

ISCOR VANDERBIJLPARK STEEL

ENVIRONMENTAL MASTER PLAN

SPECIALIST REPORT

ESTIMATION OF THE PRESENT AMBIENT NOISE CLIMATE ON THE BORDER OF ISCOR VANDERBIJLPARK STEEL

BY FRANCOIS MALHERBE

SERIES IV DOCUMENT IVS/SR/038 DECEMBER 2002



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Jasper Müller Associates Consulting Scientists in Geohydrology Tel: (013) 665 1788



Moolmans ATTORNEYS Tel: (011) 483-3704

FRANCOIS MARAIS & ASSOCIATES

Tel: (012) 993-5886

Consulting Engineers • Raadgewonde Ingenieurs



JUE A

KEN SMITH ENVIRONMENTALISTS CC Tel: (017) 82 61434 / 27

dviseurs / Environmental Advisors

ENPRO



RICHARD PAXTON **ASSOCIATES LIMITED** Tel: 0944-1543 250939

ESTIMATION OF THE PRESENT AMBIENT NOISE CLIMATE ON THE BORDER OF ISCOR VANDERBIJLPARK March 2002 Report No 01/7/3

F le R Malherbe Pr Eng

FM AC

> Tel: +27 12 803 0548 Fax: +27 12 803 8736 Cell: +27 82 469 8063 Email: <u>malherf@mweb.co.za</u>

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ESTIMATION OF THE PRESENT AMBIENT NOISE CLIMATE ON THE BORDER OF ISCOR VANDERBIJLPARK

1. PURPOSE OF THE INVESTIGATION

To provide the client with a reliable estimate of the typical ambient noise climate on the border of the ISCOR plant in Vanderbijlpark.

2. METHOD OF THE INVESTIGATION

2.1 GENERAL INTRODUCTION

The very nature of the heavy industrial activities at Iscor Vanderbijlpark imply that it must be one of the major noise sources in the area. At present the main manufacturing activities of Iscor are along southern and eastern borders of the property. On the western border activities can be associated with the transport and disposal of waste products. In the northern half of the property the are at present few or no industrial activities.

A number of measurement points were selected on or near the border of the lscor property in Vanderbijlpark. At each of these points the ambient noise level was sampled at representative parts of a 24 hour period. Together with the subjective impressions gained during the measurements, an estimate of the present ambient noise climate on the border of the lscor property was gained.

2.2 SAMPLING PROCEDURE

The ambient noise level at each measurement point was estimated using a sampling method. The duration of each sample was long enough to ensure that a noise level representative of the ambient noise climate at the point was obtained. The Gauteng Noise Regulations¹ specify that a measurement must a minimum duration of 10 minutes. For this investigation the measurement duration was a minimum of 15 minutes per sample.

Samples were taken during the day (06:00 to 18:00), evening (18:00 to 24:00) and night (00:00 to 06:00), in accordance with the definitions provided in SABS 0103². It must be noted that there were some points were the taking of measurements was deemed to be extremely hazardous during the evening and night. At these points measurement samples were only taken during the day.

During the measurements notes were taken of the subjective impression of the reigning noise climate at each point. Of particular interest was the perceived major sources of noise contributing to the present ambient noise levels.

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2.3 MEASUREMENT POINTS

A total of 11 measurement points were selected on the criterion that they be representative of the bordering areas. At present the higher density residential areas are concentrated along the south-eastern corner of the Iscor property. Since the main industrial Iscor activities lie in the south, it was evident that the measurements should be concentrated in this area. The following measurement points were selected:

