**New Largo Colliery Project**  
Report G915-R2

**Environmental Impact Assessment**

**Noise Study**

**For: Anglo American Inyosi Coal**  
Revised: 05-Jul-2012

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**Declaration of independence**

I am a single proprietor, independent acoustic consulting engineer. I have no commercial interest in Anglo American Inyosi Coal, or the above-mentioned project.

A personal curriculum vitae in support of my qualifications, expertise and experience to undertake studies of this nature, is attached in Appendix B of this report.
Executive Summary

A: Study Approach

A1: Study Methodology

The acoustic specialist’s brief was to investigate the noise impact of the proposed New Largo Colliery development on the surrounding area and, where applicable, to consider the requirements and options for mitigation. Since the noise study is concerned with the potential impact of the mine on residents in the area, the noise baseline and impact assessments focused on existing and future conditions in the external surroundings, i.e. the area outside the boundaries of the mining zone.

The methodology, measurement procedures and criteria employed in the assessment of noise impact in this noise study are based on the following:

(1) Guidelines of SANS 10328 (Methods for environmental noise impact assessments).

(2) Principles and guidelines laid down in SANS 10103 (The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication).


The procedure followed in conducting the assessment involved the following tasks:

Scoping and baseline study

(a) Investigate the existing noise climate and carry out noise surveys to quantify typical baseline ambient levels in the surrounding area;

(b) Identify noise-sensitive areas which stand to be affected by the development;

(c) Identify sources of noise affecting the existing noise climate;

Predictive noise impact study

Carry out a study in which the expected specific impacts of the development are quantified and assessed by means of computer modeling of the emission and atmospheric propagation of noise expected to be generated by the main components of the project, i.e. the open-cast operations, the processing plant and road traffic on the section of the R545 national road earmarked for relocation.

Also assess the contributions of the New Largo Colliery project and of other developments in the area to the cumulative noise impact.
A2: Study Team and Qualifications

Noise Specialist: B G van Zyl, Acoustical Engineer
Practice: Acusolv

Qualifications

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Specialisation</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) BSc (Eng)</td>
<td></td>
<td>University of Pretoria</td>
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<td>(2) BSc (Eng) Hon</td>
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<td>University of Pretoria</td>
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<tr>
<td>(3) MSc (Eng) (Cum Laude)</td>
<td>Acoustics</td>
<td>University of Pretoria</td>
</tr>
<tr>
<td>(4) PhD (Eng)</td>
<td>Acoustics</td>
<td>University of Natal</td>
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Fellow of the South African Acoustics Institute

A3: Assumptions, Exclusions and Limitations

The assessment and findings of this report assume that the development will be implemented in accordance with the proposed locations, operating parameters and alternatives defined in the Scoping Report compiled by Synergistics Environmental Services (Pty) Ltd, the principal EIA agent, as well as specific design data provided by AAIC.

Noise predictions are not absolute. The validity of predictions is subject to natural variances in atmospheric conditions. It should be noted that even for a constant source of noise, the noise footprint and levels produced at large distances by any large source such as the proposed New Largo Colliery mining operation are variable and highly dependent on atmospheric conditions. Predictions of noise impacts and findings made in this report are based on modeling and assumptions that will result in worst-case noise impacts. Although the occurrence of such worst-case conditions is inevitable, it will not prevail at all times. In practice, actual noise levels and impacts will often be lower.

It is assumed and motivated that worst-case noise impact will occur at night. This will be valid if the mine operates 24 hours per day.

A4: Uncertainties and Knowledge Gaps

There are no notable uncertainties or knowledge gaps with respect to the noise assessments made in this study.

A5: Outstanding Issues

There are no outstanding noise assessment issues.
B: Description of Baseline Environment

The proposed New Largo Colliery development will be located in a district where the character of ambient noise is to some extent determined by industrialisation and economic activity which over time has resulted in an increase in the background ambient level. It should be noted that from the perspective of noise-sensitive recipients in area, the character of the noise environment has not been affected only by external factors such as industrial and mining activity. The character is also affected and the background ambient level elevated by noises produced by farming activity, which is the principle land-use activity exercised by noise-sensitive recipients in the area. It would therefore be improper in noise impact assessment to consider the baseline reference of the environment and the development target for new development as Rural in terms of SANS 10103 guidelines.

Although traffic volumes on the R545 are low, traffic on the total road infrastructure in conjunction with land-use activities collectively elevate the ambient level over most of the project area to about 5 dB above what is considered typical for a Rural Area in terms of SANS 10103 guidelines.

In terms of SANS 10103 guidelines (See Table 2.3) the area falls in the category between Rural and Urban, described as “Suburban – With little road traffic”. As such, for purposes of noise impact assessment in this study, typical ambient levels in the area are rated as 50 dBA (daytime) and 40 dBA night-time, respectively.

B1 Existing Impact Sources

Prior to commencement of the New Largo Colliery development, existing impact sources include the following:

- Scattered existing mining activities;
- Agricultural activities;
- Traffic noise from the general road network.

B2: Synthesis of Baseline / Existing Impacts

Sources of noise currently contributing to the ambient level

- General and small-scale mining activities scattered over the area which contribute to machinery, truck and road traffic noise;
- Agricultural activities where the main sources of audible noise are tractor diesel engines.
- Road traffic noise emanates from the N4 and N12 highways, the R545 provincial road, as well as from other secondary roads. The N4 and N12 highways have a significant effect on the ambient level within a zone of approximately 500 m from the road.

Traffic on the total road infrastructure in conjunction with land-use activities collectively contribute to elevate the ambient level over most of the project area to about 5 dB above what is considered typical for a Rural Area in terms of SANS 10103 guidelines.
Future sources of noise which will contribute to the background ambient level

- Kusile Power Station construction currently in progress and operations starting late 2014, ramping up over time to full production;

- Operation of the proposed Phola-Kusile Coal Conveyor (Conveyor construction noise will be negligible);

Proposed Phola-Kusile coal conveyor

AAIC is proposing to construct an overland conveyor system, the Phola-Kusile Overland Coal Conveyor, to transport coal from the Phola Coal Processing Plant to Eskom’s Kusile Power Station currently under construction. A noise study conducted by Acusolv found that along the proposed route, the conveyor is expected to have a significant noise impact footprint (45 dBA at night) extending to a distance of 450 m from the conveyor. Conveyor noise can be mitigated to reduce the footprint to 250 m. Hence, with or without mitigation, the noise impact of the Phola-Kusile Conveyor is localised with a small footprint.

Kusile Power Station

Kusile Power Station currently under construction, is located approximately 2 km west of the proposed New Largo Colliery plant. As such, it will occupy a large part of the area and will therefore reduce the size of the area to the west of New Largo Colliery that would otherwise have constituted a noise-sensitive target area for the proposed New Largo Colliery project. A noise study for Kusile Power Station has been conducted by Jongens Keet Associates. The report finds that the Kusile Power Station is expected to have a 45 dBA footprint within a radius of approximately 3 km.

Please Note:

It should be cautioned that the impacts of these components are all localised to the respective project areas and cannot simply be summed for the entire study area. In other words, Kusile Power Station only significantly elevates the ambient level in its own surroundings (3 km radius), with only a small physical overlap with the Phola-Kusile footprint and with the future New Largo Colliery project area. Phola-Kusile Conveyor only elevates the ambient level along a small zone (450 m unmitigated, 250 m mitigated) along the conveyor route. Over the largest part of the New Largo Colliery study area the power station and the conveyor will not overlap and will not contribute to a cumulative elevation of the background ambient noise level in the New Largo Colliery project or noise study area.
C: Impact Assessment

C1: Project Impacts

The main noise-generating processes and activities in the project will include the following:

**Phase 1 and Phase 2**

- The opencast mine pit
- Draglines removing overburden
- Excavation by shovels
- Loading on to trucks, haulage from pit to crushers and tipping of coal
- Crushing
- Conveyor noise
- Coal stockpile coal discharge and stockpile maintenance
- Traffic noise - access roads
- Truck noise on haul roads
- Truck and dozer noise on overburden stockpiles

**Phase 2 only**

- Operation of the coal processing plant

**Description of Project Impacts** - Base Case Mine Plan 6 (with north-eastern R545 route)

**Construction Phase**

**Phase 1**

**General construction noise**

Potential noise-generating construction activities in Phase 1 will include:

- Construction of access road
- Topsoil stripping prior to mining
- Dragline removing overburden

The dominant and the only audible source of noise in each of the above-mentioned activities will be the diesel engines of trucks, dozers, loaders and other earth-moving equipment. Buffered by the Kusile Power Station on the western side, general construction noise in Phase 1 will be insignificant and of no consequence.
Blasting

Drilling and blasting of overburden will occur during development of the box-cut and pit. Although it is likely to be clearly audible up to several kilometres away, it will be of short duration and is not expected to be a cause of regular or significant noise disturbance at residences on neighbouring farms and small-holdings.

