise impact, i.e. the change in ambient noise of the area, is based on the relevant SANS document, (Ref. 1), and expressed in terms of the effects of impact, on a scale of 'NONE' to 'VERY HIGH'. This report is an overall assessment designed to predict the collective response of a noise-exposed population and therefore the impact the change in ambient noise is likely to have on them, and is based on measured and/or predicted equivalent continuous noise levels according to the relevant SANS code of practice, (Ref. 1).

The long term impact on the existing noise climate of the proposed alterations is generally assessed as NONE at the nearest settlement, which is visible in the photographs defining measurement position 1. During the construction process, because of the unpredictability of noisy activity, the noise impacts are generally classed as MODERATE during the short period of construction (worst case), depending on the noise profiles and operating procedures of the actual equipment used and placement of equipment and any temporary roads/bridges in relation to sensitive areas and buildings, of which there are very few affected.

Any increase in noise levels caused by the new bridge, either during operation or construction, is not considered high enough to require specific noise mitigation measures at the very few affected dwellings.

1. PURPOSE OF THE INVESTIGATION AND TERMS OF REFERENCE

A replacement higher level bridge is proposed on an existing dirt road over a flood channel in order to increase the peak capacity of that flood channel The investigation's purpose was to assess the impact of the construction of the new bridge on the existing ambient noise climate of the area, which is primarily rural with sparse settlement. It is noted that there is not expected to be a significant change in traffic volumes after construction and that the road will remain unsurfaced.

The expected response from the community to the noise impact, i.e. the change in ambient noise of the area, is based on the relevant SANS document, (Ref. 1), and expressed in terms of the effects of impact, on a scale of 'NONE' to 'VERY HIGH'.

2. INVESTIGATIVE METHODOLOGY

2.1 Introduction

The investigation's purpose was to assess the impact of the construction of a replacement bridge on an existing dirt road over a flood channel on the existing ambient noise climate of the area, which is primarily rural with very sparse settlement.

Noise measurements were made on site to confirm the baseline noise levels in the area and typical noise levels for this type of construction was compared with it.

The expected response from the community to the noise impact, i.e. the change in ambient noise of the area taking into account sociological factors as well as the noise climate, is based on the relevant SANS document, (Ref. 1), expressed in terms of the effects of impact, on a scale of 'NONE' to 'VERY HIGH'.

2.2 Ambient Noise Levels at the Proposed Site

Confirmatory measurements of the existing ambient noise levels were made on Tuesday 8 July 2008 to compare with the noise levels predicted from construction activity. Measurements were made of the equivalent continuous A-weighted sound pressure level, $\mathbf{L_{Aeq,I}}$ using the 'I' (Impulse) dynamic response characteristic as recommended in SANS 10103:2008 (ref. 1) and a number of other parameters, of which the $\mathbf{L_{90}}$ is reported as the generally accepted parameter for describing the background noise level in the absence of intrusive noise.

2.3 Assessing The Noise Impact

The recommended noise levels in residential areas are described in Table 2 of SANS 10103 (ref. 1), and Table 5 of the same document.

Type of district	Equivalent continuous rating level ($L_{Req.T}$) for noise dB(A)					
	Outdoors			Indoors, with open windows		
	Day-night $L_{R,dn}$ [1)]	Day-time $L_{Req,d}$ [2)]	Night-time $L_{Req,n}$ [2)]	Day-night $L_{R,dn}$ [1)]	Day-time $L_{Req,d}$ [2)]	Night-time $L_{Req,n}$ [2)]
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with						

one or more of the following: workshops, with business premises; and main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

Table 1: SANS 10103-2008 Table 2, Acceptable rating levels for noise in districts (Ref.1)

NB: Day-time : 06:00 to 22:00, Night-time : 22:00 to 06:00

1	2	3
Excess D$L_{Req,T}$[a] dBA	**Estimated community/group response**	
	Category	**Description**
0 – 10	Little	Sporadic complaints
5 – 15	Medium	Widespread complaints
10 – 20	Strong	Threats of community/group action
>15	Very strong	Vigorous community/group action

a $L_{Req,T}$ should be calculated from the appropriate of the following:

1))$L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS $L_{Req,T}$ of the residual noise (determined in the absence of the specific noise under investigation).
2))$L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the maximum rating level for the ambient noise given in table 1.
3))$L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the acceptable rating level for the applicable district as determined from table 2.
4) $\Delta L_{Req,T}$ = Expected increase in $L_{Req,T}$ of ambient noise in an area because of a proposed development under investigation.

NOTE Overlapping ranges for the excess values are given because a spread in the community reaction may be anticipated

Table2: SANS 10103-2008 Table 5 – Categories of Community/Group Response

The expected response from the local community to the noise impact, i.e. the exceedance of the noise over the acceptable rating level for the appropriate district, is primarily based on Table 5 of SANS 10103 (ref. 1), but expressed in terms of the effects of impact, on a scale of 'none' to 'very high'.