- <u>Measurement Point 1:</u> On the lawn at the turn-off to the Iscor main entrance, next to Delfos Road.
- <u>Measurement Point 2:</u> Next to the entrance of the Iscor Draughting Office and the Air Products plant.
- <u>Measurement Point 3:</u> In the open area east of the second southern Iscor entrance, approximately 100 m from Delfos Road.
- <u>Measurement Point 4:</u> Next to the railway line, approximately 100 m from the edge of Delfos Road.
- <u>Measurement Point 5:</u> On the curb side of Delfos Road, approximately 500 m from the T-junction with
- <u>Measurement Point 6:</u> Next to the municipal driver training area and the road leading to Boipatong.
- <u>Measurement Point 7:</u> On the lawn in front of a depot, approximately 200 m from the south-east Iscor entrance.
- <u>Measurement Point 8:</u> Approximately one kilometre east of measurement point 7 next to the road side.
- <u>Measurement Point 9:</u> Next to the parking area near the eastern Iscor entrance.
- <u>Measurement Point 10:</u> Next to the northern access road to Iscor, approximately 200 m from the R54.
- Measurement Point 11: Next to the western Iscor border and the R553.

A sketch indicating the location of the measurement points is given in Appendix A to this report.

2.4 MEASUREMENT METHOD

All the measurements were carried out in accordance with the procedures described in SABS 0103².

2.5 FREQUENCY SPECTRA

During each of the measurement samples the third octave frequency spectrum of the ambient noise level at a given point was measured. The purpose of these measurements was to correlate subjective impressions of the ambient noise character with actual measurements, and to provide a reference base for future measurements.

2.6 MEASUREMENT INSTRUMENTATION

A list of the measurement instrumentation is given in Appendix A to this report.



3. APPLICABLE LEGISLATION

The criterion against which a noise impact is measured, is whether the intruding noise causes the ambient noise level to rise above the noise zone noise level allocated to the area by the local authority, as stipulated by the Gauteng Noise Regulations published under the Environmental Conservation Act in 1999. If a noise zone level has not been allocated, the typical ambient noise levels for different types of residential areas listed in Table 2 of SABS 0103² may be used instead.

For *Industrial Districts* the typical ambient noise levels are specified as 70 dBA, 65 dBA and 60 dBA during respectively the day (06:00 to 18:00), the evening (18:00 to 24:00) and night (00:00 to 06:00). As far as could be ascertained, noise zones have not been allocated to the area surrounding the Iscor plant in Vanderbijlpark. Therefore, the consultant is of the opinion that the typical ambient noise levels for *Industrial Districts*, as defined in SABS 0103², should be accepted as reference for noise measurements on the border of the Iscor property.

It should be noted that the Noise Regulations are currently under revision and are very likely to be amended in the near future. The most dramatic change will be the dropping of the concept of a 'noise control zone', instead referring directly to SABS 0103². The amended regulations will define a 'disturbing noise' as a noise level that exceeds the typical ambient noise levels in neighbourhoods given in Table 2 of SABS 0103². This provides a subtle difference to the present Gauteng Noise Regulations¹ since, in effect, it allows a 3 dB increase in the existing ambient noise levels in contrast to no increase at all.

4. **RESULTS**

4.1 MEASURED NOISE LEVELS

The ambient measurement results are summarised in Table 3.1 and Figure 3.1.