Phase 2

General construction noise

Activities and equipment which can be expected to contribute to construction noise during Phase 2 are summarised as follows:

<table>
<thead>
<tr>
<th>Construction Activity</th>
<th>Sources of Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Power generation at construction site</td>
<td>Generator set – Diesel Engine</td>
</tr>
<tr>
<td>• Site preparation: Clearing, soil stripping</td>
<td>Bulldozer, loading, truck movement</td>
</tr>
<tr>
<td>• Blasting</td>
<td>Air blast noise</td>
</tr>
<tr>
<td>• Road works</td>
<td>Bulldozer, grader, compactor, trucks</td>
</tr>
<tr>
<td>• Building construction</td>
<td>Cutting, sawing, grinding, hammering</td>
</tr>
<tr>
<td>• Delivery – Equipment and materials</td>
<td>Trucks &amp; other vehicles on access road</td>
</tr>
</tbody>
</table>

Plant construction noise will be buffered by the Kusile Power Station on the western side. Since the intensity of noise will be relatively low and assuming that most of the work will take place during daytime, plant construction is not expected to have significant noise implications in the external surroundings.

R545 road construction

Road construction will involve the use of standard road building and earth-moving equipment, including dozers, loaders, trucks and compactors where the primary sources of noise are the diesel engines, rather than the work activities performed by the equipment. Considering that road construction by and large involves daytime operations only, noise from this activity, like tractor and vehicle noise in farming activities, is not expected to have a significant impact in the area.

Operational Phase

A  General mining noise

From a noise perspective, mining operations may be divided into a slowly moving (roaming) and a fixed group of noise generating equipment and activities, as follows:

Roaming operation

Within a short span of time (weeks or months) this group will be practically stationary, but will over the lifetime of the mine traverse at a very slow pace along strips in accordance with the mining plan. It comprises of:
- Draglines removing overburden
- Loading of overburden removed by draglines onto trucks
- Operation of bulldozers and other dragline support vehicles
- Opencast operations: drilling
- Opencast operations: excavation and loading by shovels on to trucks
- Tipping of backfill and movement of trucks on dumps located in the pit behind the pit operations
- Haulage from pit to crushers and tipping of coal

**Stationary operations**
- Crushing
- Coal stockpiling: coal discharge and stockpile maintenance
- Local conveyors
- Traffic noise on access roads
- Coal washing and water treatment
- Various workshops.

The significant noise impact footprint of the mine was investigated for various configurations of the moving group. Noise contours were calculated for night-time conditions and represent the total noise footprint of stationary and moving components combined. The practical consequences of general mining noise in Phase 1 may be summarised as follows:

**Stationary operation noise**
- The main sources of noise in the stationary operation will be the crushers, local conveyors, trucks on the haul road and tipping. Although stockpiling is also taken into account in the calculations, its contribution to the total is negligible. The same applies to night-time traffic on the access road.
- Within the 45 dBA contour where a significant impact is expected to occur, the main components of audible noise will be crushing, truck engines and tipping noises.
- The extent of the noise footprint is not a simple pattern and should be assessed by examination of the noise maps. The extent of the noise-sensitive area that stands to be affected by noise from New Largo Colliery is greatly reduced by its location in proximity of Kusile Power Station. As well as reducing the extent of the noise-sensitive surroundings for New Largo Colliery, it also serves as a spatial buffer (creating distance) and acts as a physical barrier between New Largo Colliery operations and the nearest noise-sensitive receptors to the west.

**Moving operation noise**
• When removal of overburden takes place near the perimeter of the total mining area, noise from this group will have a significant night-time impact up to a distance of 1.5 km from the operation. This will be the extent of the footprint in a direction down-wind from the source of noise. Statistically, during the course of any year, such down-wind conditions are likely to occur for recipients on any side of the mined area, more frequently so for recipients to the east, north and west of the mine.

• In the moving operation, the main contribution to the overall noise footprint comes from drilling, bulldozing, loading and from diesel engine noise of all supporting equipment. The dragline, despite its extraordinary size, produces less noise than the bulldozers, drills and other equipment. This is because the large electrical machines constituting the power plant of a dragline are fully enclosed in a plant room which provides a good degree of acoustic insulation. On the outside, noise emitted from the dragline comprises primarily of fan and airflow noise emanating from the air intakes and outlets of the cooling and ventilation system. The level of this noise is controlled by fan and outlet attenuators.

• The contribution to the total level by noise coming from most of the pit operations will be negligible. The reason is that, as the pit deepens, mining noise will be sharply attenuated by acoustic screening afforded by the pit walls. One exception is noise from truck movements and tipping at a high level on top of the dumps located inside the pit. For most of the time, however, such dumping activities will be located relatively far away from the perimeter of the mining area.

• When overburden operations are close to (less than 250 m) or at the mining boundary, residents located within the 45 dBA footprint (within approximately 1.5 km from the dragline) will under down-wind conditions at night be disturbed by noise from such operations. Most audible will be diesel engine, bulldozing and loading noises. Should drilling take place at night, it will contribute significantly to the overall noise level and to audible noise.

• There will be times when such residents will also hear bulldozing, truck movements, diesel engine and tipping noises coming from the top of waste dumps further away inside the pit. Another source of noise which should not be underestimated is reverse alarm and hooter noise. It is a common cause of noise complaints from residents near mines. It is difficult to quantify because it does not necessarily register as an increase in the measured ambient level, but is particularly audible and annoying due to its pure tone characteristics.

B Blast noise

Blasting will have a significant impact in the surroundings of the New Largo Colliery Project. A factor which has a strong influence on the level is the time of day (AM or PM) during which blasting takes place. Blasting during the afternoon will over large distances on average produce much lower noise levels.

C Traffic noise from Relocated Section of R545

The significant day-night impact footprint of the relocated section of the R545 is expected to extend approximately 250 m on either side of the road. This small footprint is due to two factors:

(a) The relatively low baseline traffic volumes on the R545;

(b) The small rate of New Largo Colliery project trip generation due to the fact that coal will be transported by conveyor rather than road transport.


**Decommission and Closure**

Noise in the decommissioning phase will be of a similar nature, but at a lower intensity and of shorter duration compared to noise in the construction phase. Decommissioning noise will be inaudible in noise-sensitive areas and the noise impact will be negligible.

**Description of Project Impacts - Alternative Mine Plan 7 (with north-eastern R545 route)**

Except for a slightly smaller footprint in the north-eastern corner of the mining area, the sources of noise as well as the noise impacts produced by implementation of Mine Plans 6 and 7 will be practically identical in the construction, operational and decommissioning phases.

Mine Plan 7 would still have a significant impact at the Rockblend business, should they remain at the current location. The only advantage that Mine Plan 7 would have over Mine Plan 6 is that the Nelson residence to the north-east of the mine will experience a much smaller noise impact.

Since the descriptions of the impacts for all the phases would otherwise be identical, it is not repeated here.
C3: Cumulative Impacts

Cumulative impact contribution of Kusile Power Station and Phola-Kusile Conveyor

The respective significant noise impact footprints of Kusile Power Station and the Phola-Kusile Conveyor will only overlap inside the boundaries of the Kusile and the New Largo Colliery sites where no people will be living in the future. Kusile Power Station will create a significant noise footprint with an approximate radius of 3 km around the power station, while the Phola Kusile conveyor will affect a 250 m strip either side of the conveyor route in a different area. In other words, each development will create its own sphere of influence adding to the size of the overall impacted area in the district, yet without the two impacts overlapping anywhere on the same noise-sensitive terrain. Nowhere will the impact experienced by any person living in the area be significantly elevated by both developments simultaneously.