INCREASE dB	RESPONSE INTENSITY	REMARKS	NOISE IMPACT
0	None	Change not discernible by a person	None
3	None to little	Change just discernible	Very low
3 ≤ 5	Little	Change easily discernible	Low
5 ≤ 7	Little	Sporadic complaints	Moderate
7	Little	Defined by National Noise Regulations as being 'disturbing'	Moderate
7 ≤ 10	Little to medium	Sporadic complaints	High
10 ≤ 15	Medium	Change of 10dB perceived as 'twice as	Very high

		loud' leading to widespread complaints	
15 ≤ 20	Strong	Threats of community/group action	Very high

Table 3: Response intensity and noise impact for increases over the ambient noise

3. AMBIENT NOISE MEASUREMENTS AT THE SITE

3.1 Introduction

Ambient noise measurements according to SANS Code of Practice 10103:2008 (Ref. 1) were carried out at two positions, the first at the bridge site, and the second on the same dirt road remote from the bridge site and the settlement. This point best represents the noise situation in the general rural area affected and agrees well with the recommendations of SANS 10103 for rural areas. These points are defined in Section 3.5.

3.2 Equipment Used:

01dB Type SdB01+ Precision Integrating Sound Level Meter, serial number 10180, fitted with 01dB Microphone Type MCE210, serial number 11474, and windscreen. Field calibration using and 01dB Type CAL01 Sound Level Calibrator, serial number 990640.

3.3 Calibration Certificates:

All equipment with valid calibration certificates, from the testing laboratories of De Beer Calibration Services. The calibration certificates are available for viewing if required.

3.4 Procedures Used:

Measurements were carried out in accordance with SOUTH AFRICAN NATIONAL STANDARD - Code of practice, SANS 10103:2008, *The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication.*

and as required by the regulations of the DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM. NO. R. 154. *Noise Control Regulations in Terms of Section 25 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989).* Govt. Gaz. No. 13717, 10 January 1992, i.e. Gauteng province, Department of Agriculture, Conservation and Environment, Notice 5479 of 1999. *Noise control regulations, 1999*, Provincial gazette extraordinary, 20 august 1999.

3.5 Measurements at the Proposed Bridge Site

Measurements were carried out at two locations, at the bridge site itself, and further along the dirt road and remote from the settlement and existing bridge, as described in detail under each noise measurement location below. These locations were chosen for the following reasons:

1) Easily definable and with easy future access in case of need for comparison measurements after completion of the project.
2) At different distances from the existing settlement for representative coverage.

Note 1: All noise levels in this report are A-weighted noise levels expressed in dB(A).

Note 2: $\mathbf{L_{Aeq,I}}$ is the A-weighted equivalent sound level using the 'I' (Impulse) dynamic response characteristic as recommended in SANS 10103:2008 (ref. 1)

Note 3: The noise level exceeded for 90% of the time ($\mathbf{L_{90}}$) is taken as an expression of the background noise in the absence of intrusive noisy events, primarily road traffic and random domestic noise events.

Note 4: In the Comments column of the noise tables, C - Car, Minibus or LDV, HGV – Heavy Goods Vehicle or Bus, A/c – Commercial airliner, La/c – light aircraft, H - Helicopter, c – noise level calculated from traffic count, for the measurement period (usually 10 Minutes)

Location 1:

Close to the existing bridge and settlement, and 5m from the centreline of the dirt road as shown in the following photographs. GPS Coordinates – S 28° 20.340', E 29° 35.435', altitude 1206 ±4.8m

View towards existing bridge and settlement

View over veld away from the settlement

Note: The proposed bridge will be very close to and upstream of the existing site.

Measurement Table

Date	Time	T °C	RH %	Wind	$L_{Aeq,I}$	L_{90}	Comments
Tue 08/07/08	10:55 - 11:09	22	10	<5	58.4	57	No traffic
Tue 08/07/08	11:10 - 11:20	22	10	<5	59.9	57	No traffic
Tue 08/07/08	11:22 - 11:36	22	10	<5	59.6	57	No traffic
Tue 08/07/08	11:37 - 11:47	22	10	<5	58.5	57	No traffic

Observations: These values are typical of a rural area with no road traffic, with the natural sounds of birds and insects, and at this position, running water in the stream dominating the $L_{Aeq,I}$ value during the day. In addition, noise from activities at the settlement, the nearest dwelling of which is approximately 120m from the measurement point, is clearly audible at this position. These values are generally higher than the SANS recommendations of Table 1 above for a rural area, due to the proximity of the settlement. The L_{90} (the sound level exceeded for 90% of the time, and usually taken as the background noise without intruding events such as bird calls) is due to continuously running water in the stream and is very repeatable at 57 dB(A) during the day.