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Measure point	Period	Time	L _{Aeq,I} DBA	Weather	Remarks	
	Day	14:25	64,0	Sunny, wind still	Traffic on Delfos Road, many heavy vehicles. Air products plant is main source of noise, high pitched noise component. Iscor not discernible	
1	Evening	20:00	66,5	Cool, wind still	Airpoducts main source of noise, high pitched noise. Delfos Road is less busy, less heavy vehicles.	
	Night	23:00	66,8	Cool, wind still	Little traffic on Delfos Road. Airpoducts dominant source of noise. Hooters of Iscor locomotives. Industry to the S also audible (release of pressurised air).	
	Day	15:10	62,2	Sunny, light wind	Traffic on Delfos Road. Arc furnaces clearly audible, with a definite tonal component. Sirens every now and then. Low frequency noise.	
2	Evening	20:25	65,7	Cool, wind still	Traffic on Delfos Road. Arc furnaces clearly audible, dominant noise source. Heavy vehicles on Iscor premises, loading and dumping noises, Air products plant faintly audible.	
	Night	23:20	62,9	Cool, wind still	arc furnaces are dominant. Hissing noises caused by dowsing of molten material cloby. Locomotive hooters. Airpoducts plant faintly audible.	
	Day	15:45	66,1	Sunny, light wind	Traffic on Delfos road. Arc furnaces audible. Cooling fans opposite measurement position audible. Taxis arriving and departing.	
3	Evening	21:0 <mark>0</mark>	60,3	Cool, wind still	Traffic on Delfos Road fairly busy, heavy vehicles. General broadband noise. Heavy vehicles from and to Multi Serve.	
	Night	23:40	60,0	Cool, wind still	Less traffic on road. Other noises as before. Crane handling iron at Multi Serve clearly audible.	
	Day	16:05	58,1	Sunny, light wind	Traffic on Delfos Road dominates. Hooters of locos. Cranes dropping material with thuds. Diesel engine vehicles from and to dumps.	
4	Evening	21:20	57,8	Cool, wind still	Thudding noises from cranes dropping material. Iscor broadband noise with slight tonality (approx. 400 Hz), probably rotating machinery. Traffic on road still busy. Dogs barking.	
	Night	0:05	55,5	Cool, wind still	As before, only less traffic on road. Reversing hooters clearly audible (approx. 1 kHz).	
	Day	10:55	67,4	Warm, light NW wind	Handling of scrap metal at Steelserve, falling of material. Trains and their hooters. Diesel trucks to and from dump. Reversing siren of bulldozer on dump. Little else of Iscor audible. Traffic on Delfos Blvd dominates noise level.	
5	Evening	-	(55,0)	-	Assumed noise level on the basis of reduced traffic during the evening.	
	Night	0:50	54,6	Cool, no wind	Diesel Trucks to and from dump. Reversing hooters on dump. Broadband noise from Iscor. Bulldozer operating on dump.	
6	Day	11:15	55,5	Warm, light NW wind	Traffic on main road dominates noise levels. Noise caused by falling material at scrap metal plant. Trains and hooters. Heavy vehicles. Sirens	
0	Evening	-	(50,0)	-	Too hazardous to measure after dark!	
	Night	-	(50,0)	-	Assumed noise levels on the basis of reduced traffic during the evening.	
	Day	11:55	54,0	Warm, little wind	Diesel locomotives and their hooters are the main source of noise. Occasional traffic on lscor access road.	
7	Evening	23:05	67,5	Cool, no wind	Diesel locomotives and trains very noisy, hooters - by far most dominant noise source (without trains 55,4 dBA)	
	Night	1:20	51,0	Cool, no wind	Broadband noise from Iscor. Hooters of locomotives Reverse alarms of vehicles and diesel engine noise	
	Day	13:15	52,6	Warm, little wind	Shunting noise of trains. General broadband noise. Noise with an audible tonality to the north.	
8	Evening	23:30	53,1	Cool no wind	Shunting noise of trains. General broadband noise. Noise with an audible tonality to the north.	
	Night	-	(53,0)	-	Assumed noise levels on basis of a very constant noise climate.	
	Day	12:25	49,4	Warm, light wind	Broadband noise. Hooters of locomotives.	
9	Evening	22:05	48,1	Mild, light wind	Can hear plant, but quite faint. Main road is busy and audible.	
	Night	1:35	46,9	Cool, no wind	Broadband noise. Diesel engine vehicles on Iscor premises.	
10	Day	12:50	47,1	Warm, light wind	Natural sounds. Some contribution of traffic on R54.	
	Evening	22:40	57,7	Mild, light wind	Traffic on main road is dominant source of noise. Community noise and music in quiet periods. Iscor plant is inaudible. Natural sounds, especially crickets.	

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TABLE 3.1 Summary of the measured ambient noise levels.