Cumulative impact contribution of New Largo Colliery – Stationary operations

Interface of stationary New Largo Colliery operations with Kusile Power Station: As in the case of the Phola-Kusile Conveyor, the respective impacts of stationary operations in the proposed New Largo Colliery operation and that of Kusile Power Station will only overlap inside the boundaries of the Kusile and the New Largo Colliery sites. It will not overlap in areas where people will be living in the future. The cumulative impact of the two developments at noise-sensitive locations in the study area will be negligible.

Interface of stationary New Largo Colliery operations with Phola-Kusile Conveyor: A measureable cumulative impact by New Largo Colliery and the Phola-Kusile Conveyor can be expected where the conveyor route approaches the plant along the haul road to the south of the plant. The magnitude of the cumulative impact is not constant and will depend on the distances of houses from either of the two sources of noise. Any house which at the same time is located within 250 m from the conveyor and 2 km from the haul road will experience specific impacts of 5 dB from each component resulting in a cumulative impact of 8 dB (the energy-based sum of two equal noise levels is equal to the individual source level plus 3 dB).

Cumulative impact of New Largo Colliery – Roaming operations

Interface of New Largo Colliery roaming operations with Kusile Power Station: With the roaming component of the New Largo Colliery operation continually moving across a large area, the potential cumulative impact will vary over time. Nowhere will the respective impacts of New Largo Colliery opencast operations and Kusile Power Station overlap in areas where people will be living in the future.

Interface of New Largo Colliery roaming operations with Phola-Kusile Conveyor: A measureable cumulative impact by New Largo Colliery opencast operations and the Phola-Kusile Conveyor can be expected where the moving opencast operation approaches the conveyor route. The magnitude of the cumulative impact will depend on the distances of houses from either of the two sources of noise. Over most of the life-of-mine the cumulative impact will be negligible. Only when the opencast operation approaches the conveyor will any house located both within a distance of 250 m from the conveyor and 1,5 km from the haul road experience specific impacts of 5 dB from each component. This would then result in a cumulative impact of 8 or dB or more.

Cumulative impact of relocated R545

Relocation of a section of the R545 will not result in a significant cumulative impact. The reason is that the small significant noise footprint of the road, which only extends about 250 m
on either side of the road, will not overlap with that of the mining operation. The small road noise impact is due to two factors:

(a) The relatively low baseline traffic volumes on the R545;

(b) The small rate of New Largo Colliery project trip generation due to the fact that coal will be transported by conveyor rather than road transport.

Caution

It should be cautioned that the specific impacts of the various components are all localised to the respective project areas and cannot simply be summed and interpreted as a cumulative impact on the entire study area. Kusile Power Station only significantly elevates the ambient level in its own surroundings (3 km radius), with only a small physical overlap with the Phola-Kusile footprint and with the future New Largo Colliery project area. Phola-Kusile Conveyor only elevates the ambient level along a small zone (450 m unmitigated, 250 m mitigated) along the conveyor route. Over the largest part of the New Largo Colliery study area, the power station and the conveyor will not overlap and will not contribute to a cumulative elevation of the background ambient noise level in the noise study area. Moreover, what is not quantifiable, is that the implementation of the New Largo Colliery project will result in localised noise reductions and relief to the nearest residents due to cessation of some existing small-scale noise-generating mining operations scattered over the area.

By and large, the overall cumulative impact over the largest part of the study area will be the same as the specific impact of New Largo Colliery.

C3: Impacts of No-Go / Alternative Development

With the No-Go alternative the noise environment will be better off in the sense that a 1,5 km zone around the proposed mine will not be exposed to additional noise impact. Existing impacts of existing mining and agricultural activities and road traffic will remain.

D: Mitigation, Management and Monitoring Measures to be incorporated into the Environmental Management Programme

Construction Phase

Construction noise is not expected to be noticeable at noise-sensitive locations during daytime hours. Potential noise disturbance at night, should such a problem arise, can only be prevented if construction is restricted to daytime hours, i.e. by stopping all construction activities between 22:00 and 06:00.

Operational Phase

Stationary group (Plant noise)

Crusher noise should not be considered as uncontrollable. It can be reduced by partial enclosure and selective acoustic screening of units. The concept is explained and illustrated in the report. Noise screens comprise of removable acoustic panels mounted against a steel supporting framework which have to be designed for each particular case. The specific solution will depend on the specific plant size and configuration.
Reverse alarms and truck hooters

- The mine is advised to instruct drivers and fleet owners of trucks to use hooters in a disciplined manner for purposes of safety only, not for signalling or any other purpose. The mine should be very strict in enforcing this rule and should verify compliance.

- It should be considered to replace conventional beeping type reverse alarms (which produce a pure-tone or whistle) with buzzer types (which produce a hissing sound) on vehicles operating on the mine, waste rock dumps in particular. This measure will only be successful if implemented on all vehicles and if adherence by contractors is strictly enforced and monitored on a continual basis.

Haul road noise - Screening by means of waste rock dumps and berms

Construction of berms and placement of waste rock dumps along the full length of haul road routes can be an effective measure to screen off truck noise. The problem in practice, ironically, is that the trucks and bulldozers employed in the construction of such a noise barrier, for the duration of construction, generate more noise than what emanates from the noise source (haul road) which it is supposed to screen off. This is a common problem at opencast mines and lasts for as long as night-time construction of the berm continuous. This could take several months or longer.

For a berm to be effective as a noise screen, it has to be located close to the source of noise and be high and long enough to break the line-of-sight between source and receiver.

Moving group

Exposure of residents to noise from moving operations will on average be much shorter than the life of the mine. Notwithstanding, for those periods when noise-sensitive locations are within 1,5 km distance from the operation, a significant impact will be experienced. Measures that should be considered for noise reduction are:

- Temporary storage or placement of overburden and waste material on berms or dumps which can act as noise screens. For a berm to be effective as a noise screen, it has to be located close to the source of noise and be at least high and long enough to break the line-of-sight between the source of noise and the noise-sensitive receiver.

- Control of truck hooter and reverse alarm noise as explained above.

Decommissioning and Closure

Because of the acoustically buffered location of the plant, no mitigation will be required during the decommissioning and closure phases.
E: Conclusions and Key Findings

Over the largest part of the New Largo Colliery project study area, the overall cumulative impact of New Largo Colliery and other sources of existing and future noise will be the same as the specific impact of New Largo Colliery.

Although the proposed New Largo Colliery project will have significant noise impacts, it is important to note that the impacts will be localised and restricted to quantifiable zones around the haul roads, the mining area, as well as a small zone along the relocated R545 route. It is not the entire area around the mine that will be affected by noise from the development. Moreover, the impact of the roaming opencast operation, although it will over time cover the entire mining area, will only be located at one position at a time.

The plant and associated infrastructure which forms part of the stationary component of the project will only have a limited noise impact. A significant impact on a relatively small area is likely to result from the remainder of the stationary component comprising of the crushers and trucks on the haul road. Noise from moving operations comprising of opencast mining and removal of overburden, will have a significant impact up to a distance of 1.5 km for the duration of time when such operations are located near or at the boundary of the mining area. This impact will result primarily from noise generated by surface operations (removal of overburden), while the contribution of noise from pit operations, screened by the pit walls, will be negligible. A significant impact will result from blasting which will occur at frequent intervals throughout the construction and life of the mine. Measures which should be considered for mitigation of noise impacts are proposed.

Crusher noise which is the component of plant noise most likely to be disturbing in the area south of the plant can be mitigated. Haul road noise as well as mining noise produced by surface equipment at the opencast operation can be mitigated by placement of waste dumps to create noise berms.

F: Specialist Recommendations

Although the project is not expected to affect the largest part of the study area, where singular houses stand to be affected, the localised impacts of the main components should nevertheless be addressed. It is advised that the mine involve an acoustical engineer to work out specific design solutions for implementation of the noise reduction concepts outlined in this report.