Location 2:

The measurement position is 5m from the centreline of the dirt road and 20m from the road sign as shown in the following photographs. GPS Coordinates – S 28° 20.270', E 29° 35.502', altitude 1215 ±5.8m

View to the bridge and settlement

View across the associated unsettled veld

Measurement Table

Date	Time	T °C	RH %	Wind	$L_{Aeq,I}$	L_{90}	Comments
Tue 08/07/08	11:52 - 12:02	22	10	<5	46.4	40	No traffic
Tue 08/07/08	12:02 - 12:14	22	10	<5	49.2	33	No traffic
Tue 08/07/08	12:22 - 12:32	22	10	<5	50.9	41	No traffic
Tue 08/07/08	12:33 - 12:43	22	10	<5	47.0	39	No traffic

Observations: These values are typical of a rural area with no road traffic, with the natural sounds of birds and insects and the wind rustling the grass and foliage dominating the $L_{Aeq,I}$ value during the day. These values are generally slightly higher than the SANS recommendations of Table 1 above (45 dB(A)), and The L_{90} (the sound level exceeded for 90% of the time, and usually taken as the background noise without intruding events such as bird calls, vehicles) is somewhat variable, depending on the effect of varying wind strengths, at 33 to 41 dB(A) during the day.

4. IMPACT ASSESSMENT

4.1 General

The noise impact on the areas affected by the proposed bridge upgrade is entirely concentrated in the short construction period as there will be no change to the currently extremely low traffic volumes after the construction of the new bridge, and it will not be significantly closer to the nearest settlement. No other significant industrial or transportation noise sources could be found in the area other than occasional remote aircraft flyovers.

Based on a worst case scenario during the construction phase, of continuously operating machinery, which typically produces a $\mathbf{L_{Aeq,I}}$ of 70 dB(A) at 15m over a working day, (very unlikely to occur in practice), activities could potentially lead to a noise level at the nearest dwelling of 52dB. This increase in ambient noise level would be 7 dB at the nearest dwellings, an impact rated in the category MODERATE as stated in Table 3 above.

4.2 Continuous Equivalent Noise Levels And Individual Noise Events

This report is an overall assessment designed to predict the collective response of a noise-exposed population and therefore the impact the increased environmental noise is likely to have on them, and is based on measured and predicted equivalent continuous noise levels according to SANS 10103. It will be possible to detect and distinguish individual noise events, even if the noise impact is assessed as NONE, or VERY LOW, i.e. where a person with normal hearing will not be able to detect the predicted increase in ambient noise level over the acceptable rating value for the applicable district, or the actual measured pre-development noise level, but where an individual intrusive noise may nevertheless be audible to that person.

4.3. Predicted General Impact of Noise on The Community

Reference is made to the above table 2, (table 5 of SANS 10103-2003), criterion 4, and table 3 to determine the impact on the community of the increase in ambient noise level due to the construction of the bridge.

Construction Phase

Impacts are certain to be higher than for the operational phase, generally classed as MODERATE (7 dB increase in equivalent noise level in the worst cases) in the short term

during the construction process, depending on the equipment noise profiles of the actual equipment used and placement of temporary access roads, if any, and the extent of blasting.

Post-development Phase

There will be no change to the currently extremely low traffic volumes after the construction of the new bridge and there is no significant horizontal realignment which will bring it closer to the nearest settlement. The long term noise impact is therefore assessed as NONE.

4.4. Mitigation

4.4.1. Construction Noise Management and Mitigation Options:

To ensure that no impacts are reported, the following should be implemented:

Maintenance of equipment and operational procedures: Proper design and maintenance of silencers on diesel-powered equipment, systematic maintenance of all forms of equipment, training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events.

Placement of Plant and/or material stockpiles: Plant placement should be as remote as possible from noise-sensitive areas. Where possible, material stockpiles should be placed so as to protect noise-sensitive areas from noise from individual noisy operations or permanent plant.

Equipment noise audits: Standardised noise measurements should be obtained, or failing this carried out, on individual equipment at the delivery to site to construct a reference data-base and regular checks carried out to ensure that equipment is not deteriorating and to detect increases which could lead to increase in the noise impact over time and therefore to increased complaints.

Environmental noise monitoring: Should be carried out regularly to detect deviations from predicted noise levels and enable corrective measures to be taken where warranted.

Complaints Procedure: This should be implemented and complaints responded to.

Source	Remedial measures
Mobile equipment noise	Fit efficient silencers and enclose engine compartments Damp mechanical vibrations Use quiet procedures if available, i.e during pavement breaking Ensure adherence to operational procedures that reduce the occurrence and

Source	Remedial measures
	magnitude of individual noisy events
Fixed plant noise	Reduce noise at source, damping and acoustic treatment, etc. Isolate source by enclosure in acoustic building, room, etc. Carefully select fixed plant site remote from sensitive areas Use material stockpiles or temporary screens at sensitive areas

Table 4. Noise and vibration sources associated with roadmaking operations, and the possible remedial measures

5. REFERENCES

1. SOUTH AFRICAN NATIONAL STANDARD - Code of practice, SANS 10103:2008, *The measurement and rating of environ-mental noise with respect to land use, health, annoyance and to speech communication.*
2. SOUTH AFRICAN STANDARD - Code of practice, SABS 10210:2004, *Calculating and predicting road traffic noise.*
3. SOUTH AFRICAN STANDARD - Code of practice, SABS 10328:2008, *Methods for environmental nose impact assessments.*
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