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		Night	-	(50,	0)	-	Assumed noise level on basis of constant noise contribution from the R54.
11	Day	16:50	55,5 ⁺	71,3	Sunny, light wind	Traffic on R553 totally dominates noise levels. Loud explosive noises from arc furnace building. Iscor noise cause by arc furnaces, rolling plant, locomotives and hooters. General broadband noise.	
	Evening	21:50	55,3 ⁺	67,1 *	Cool, wind still	Less traffic on R553, but still dominating. Rest as before, but with some tonality caused by rotating machines.	
		Night	0:05	56,8 ⁺	59,7 *	Cool, wind still	As before, only little traffic on R553.

Note: ⁺ Measured noise levels exclude traffic noise from R553 * Measured noise levels include traffic noise from R553 () Noise levels in brackets indicate assumed noise levels



Figure 3.1: Noise levels measured during the day (D), evening (E) and night (N) at the different measurement positions. For MP11 the higher levels are measurement results that include the noise contribution from traffic on the R553.

4.2 MEASURED FREQUENCY SPECTRA

The measured frequency spectra of ambient noise levels at the measurement points are given in Appendix B to this report.

5. DISCUSSION OF THE RESULTS

5.1 MEASUREMENT POINT 1

The results indicate that the ambient noise level at this point remains very constant around approximately 65 dBA. This is due to the constant noise contribution of the Airpoducts plant, and to a lesser extent the traffic on Delfos Boulevard. Although the measured noise levels meet the criterion of typical *Industrial Districts*² during the day and evening, the typical ambient noise level during the night, i.e. 60 dBA, is exceeded by approximately 5 dB. However, there is a considerable buffer between this measurement point and the nearest residential area to the south. This buffer also contains industrial premises which were at times audible during the night. It is the opinion of the consultant that the present ambient noise levels at this point do not present a problem.

The measured frequency spectra (see Figure B-1, Appendix B) exhibit a pronounced peak in the third octave band of 1 250 Hz. This confirms the high pitched noise component perceived during the ambient noise measurements.

5.2 MEASUREMENT POINT 2

The results indicate that the ambient noise level also remains very constant around approximately 63 dBA. Although the Air products plant is audible, the major noise contributions are from Delfos Boulevard and Iscor. The dominant Iscor noise source is the arc furnace plant, which provides a constant noise contribution with a high low frequency energy content, and a definite tonal component that can be associated with the electric furnaces. Other Iscor noise sources are of a single event nature, e.g. the passing of heavy vehicles and blowing of sirens.

As far as the criterion of typical *Industrial Districts*² is concerned, the remarks made under section 5.1 for point 1 are also applicable here.

The measured frequency spectra (see Figure B-2, Appendix B) confirm the large amount of low frequency energy. Although tonality was subjectively perceived during the day (see Table 3.1), the spectra during the day and evening show only a slight peak at 200 Hz.

5.3 MEASUREMENT POINT 3

As with the first two measurement points the ambient noise level at point 3 also remains quite constant, although the sample taken during the day is approximately 6 dB higher than during the evening and night. This is probably due to fact of a significant number of taxis arriving and departing at the curb side of Delfos Boulevard during this period.

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Although traffic on Delfos Boulevard is a major noise source, the general broadband noise emissions from Iscor provide the dominant noise contribution. No tonality could be detected at this point, which is confirmed by the measured spectra (see Figure B-3, Appendix B). Single events included noise emissions from heavy vehicles and the handling of materials at the Steelserve plant.

The measured ambient noise level at this point conform to the *Industrial Districts*² criterion.

5.4 MEASUREMENT POINT 4

At this point noise caused by traffic on Delfos Boulevard was perceived to be dominant. Noise emissions from Iscor were characterised by the occurrence of noisy single events, e.g. the handling of materials at Steelserve. The dropping of large and heavy quantities of material from a height by cranes particularly stood out. The measured frequency spectrum (see Figure B-4 b, Appendix B) indicates a peak in the third octave bands of 315 Hz and 400 Hz that can be associated with the tonality that was subjectively perceived. This tonality is typically generated by rotating machinery.