From a noise point of view there are no fundamental objections for the development to be implemented and the project is deemed acceptable.

Ben van Zyl MSc (Eng) PhD
Acoustical Engineer
## Index

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Location and description of the proposed development</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Terms of reference and scope of work</td>
<td>2</td>
</tr>
<tr>
<td>1.3 Project overview - Subject of this noise study</td>
<td>4</td>
</tr>
<tr>
<td><strong>2 Methodology</strong></td>
<td></td>
</tr>
<tr>
<td>2.1 General</td>
<td>9</td>
</tr>
<tr>
<td>2.2 Baseline Study</td>
<td>9</td>
</tr>
<tr>
<td>2.2.1 Baseline field survey</td>
<td>9</td>
</tr>
<tr>
<td>2.2.2 Test Equipment</td>
<td>13</td>
</tr>
<tr>
<td>2.3 Predictive noise impact study</td>
<td>14</td>
</tr>
<tr>
<td>2.4 Noise regulations and assessment criteria</td>
<td>24</td>
</tr>
<tr>
<td>2.4.1 South African noise regulations</td>
<td>24</td>
</tr>
<tr>
<td>2.4.2 SANS 10103 - Acceptable ambient levels</td>
<td>26</td>
</tr>
<tr>
<td>2.4.3 Road traffic noise</td>
<td>28</td>
</tr>
<tr>
<td><strong>3 Baseline assessment</strong></td>
<td>29</td>
</tr>
<tr>
<td>3.1 Current state of the environment</td>
<td>29</td>
</tr>
<tr>
<td>3.2 Baseline ratings</td>
<td>32</td>
</tr>
<tr>
<td>3.3 Recommended limits</td>
<td>33</td>
</tr>
<tr>
<td><strong>4 Noise impact assessment – Base Case (Mine Plan 6)</strong></td>
<td>34</td>
</tr>
<tr>
<td>4.1 Noise impact – Construction phase</td>
<td>34</td>
</tr>
<tr>
<td>4.2 Noise impact – Operational phase</td>
<td>36</td>
</tr>
<tr>
<td>4.3 Noise impact – Decommissioning phase</td>
<td>43</td>
</tr>
<tr>
<td>4.4 Noise impact – Closure phase</td>
<td>43</td>
</tr>
<tr>
<td>4.5 Mitigation</td>
<td>52</td>
</tr>
<tr>
<td>4.5.1 Mitigation - Construction noise</td>
<td>52</td>
</tr>
<tr>
<td>4.5.2 Mitigation - Operational noise</td>
<td>52</td>
</tr>
<tr>
<td>4.5.3 Mitigation – Decommissioning phase</td>
<td>53</td>
</tr>
<tr>
<td>4.5.4 Mitigation – Closure phase</td>
<td>53</td>
</tr>
<tr>
<td><strong>5 Noise impact assessment – Alternative Mine Plan (Mine Plan 7)</strong></td>
<td>54</td>
</tr>
<tr>
<td>5.1 Noise impact – Construction phase</td>
<td>54</td>
</tr>
<tr>
<td>5.2 Noise impact – Operational phase</td>
<td>56</td>
</tr>
<tr>
<td>5.3 Noise impact – Decommissioning phase</td>
<td>62</td>
</tr>
<tr>
<td>5.4 Noise impact – Closure phase</td>
<td>62</td>
</tr>
<tr>
<td>5.5 Mitigation</td>
<td>71</td>
</tr>
<tr>
<td>5.5.1 Mitigation - Construction noise</td>
<td>71</td>
</tr>
<tr>
<td>5.5.2 Mitigation - Operational noise</td>
<td>71</td>
</tr>
<tr>
<td>5.5.3 Mitigation – Decommissioning phase</td>
<td>72</td>
</tr>
<tr>
<td>5.5.4 Mitigation – Closure phase</td>
<td>72</td>
</tr>
</tbody>
</table>
### Index (Continued)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Summary of noise impact implications</td>
<td>73</td>
</tr>
<tr>
<td>6.3</td>
<td>Impact implications Comparison Mine Plan 6 and Mine Plan 7</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Cumulative impacts</td>
<td>77</td>
</tr>
<tr>
<td>8</td>
<td>Monitoring programme</td>
<td>81</td>
</tr>
<tr>
<td>9</td>
<td>References</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>Appendix A: Noise survey complete data sets</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>Appendix B: Curriculum Vitae</td>
<td>90</td>
</tr>
</tbody>
</table>
1 Introduction

1.1 Location and description of the proposed development

Anglo American through its subsidiary Anglo American Inyosi Coal (AAIC) is proposing to develop a new opencast coal mine (New Largo Colliery) to supply coal to Eskom’s new Kusile Power Station currently under construction just south of the N4 highway between Bronkhorstspruit and Emalahleni (Witbank) in Mpumalanga Province.

The Kusile Power Station will consist of six units of 800 megawatts (MW) each and a total capacity of 4800 MW. At full production, Kusile will require approximately 17 million tons (Mt) of coal per year, depending on the quality of the coal. AAIC intends to enter into a long-term agreement with Eskom to supply coal to the new Kusile Power Station. AAIC has committed, in a letter of intent, to supply the bulk of the 17 Mt of coal to Kusile over a period of 47 years. The intention is for this coal to be sourced from the New Largo Colliery, with supporting production from AAIC’s Zibulu 2 seam and Zondagsfontein 4 seam operations.

The New Largo Colliery coal reserve is located directly to the east of the new Kusile Power Station, between the N4 highway in the north and the N12 highway in the south, with a small portion of the coal reserve found to the south of the N12 highway (Figure 1.1).

Figure 1.1
Regional Setting of the proposed New Largo Colliery Project
It is estimated that approximately 27% of the reserve area comprises defunct collieries with reserves contained in the pillars, roof and/or floor of the workings. About ~52Mt of coal over an area of 1300 hectares has been extracted by previous mining activities.

AAIC currently holds the prospecting rights over an area of 12 773 hectares and has submitted a mining right application to the Department of Mineral Resources (DMR) over this area (see Figure 1.1) in April 2011. The proposed New Largo Colliery and associated infrastructure requires an environmental impact assessment (EIA) in terms of the National Environmental Management Act (No 107 of 1998) (NEMA) and the new EIA regulations (Government Notice Regulation (GNR) 543 to 546, published 18 June 2010). The Mpumalanga Department of Economic Development and Tourism (MDEDET) is the competent authority responsible for administration, review and decision-making (granting or refusal) regarding this EIA.

AAIC currently holds prospecting rights over the New Largo Colliery coal reserve in terms of the MPDRA and intends to submit a mining right application to the Department of Mineral Resources (DMR) over the same area (see Figure 1.1) in April 2011. In support of the mining right application, AAIC will need to submit three principal documents:

- Mine works programme, which describes the technical and financial aspects of the mining operation;
- Social and labour plan, which describes how the mine will manage social and labour issues; and
- Environmental management programme (EMP), which incorporates the findings of the EIA and sets out practical measures for managing or mitigating the identified environmental impacts of the proposed project. It must also indicate how environmental performance will be measured once the project commences, during operation and after closure of the proposed mine.

A key component of a mining right application is the assessment of potential environmental impacts. A mining right only comes into effect on the date on which the environmental management programme is approved. Section 22 of the MPRDA defines the requirements of an application for a mining right. Upon acceptance of a mining right application by the DMR the applicant must conduct an environmental impact assessment (EIA), submit an environmental management programme (EMP) and notify and consult with interested and affected parties within 180 days from the date of the notice.

1.2 Terms of reference and scope of work

The acoustic specialist’s brief was to investigate the noise impact of the proposed development on the surrounding area and, where applicable, to consider the requirements and options for mitigation.

The core study area for the EIA (see Figure 1.1) can be defined as the current AAIC prospecting right area (the area over which AAIC intends to submit a mining right application and areas affected by associated activities and infrastructure. Since the noise study is concerned with the potential impact of the mine on residents in the area, the noise baseline and impact assessments focus on existing and future conditions in the external surroundings, i.e. the area outside the boundaries of the mining zone (Figure 1.2).
The scope of work required in support of an EIA, involves the following two main tasks:

**Scoping and baseline study**

Carry out a physical scoping and a measurement survey to assess the nature of the existing noise environment and to determine typical existing, i.e. predevelopment outdoor ambient sound levels in the area. The results of such a survey conducted in a baseline noise study in by Acusolv in June 2011 were published in Report G915-R1 [1].

**Predictive noise impact study**

Carry out a study in which the expected impact of the development is quantified and assessed by means of computer modeling of the emission and atmospheric propagation of noise expected to be generated by the main components of the project, i.e. open-cast operations at the colliery, the processing plant, the conveyor between Phola and Kusile Power Station and road traffic on the R545 national road to be relocated.

This report (G915-R2) presents the results of a noise impact study conducted for the proposed the New Largo Colliery project. Since it forms an integral part of the methodology and noise assessment, content of the baseline study is included in the noise study report.
1.3 Project overview - Subject of this noise study

1.3.1 Mine Plan

AAIC Base Case Mine Plan (Mine Plan Version 6)

The proposed New Largo Colliery will be an opencast coal mine designed to process between 10 to 15 million tonnes of raw coal per annum for supply to Kusile Power Station. AAIC Base Case Mine Plan (Mine Plan Version 6) covers a total area of 5600 hectares and presents AAIC’s optimised mine plan.

Alternative Mine Plan (Mine Plan Version 7)

Alternative Mine Plan (Mine Plan Version 7) covers a total area of 4800 hectares. This is 800 hectares less than Mine Plan Version 6 as it excludes mining of a ~100 Mt portion of the minable coal reserve in the north on Farm Honingkrantz 536 JR (mine pit area A). This mine plan was introduced subsequent to the scoping phase consultation process as concerns were raised by I&APs and authorities regarding the impact of mining on wetlands.

This mine plan presented challenges in terms of mine plan sequencing and blending of coal to provide Kusile with an adequate supply of coal at the correct specification. AAIC investigated a number of iterations of Mine Plan Version 7:

- Mine Plan Version 7A was issued by AAIC in November 2011 but was still problematic as the mine plan sequencing resulted in certain periods where the coal quality requirements of Kusile could not be met.


Specialist studies were initially based on the Base Case Mine Plan (Mine Plan Version 6 Figure1.3-A). The Alternative Mine Plan (Mine Plan Version 7A Figure1.3-B) was issued to the specialists in November 2011 and, where required, the studies were updated to include a comparative assessment of Mine Plan Version 6 and Mine Plan Version 7A. Since the sequence of mining does not affect the noise footprint of the project, sequencing optimizations that occurred between the issuing of Mine Plan Version 7A and Mine Plan Version 7D did not change the noise impact ratings or findings of the noise study.

Alternative Mine Plan (Mine Plan Version 7) can provide 450 Mt of coal to Kusile and can thus supply Kusile for 38 years. It also involves relocation of a section of the R545. This plan cuts out ~100 Mt of coal and reduces the number of years of coal supply to Kusile from 47 years to 38 years. As a result, ~7 years of blending good quality coal is lost.

Should Mine Plan Version 7 be adopted, it will mean that Eskom will have to source the ~100 Mt of coal from elsewhere to replace the coal not mined as part of New Largo Colliery Mine Plan Version 7. Currently it is not clear where Eskom will source this ~100 Mt of coal to replace the coal not mined as part of New Largo Colliery Alternative Mine Version 7. Decision-making regarding the mine plan to be adopted for the New Largo Colliery needs to bear in mind that coal mining in other areas would also be associated with environmental impacts.
Figure 1.3-A – Proposed Base Case Mine Plan Version 6

Figure 1.3-B – Proposed Alternative Mine Plan Version 7
1.3.2 Main Project Components

Mining and associated activities

Mining and associated activities will include:

- Topsoil striping prior to mining
- The opencast mine pit (Phase 1 and Phase 2)
- Drilling and blasting of overburden
- Draglines for overburden removal and placement
- Trucks and shovels for excavation, loading and haulage of coal from the mine pit
- Crushing plants
- Conveyor belts and tips
- Coal stockpiles
- Access roads and haul roads
- Overburden stockpiles
- Storm water and process water management systems and a water treatment plant
- Offices, various Workshops, change houses, canteens, and laundry services
- Refueling bays, stores and explosive magazines.

As opencast mining advances and overburden is replaced into mined-out cuts of the opencast pit, rehabilitation of the mined-out areas will commence. The area will be leveled and once the replaced overburden has been compacted and settled sufficiently to minimise further subsidence, the area will be graded and shaped to facilitate storm water drainage without causing erosion. After this, a layer of soil will be replaced to act as a growth medium for vegetation to be re-established on the mined-out areas.

Coal processing plant and coal discard facilities

High contamination levels and lower coal qualities to the southern portion of the mine area necessitates a coal processing plant to be commissioned by 2023. Coal beneficiation (coal washing) involves crushing the coal into smaller pieces and passing it through a process called dense medium separation (DMS). An estimated 15% of raw material feed to the processing plant will be removed as coal discard. The total estimated discards generated over the life of New Largo Colliery will be in the region of 94 million tonnes (Mt).

Two methods of disposing of the discards have been identified:

- Construct a surface coal discard disposal facility.
- Backfill the coal discards back into the mine pit, and cover with overburden (dragline operation).
Demolition and Replacement of a Section of the R545 Road

A section of the R545 provincial tar road between Kendal and Balmoral that provides a north-south link between the N4 and N12 highways runs through the centre of the proposed New Largo Colliery. A section of approximately 17 km of the R545 will have to be demolished. The affected section of the R545 is from approximately 2 km south of the Kendal-Balmoral road intersection on the N4 up to the intersection of the Kendal-Balmoral Road with the N12. A small section of the R545 splits and runs east towards Wilge Village and will also have to be demolished where it is affected by the mining area. Since the life of mine is anticipated to be in excess of 50 years the demolition is regarded as permanent.

The replacement road will be a tarred road, 7.4 m wide and the road servitude will be 40 m wide. The R545 falls under the jurisdiction of the Mpumalanga Department of Public Works, Roads and Transport. The replacement road will be a tarred provincial road and will also fall under their jurisdiction.

The following possible alternatives for mitigating the impacts of demolishing the section of the R545 Provincial Road between the N4 and N12 are being considered (see Figure 1-1):

- **Option 1**: Construction of the new road from the R545 approximately 2 km south of the Kendal-Balmoral intersection, to run south-eastwards and then southwards along the eastern border of the proposed New Largo Colliery, tying in with the R545 (eastern split) near Wilge Village.

- **Option 2**: Upgrading of the road running southwards from the Rondebult intersection on the N4 to the R104 and the R104 westwards to where it then joins road D432 southwards, until it crosses with a bridge overpass. No interchange exists at his point and a new interchange would be required.

- **No-Go Development Option**: The no-go development assumes that no road replacement gets approved, but that the demolition of the section of the R545 Provincial Road between the N4 and the N12 proceeds as a result of the New Largo Colliery development.

1.3.3 Project programme and phasing

Project programming and phasing are summarised in Table 1.1. Implementation is planned in two main phases as follows:

Phase 1 entails general construction, the development of the first opencast box-cut in the northern section of the mining area and commissioning of one dragline to move overburden. The coal in the northern section of the New Largo Colliery coal reserve is of such a quality that it does not require beneficiation. AAIC intends to mine this coal as part of Phase 1 and to dispatch the coal directly from the crushing plants to the Kusile Power Station.

Phase 2 will be commissioned in 2023 and will entail the development of the second opencast box-cut in the southern section of the mining area, commissioning of a second dragline in this southern section, as well as commissioning of a coal processing plant to process lower grade coal and coal associated with the old underground workings that will be mined from approximately 2023 onwards. Construction of the coal processing plant will take approximately 24 months and is scheduled to occur from 2021 to 2023.