The measured ambient noise levels fall safely within the Industrial Districts² criterion.

5.5 MEASUREMENT POINT 5

The results indicate that the measured noise level is dominated by traffic on Delfos Boulevard. This can be concluded from the fact that the ambient noise level during the night, when there is very little road traffic, is very significantly lower than during the day.

Noise emissions from Iscor are characterised by noisy single events, such as the dropping of material from cranes, heavy diesel vehicles and earthmoving machinery and reversing hooters. During the night the noise also has a broadband character.

The slight peaks in the frequency spectra during the day and night (see Figure B-5, Appendix B), are probably caused by the audibility of reverse hooters (typically at approximately 1 kHz) and the impulsive noise caused by falling material.

The measured ambient noise levels fall safely within the *Industrial Districts*² criterion.

5.6 MEASUREMENT POINT 6

At this measurement point the ambient noise level is very much dominated by traffic on the main road. Noise emissions from Iscor are characterised by noisy single events, which include the noise generated by diesel locomotives and their hooters.

Although no measurement samples could be taken during the evening and night, the day-time measurement sample indicates clearly that the *Industrial Districts*² criterion is safely met.

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Confidential February 2002 Research for IVS The measured frequency spectrum (see Figure B-6, Appendix B) also is quite smooth, indicating the absence of a specific cause for concern in terms of noise emissions from lscor.

5.7 MEASUREMENT POINT 7

The measured noise level at this point largely depends on the amount and nature of activities in the lscor train marshalling yard, as indicated by the remarks made during the evening (see Table 3.1). Depending on these events the ambient noise level at this point could be well in excess of the *Industrial Districts*² criterion. However, it must be noted that this measurement point is quite close to the railway marshalling yard and that there is also a significant distance to the main road and the further lying residential area of Boipatong.

The difference between noise levels with and without marshalling yard activities is also evident in the measured frequency spectra (see Figure B-7, Appendix B). The spectrum for the evening (Figure B-7 b) indicates shows a marked increase in noise level and tonal components in the frequency range between approximately 315 Hz and 3 150 kHz, due to the shunting activities, impulsive noises and locomotive hooters. The frequency spectra of noise levels during the day and night, on the other hand, are very much smoother.

5.8 MEASUREMENT POINT 8

The measured noise levels at this point are very constant and significantly below the *Industrial Districts*² criterion. This main road is less audible due the screening provided by a group of buildings, and the point is also further removed from the marshalling yard.

The frequency spectra (see Figure B-8, Appendix B) are fairly smooth, although there is a peak at 1 250 Hz during the evening which may be associated with the tonality noted during the measurements.

5.9 MEASUREMENT POINT 9

At this point the measured noise levels are well below the *Industrial Districts*² criterion. The Iscor rolling plant can be heard, but only as a general broadband source. The plant itself is housed in buildings that appear to be fairly modern and well maintained. This may be a significant reason why the noise levels at this measurement point are relatively low, despite the proximity of the plant buildings.

The occurrence of noisy single events, such as locomotive hooters and diesel engine vehicles also form part of the ambient noise climate.

The frequency spectra (see Figure B-9, Appendix B) confirm the subjective observations made at this point.



5.10 MEASUREMENT POINT 10

The measured ambient noise levels at this point are well below the *Industrial Districts*² criterion, and are dominated by traffic noise on the R54, natural sounds caused by birds or crickets and community noise from the settlements to the north. At no stage could noise emissions from any Iscor activity be identified.

The frequency spectra (see Figure B-10, Appendix B) confirm the subjective observations made at this point.

5.11 MEASUREMENT POINT 11

The measurement results at this point indicate that the ambient noise levels are dominated by traffic on the R553. Without the traffic noise contribution the ambient noise level is very constant around 55 dBA, which is well below the *Industrial Districts*² criterion. The noise contribution from Iscor is broadband in nature, caused by the arc furnace plant, trains and locomotive hooters.