The life of mine is expected to be approximately 50 years.
Table 1.1

Project Programme

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning Phase</td>
<td></td>
</tr>
<tr>
<td>Pre-Feasibility</td>
<td>2005 to 2010</td>
</tr>
<tr>
<td>Feasibility</td>
<td>2011 to Feb 2012</td>
</tr>
<tr>
<td>Detailed Design and Tender Phase</td>
<td>Feb – Nov 2012</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation Phase</td>
<td></td>
</tr>
<tr>
<td>Phase 1</td>
<td></td>
</tr>
<tr>
<td>Construction, box-cut 1 (northern portion of mining area) and commissioning of dragline 1</td>
<td>Nov 2012 to June 2015</td>
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<tr>
<td>First Coal Delivered to Kusile</td>
<td>June 2015</td>
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<tr>
<td>Mining Activity Ramp Up</td>
<td>June 2015 to 2017</td>
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<tr>
<td>Phase 1 Production Phase (Open Pit 1 – Northern Mining Area)</td>
<td>2018 to 2023</td>
</tr>
<tr>
<td>Phase 2</td>
<td></td>
</tr>
<tr>
<td>DMS coal processing plant construction, box-cut 2 (southern mining area) and commissioning of dragline 2</td>
<td>2021 to 2023</td>
</tr>
<tr>
<td>Full Production Phase (Phase 1 and Phase 2) (Open Pit 1 – Northern Mining Area, and Open Pit 2 – Southern Mining Area)</td>
<td>2023 to ~2063</td>
</tr>
<tr>
<td>Closure Phase</td>
<td>from ~2063</td>
</tr>
</tbody>
</table>
2 Noise study methodology

2.1 General

The New Largo Colliery Project noise study was carried out in accordance with SANS 10328 [2], a South African Standard presenting guidelines on procedures to conduct noise assessments.

2.2 Baseline Study

2.2.1 Baseline field survey

Selection of noise monitoring locations

Criteria applied and practical considerations taken into account in the selection of suitable locations for noise monitoring, include the following:

- **Community concerns:** In selecting locations for noise monitoring, concerns raised by interested and affected parties should be taken into account.

- **Worst-case impact:** Focus on areas where maximum noise impact is expected.

- **Suitability for future surveys:** As far possible, select locations likely to be accessible in future surveys.

- **Avoid interference:** As far as practically possible, stay clear of and avoid interference by localised noise sources which may distort the data. Examples are power distribution boxes, barking dogs, speech interference by curious visitors and insects.

- **Equipment safety:** Measurement procedure, integration periods and sample size depend on the availability of facilities for safeguarding equipment. Long duration samples are only possible at locations where facilities are available to lock away recording equipment connected via a cable to a microphone positioned outdoors at a point clear of vertical reflecting surfaces and protected from the elements.

Meteorological considerations

Outdoor noise measurement is not permitted under certain weather conditions. Rain, drizzle or fog affects the conductivity of measurement microphones, resulting in faulty readings. It may also damage the microphone and measuring equipment. Secondly, although measurement often has to be performed in the presence of wind, care should be taken to verify that wind turbulence noise on the microphone capsule is negligible compared to the sound level being measured. There is no fixed upper limit for permissible wind speed, it all depends on the level being measured. Another weather phenomenon which may cause interference and spoil measurement data, is thunder.

Meteorological conditions also affect the acoustic environment and the actual sound levels without causing interference or measurement error. Normal fluctuations in atmospheric conditions may cause large variations in noise level which cannot and should not be avoided in the planning and execution of noise monitoring surveys. These variations constitute the natural variance in both background and intrusive noise levels. Noise levels at a distance from large sources are highly dependent on meteorological conditions. In fact, the difference in
characteristic day and night meteorological patterns is one reason why 24-hour mining or industrial operations always have a much greater noise impacts at night\(^1\).

It should be noted that, for the reasons explained above, the monitoring of meteorological conditions, such as temperature, wind and humidity on the ground can at best only serve to avoid errors and distortion of measurement data. Knowledge of cloud cover, temperature, humidity and wind which prevailed during the course of a noise survey has little if any value in the post-processing and interpretation of data.

**Sampling considerations**

To be of any use as an environmental management tool, noise monitoring has to produce accurate and relevant data. As a minimum requirement measurements should be performed using equipment with the necessary precision and accuracy as laid down in SANS 10103 [3]. Just as important, no matter how accurate the measurements, the data is only as good as the sample. What complicates noise sampling is that ambient noise is all but constant. As a rule, it is the net result of contributions from various constant, cyclic and randomly fluctuating sources.

To account for the intrinsic 24-hour cyclic variation, measurements should be taken within the relevant period of interest, e.g. daytime, night-time or a 24-hour cycle. Noise regulations require that the noise investigated must be measured (averaged) over a period of at least 10 minutes; i.e. 10 minutes or longer. Occasionally, in the investigation of noise complaints, a 10 minute sample may be sufficient to obtain the data needed to make a finding. For purposes of predictive noise studies and monitoring surveys, however, longer averaging periods are required to determine baseline or operational noise levels. Noise levels have to be averaged over intervals long enough to ensure that the sample is representative of conditions which prevailed during the period of investigation.

Where this is possible, in addition to measuring the average over the day or night-time period of interest, equipment may be programmed to simultaneously determine averages in a contiguous series of short sub-intervals of say 10-minute, 30-minute, or 1 hour duration, covering the main survey period. In this way, a picture can be obtained of the noise pattern over that period. For practical reasons, it is often not possible to attend measurements for the full duration of such long recordings.

**Noise survey conducted in the New Largo Colliery study**

**Field surveys**

It was an explicit requirement for specialists involved in the New Largo Colliery project to arrange permission access to property through the mine. In the case of the noise study, based on a map study and on visual and aural scoping surveys of the project area, the specialist identified and informed the mine about areas where ambient noise samples had to be taken. The mine (Mr. Kitching) then informed property owners of the need to conduct a baseline study in terms of an EIA, arranged permission of access and introduced them to the specialist. Following this procedure, the specialist engaged directly with the owners to arrange specific times for visits to setup equipment for noise monitoring and for collection of equipment at the end of each survey.

The number of properties where the mine could arrange for such access was limited, though sufficient to obtain representative samples of large areas within which the characteristic noise

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\(^1\) The other main reason is the increased community sensitivity at night due to a natural decline in road traffic and human activity noise.
climates are intrinsically homogeneous. The specialist conducted surveys at all six locations where access could be arranged by the mine.

Scoping and measurement surveys were carried out during the period 13 to 24-Jun-2011. Locations where ambient noise was monitored for a period of approximately 24 hours (see Figure 2.1) are as follows:

M1 Premises Rockblend
M2 Residence Mac Donald
M3 Residence Engelbrecht
M4 Residence Cloete
M5 Residence Truter
M6 Residence Van den Heever

Noise recording equipment was programmed to measure averages in sequences of 10-minute intervals for a total duration of 24 hours or longer. In all recordings, A-weighted, equivalent continuous sound pressure levels $L_{Aeq}$ (dBA) were measured, using an integrating sound analyser. For purposes of identifying sources of noise, third-octave spectra were examined during attended sessions, as well as in post-processing of data. At the same time, for purposes of identifying sources of noise, audio recordings synchronised with the data recordings were made at each monitoring point.

In the area south of the N12 highway where the mine could not arrange access for setting up equipment in a protected location for long duration monitoring, ambient noise levels were probed to obtain estimates of typical daytime and night-time ambient noise levels in that area. This is indicated as M7 in Figure 2.1:

M7 Area south of the N12 highway

Assessment

Although measurements covered daytime periods as well, when considering noise impact, it is for all practical purposes only the night-time results that matter. Night-time, when people are normally sleeping, is when the environment is by far the most sensitive to intrusive noise and when maximum impact is experienced. Hence, in the assessment of noise, the focus is on night-time conditions.