The frequency spectra (see Figure B-11, Appendix B) confirm the general broadband character of the ambient noise levels. Peaks during the evening and night are typically caused by single noise events, such as locomotives accelerating and sounding their hooters.

6. CONCLUSIONS

As may be expected the present ambient noise levels are highest along the southern border of Iscor. This is due to the fact that nearly all the heavy industrial activities are concentrated in the southern half of the Iscor property at Vanderbijlpark. However, other noise sources, such as traffic on Delfos Boulevard and other main roads, as well as other industrial plants also contribute significantly to the present ambient noise climate in the area. Further to the north ambient noise levels are very much dominated by factors other than noise emissions from Iscor.

In general it is only on the southern border that the *Industrial Districts*² criterion is exceeded during the evening and night. However, there is a significant buffer of land between the Iscor border and the nearest residential areas of Vanderbijlpark.

On the south-eastern border the residential area is much closer, and Iscor activities can be heard, but this are is quite a distance further from the heavy industrial activities, such as the arc furnace plant and other works. The noise contribution from Iscor is here characterised by the occurrence of noisy single events, such as the handling of materials and sounding of hooters.

The consultant is of the opinion that generally the *Industrial Districts*² criterion is at present met at the border of the Iscor property in Vanderbijlpark.

7. REFERENCES

In this report reference was made to the following documentation:

- (1) Noise Control Regulations published under the Environment Conservation Act, 1986 (Act No. 73 of 1989), Provincial Gazette Extraordinary, 20 August 1999.
- (2) Code of Practice SABS 0103:1994 (As amended in 1997) 'The measurement and rating of environmental noise with respect to annoyance and to speech communication'

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APPENDIX A

Measurement positions and equipment

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A-1 MEASUREMENT POSITIONS

The location of the measurement positions that were chosen for this investigation are illustrated in Figure A-1.



Figure A-1: Map illustrating the location of the measurement positions that were selected for the investigation.

A-2 MEASUREMENT INSTRUMENTATION

The measurement instrumentation complies with the accuracy requirements specified for a type 1 instrument in IEC 651 'Sound level meters', IEC 804 'Integrating-averaging sound level meters' and IEC 942 'Sound calibrators'.

Instrument	Туре	Serial	Date	SABS
		Number	calibrated	Calibration Certificate
Sound level meter	Rion NL-14	10130677	2001-06-27	7232.UV92A
Microphone	Rion UC-53	13496	2001-06-27	7232.UV92A
Octave band filter	Rion NX-04	10881059	2001-06-27	7232.UV92A
Sound analyser	Svantek 912 AE	2935	· · · · · · · · · · · · · · · · · · ·	
Microphone	GRASS 40AF	24135		
Sound level	Rion NC-73	11086877	2001-06-27	7232.UV92B
calibrator				

•	TABLE	A-2
Measurer	nent ins	trumentation

The calibration status of the instrumentation was checked before and after each set of measurements against a calibrated signal with a level of 94,0 dB at 1 kHz. In each case the instrument displayed a reading of within 1 dB of the calibrated value. A windshield supplied by the manufacturer of the instrument was used during all the measurements.

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APPENDIX B

Measured frequency spectra of ambient noise levels



B-1 MEASURED FREQUENCY SPECTRA OF AMBIENT NOISE LEVELS

The frequency spectra that were measured at the different measurement positions are given in Figures B-1 to B-11.



Figure B-1: Frequency spectra measured for point 1 during the a) day, b) evening and c) night.

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Figure B-2: Frequency spectra measured for point 2 during the a) day, b) evening and c) night.

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Figure B-5: Frequency spectra measured for point 5 during the a) day and b) evening.



Figure B-6: Frequency spectra measured for point 6 during the day.

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Figure B-8: Frequency spectra measured for point 8 during the a) day and b) evening.

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Figure B-10: Frequency spectra measured for point 10 during the a) day and b) evening.

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