Measurement data was processed to obtain a time history of ambient noise levels. Using the audio recordings, it was possible to listen to the actual noises which occurred at any time, to identify sources of noise and to correlate audible noise events with data.
Figure 2.1

Noise monitoring locations

| Monitoring location            | Coordinate       | Monitoring location | Coordinate       |
|*********************************|------------------|---------------------|------------------|
| M1 Premises Rockblend          | S25 54 18.4      | M4 Residence Cloete | S25 57 44.3      |
|                                | E28 58 27.2      |                     | E29 01 24.7      |
| M2 Residence Mac Donald        | S25 57 09.9      | M5 Residence Truter | S25 59 23.7      |
|                                | E28 55 57.0      |                     | E29 00 43.6      |
| M3 Residence Engelbrecht       | S25 59 51.0      | M6 Residence V d Heever | S25 54 00.0    |
|                                | E28 55 47.9      |                     | E29 04 04.8      |
| M7 Area south of the N12       |                  |                     |                  |
2.2.2 Test equipment

**Noise level measurements**

Field measurements were carried out using the following equipment:

(a) Brüel & Kjaer Type 2260 Modular Precision Sound Analyser (Ser no. 1875497)

(b) Brüel & Kjaer Type 2260 Modular Precision Sound Analyser (Ser no. 1823652)

(c) Brüel & Kjaer Type 4231 Sound Calibrator (Ser no. 2606011)


Calibration:

- M& N Calibration Services Certificates No’s 2010-1164 & 2010-1165
- National Metrology Institute of SA Certificate No AV/AS-4016-R
- National Metrology Institute of SA Certificate No AV/AS-4021-R

**Audio recording equipment**

(a) Olympus LS11 PCM Digital Recorder (Ser no. 200109647)

(b) Olympus LS11 PCM Digital Recorder (Ser no. 200114547)
2.3 Predictive noise impact study – Noise modelling

2.3.1 Principle

Estimates of future noise levels to be generated by the proposed development in the study area were derived with the aid of a model simulating noise emission from all major noise-generating components. To this end, it was required to quantify the acoustic emission (sound power) levels, as well as the frequency and directional characteristics of individual or groups of sources. Calculation of geometric dispersion and atmospheric propagation of noise is based on the principles of the Concawe method SANS 10357:2000 [4], extended to deal with more complex source configurations, as well as to simulate the effect of wind.

2.3.2 Noise model – Scope of operations covered

Mining Method

The New Largo Colliery opencast mining operation is designed to process between 10 to 15 million tonnes of raw coal per annum for supply to Kusile Power Station. It is proposed that two large walking draglines be used to strip the required volumes of overburden and that coal will be loaded into rear dump trucks for transport to one of two primary crushing plants.

Certain areas of the New Largo Colliery coalfield do not require beneficiation in the proposed coal processing plant and can be dispatched directly to the stockyards. In other areas where coal contamination is higher due to numerous intra-seam partings or underground workings, coal will be dispatched to the washing plant. The dragline strips will on average be in excess of 3km long and 60m wide in single seam areas and 130m wide in double seam areas.

The mining process can be described as follows:

- Vegetation and topsoil stripping ahead of mining;
- Topsoil gets loaded onto 100 t trucks (Komatsu HD785) by hydraulic excavators (Komatsu PC1250) and hauled back of the advancing pit for placement on top of the leveled spoils;
- Overburden and interburden drilling operations will commence in front of the advancing pit after the topsoil has been removed;
- After drilling, overburden and interburden will be charged with explosives and blasted;
- Areas not containing old underground workings will be cast-blasted to move as much of the burden possible into the open void utilizing the explosives energy;
- After blasting the dragline and dozers can now move the final volumes of burden into the open void so as to expose the coal seams at the bottom;
- Once the coal is exposed, coal and parting operations can commence which include the drilling, blasting, loading and hauling of coal and intra seam partings;
- Typically the leveling of spoils will follow within 3 strips behind the open void;

New Largo Colliery Blasting Operations

Drilling operations will be conducted 24 hour/day and 7 days/week. There will be approximately four large electric overburden drills (Bucyrus 49R) allocated to overburden and
interburden drilling. There will also be a fleet of approximately five coal drills (Drilltech DK25) and two parting drills (Tamrock Pantera 1190) operating within the coal drilling operations.

It is envisaged that blasting operations will be conducted six days a week (Monday – Saturday) between 08h00 in the morning and 18h00 in the afternoon. The aim would be to conduct most of the blasting operations during the mid-day period when ambient temperatures as well as background noise levels are at their highest.

It is anticipated that at least two overburden and interburden blasts will be conducted per week while at least two coal parting blasts will be conducted every day within the mining pit area. This frequency will however vary as the mining conditions change over time.

**Blasting noise and ground vibration**

Ground vibration and seismic effects are addressed in studies by other specialists.

**Coal Hauling**

There will be two main mining areas within the pit at any time during New Largo’s life. This will be dictated by the two large walking draglines. Two large hydraulic face shovels (Komatsu PC4000) will be deployed at each of the dragline sites to conduct coal loading. Coal will be loaded into 190 t coal trucks (Komatsu 730E) which would in turn dispatch it to either of the two crushing plants.

The mine will start off with about seven 190 t coal haulers which will then steadily increase over time as the hauling distances increase to the tips. The coal fleet increases up to 16 trucks near the end of the life of mine. The approximate frequency that coal haulers will pass a specific point on the haul route is once every 4.5 minutes. Trucks are expected to reach a maximum speed of about 50 km/h on long stretches of haul road.

A dedicated road building and maintenance fleet will be deployed for maintenance of haul roads. The fleet will consist of graders, water tankers, a stone crusher, compacter and other ancillary equipment.

**Rehabilitation**

Two large 100 t dozers (Komatsu D475) will be used behind the advancing pits for spoil leveling. Approximately five 100 t trucks (Komatsu HD785) will be employed to haul topsoil from the front to the back of the advancing pit. There will be a rolling bridge within the advancing pit so as to provide access for these trucks to cross over the void to the back of the pit. The approximate frequency that topsoil haulers will pass a specific point on the haul route is once every 15 minutes.

### 2.3.3 Potential sources of noise

#### A Construction phase – Potential sources of noise

Phase 1 entails general construction, the development of the first opencast box-cut in the northern section of the mining area and commissioning of one dragline to move overburden. There will be no plant construction activities during this phase.

Phase 2 will be commissioned in 2023 and will entail the development of the second opencast box-cut in the southern section of the mining area, commissioning of a second dragline in this southern section, as well as commissioning of a coal processing plant to process lower grade coal and coal associated with the old underground workings that will be mined from
approximately 2023 onwards. Construction of the coal processing plant will take approximately 24 months and is scheduled to occur from 2021 to 2023.

Potential noise-generating activities during the construction phases include:

**Phase 1 and Phase 2**

- Topsoil stripping prior to mining
- Drilling and blasting of overburden
- Draglines removing overburden

**Phase 2 only**

- Construction of a coal processing plant near Kusile Power Station

**R545 road construction**

Road construction will involve the use of standard road building and earth-moving equipment, including dozers, loaders, trucks and compactors where the primary sources of noise are the diesel engines, rather than the work activities performed by the equipment.

**B Operational phase – Potential sources of noise**

Phase 1 will involve opencast mining in the northern section of the New Largo Colliery coal reserve. Coal will be hauled to the crushers from where it will be dispatched directly to the Kusile Power Station. There will be no beneficiation plant in Phase 1.

Phase 2 will be commissioned in 2023 and will entail the development of the second opencast box-cut in the southern section of the mining area, commissioning of a second dragline, as well as commissioning of a coal processing plant to process lower grade coal and coal associated with the old underground workings that will be mined from approximately 2023 onwards. Construction of the coal processing plant will take approximately 24 months and is scheduled to occur from 2021 to 2023. The life of New Largo Colliery is expected to last approximately 50 years.

Potential noise-generating activities during the operational phases include:

**Phase 1 and Phase 2**

- The opencast mine pit
- Draglines removing overburden
- Excavation by shovels
- Loading on to trucks, haulage from pit to crushers and tipping of coal
- Crushing
- Conveyor noise
• Coal stockpile coal discharge and stockpile maintenance
• Traffic noise - access roads
• Truck noise on haul roads
• Truck and dozer noise on overburden stockpiles
• Noise from water treatment plant
• Various Workshops.

**Phase 2 only**

**Coal processing plant**

High contamination levels in the areas of previously mined underground workings and lower coal qualities to the southern portion of the mine area (mined after 2023) necessitate a coal processing plant to be commissioned by 2023 to beneficiate coal to meet the required Kusile (Eskom) coal quality specifications.

Coal beneficiation (coal washing) involves crushing the coal into smaller pieces and passing it through a process called dense medium separation (DMS). This process utilises the differences in mass density (mass per unit volume) between the coal and the impurities such as sulphur, ash, rock and soil particles to separate the coal from the impurities.

The overall yield per saleable tonne after the beneficiation plant is installed in 2023 is estimated to be in the region of 85%. This implies that 15% of the raw material feed to the processing plant will be removed as coal discard. The total estimated discards generated over the life of New Largo Colliery will be in the region of 94 million tonnes (Mt).

Two methods of disposing of the discards have been identified:

• Construct a surface coal discard disposal facility
• Backfill the coal discards back into the mine pit, and cover with overburden (dragline operation).

Figure 2.2 shows the location relative to the Kusile Power Station and the layout of the New Largo Colliery crushers and beneficiation plant. The layout of the beneficiation plant is shown in Figure 2.3.
Figure 2.2

Location and layout of the crushers and beneficiation plant
Figure 2.3

New Largo Colliery beneficiation plant
Primary sources of noise at and within the plant are:

- Dumping
- Stockpiling and stockpile maintenance
- Conveyors
- Primary and secondary screening
- Tertiary crushers contained in a building
- Thickeners

Tables 2.1-A and 2.1-B list equipment to be used in the New Largo Colliery opencast mining operation.
Table 2.1-A

Equipment to be employed on the mine

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Fleet</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Equipment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dragline 1</td>
<td>8750R_91_1</td>
<td>1</td>
</tr>
<tr>
<td>Dragline 2</td>
<td>8750R_91_2</td>
<td>0</td>
</tr>
<tr>
<td>Coal Shovel</td>
<td>PC4000_FS</td>
<td>3</td>
</tr>
<tr>
<td>Topsoil Excavator</td>
<td>PC1250SP_7</td>
<td>2</td>
</tr>
<tr>
<td>Overburden Dozers</td>
<td>D475_A5</td>
<td>3</td>
</tr>
<tr>
<td>Coal Trucks</td>
<td>730E</td>
<td>9</td>
</tr>
<tr>
<td>Topsoil Trucks</td>
<td>HD785_5</td>
<td>3</td>
</tr>
<tr>
<td>Overburden Drills</td>
<td>BE49RIIIIE</td>
<td>4</td>
</tr>
<tr>
<td>Coal Drills</td>
<td>DK25_C</td>
<td>4</td>
</tr>
<tr>
<td>Parting Drills</td>
<td>1190_Ptg</td>
<td>1</td>
</tr>
<tr>
<td><strong>Ancillary Equipment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graders</td>
<td>GD825A_2</td>
<td>3</td>
</tr>
<tr>
<td>Water Bousers</td>
<td>HD785_5_WB</td>
<td>3</td>
</tr>
<tr>
<td>Skid Steer</td>
<td>SkidSteerFEL</td>
<td>2</td>
</tr>
<tr>
<td>Cable Reeler</td>
<td>WA600_Cable</td>
<td>2</td>
</tr>
<tr>
<td>Crane</td>
<td>CraneAT_190t</td>
<td>1</td>
</tr>
<tr>
<td>Crane</td>
<td>CraneAT_30t</td>
<td>3</td>
</tr>
<tr>
<td>Service Trucks</td>
<td>HM300_ServTruck</td>
<td>5</td>
</tr>
<tr>
<td>Diesel Bowser</td>
<td>HM300_DieselBowser</td>
<td>2</td>
</tr>
<tr>
<td>LDV Pit Bakkies A</td>
<td>LDV</td>
<td>40</td>
</tr>
<tr>
<td>Ambulance</td>
<td>Ambulance</td>
<td>1</td>
</tr>
<tr>
<td>Pump Truck</td>
<td>HM300_PumpTruck</td>
<td>1</td>
</tr>
<tr>
<td>Drill Water Bowser</td>
<td>HM300_DrillWB</td>
<td>1</td>
</tr>
<tr>
<td>Dewatering Truck</td>
<td>D50_Dewater</td>
<td>1</td>
</tr>
<tr>
<td>Wheel Dozers - Coal</td>
<td>WD600</td>
<td>2</td>
</tr>
<tr>
<td>TLB Cable handlers</td>
<td>TLB</td>
<td>2</td>
</tr>
<tr>
<td>Rehab Tractors</td>
<td>Tractor</td>
<td>4</td>
</tr>
<tr>
<td>Graders</td>
<td>GD825A_2</td>
<td>2</td>
</tr>
<tr>
<td>Dragline Dozers</td>
<td>D375_A5</td>
<td>5</td>
</tr>
<tr>
<td>LDV Pit Bakkies B</td>
<td>LDV_Fix</td>
<td>41</td>
</tr>
</tbody>
</table>
Table 2.1-B

Equipment to be employed on the mine

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Fleet</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pit Services Equipment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Pumps</td>
<td>Pumps</td>
<td>20</td>
</tr>
<tr>
<td>Lighting Plant</td>
<td>Lighting_Plant</td>
<td>3</td>
</tr>
<tr>
<td>Tyre Handler</td>
<td>WA600_Tyre</td>
<td>1</td>
</tr>
<tr>
<td>Pit Lowbed</td>
<td>HD785_Lowbed</td>
<td>1</td>
</tr>
<tr>
<td>Tip Wheel Dozer</td>
<td>WD600</td>
<td>1</td>
</tr>
<tr>
<td>Rehab Dozers - Spoils</td>
<td>D475_A5</td>
<td>2</td>
</tr>
<tr>
<td>Highwall Radar</td>
<td>Radar</td>
<td>1</td>
</tr>
<tr>
<td><strong>Pit Construction Equipment - Day Shift</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front End Loader</td>
<td>WA800_3</td>
<td>1</td>
</tr>
<tr>
<td>Construction Dozer</td>
<td>D375_A5_Day</td>
<td>1</td>
</tr>
<tr>
<td>Construction Grader</td>
<td>GD825A_2_Day</td>
<td>1</td>
</tr>
<tr>
<td>Construction Haul Truck</td>
<td>HD785_5_Day</td>
<td>3</td>
</tr>
<tr>
<td>Road Building Compactor</td>
<td>Roller_12T</td>
<td>1</td>
</tr>
<tr>
<td>Front End Loader</td>
<td>WA1200_3</td>
<td>1</td>
</tr>
<tr>
<td>Inpit Discard Hauling</td>
<td>HD785_5</td>
<td>0</td>
</tr>
<tr>
<td>Stone Hauling</td>
<td>HD785_5</td>
<td>2</td>
</tr>
<tr>
<td>Road Building Crusher</td>
<td>Stone_Crusher</td>
<td>1</td>
</tr>
<tr>
<td>Road Building Excavator</td>
<td>PC1250SP_Day</td>
<td>1</td>
</tr>
<tr>
<td><strong>Coal Processing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coal Processing Plant Equipment</td>
<td>Tipper</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Bobcat</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>WA600_FEL</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Excavator</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Truck_Highup</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Fork_Lift</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>LDV_Plant</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Bobcat</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tipper</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Truck_Highup</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Fork_Lift</td>
<td>0</td>
</tr>
</tbody>
</table>
Traffic noise from the relocated section of the R545 road

A section of the R545 (D686) will be demolished from approximately 2 km south of the N4 interchange to the N12/D686 interchange. A section of the R545 eastbound, towards Wilge Village which falls over the proposed mining area, will also be demolished. A new road will be constructed from the R545, around the eastern border of the proposed New Largo Colliery, over AAIC property. The new road will tie in with the existing R545 to the east of Wilge Village. Two road alignment options are considered as follows:

**R545 Option 1:** Relocation alignment for Base Case Mine Plan 6

**R545 Option 2:** Relocation alignment for Alternative Mine Plan 7

Relocation of the R545 will result in realignment of a section of an existing source of traffic noise and a consequent change in the existing noise footprint of the road. Modeling of R545 road traffic noise in this study is based on traffic data obtained from a traffic impact assessment report issued by WSP SA Civil and Structural Engineers (Pty) Ltd (WSP). Relevant data for purposes of noise modeling obtained from the WSA report is summarised in Table 2.2. Average 24-hour traffic volumes were determined from a seven-day electronic count of traffic in both (northbound and southbound) directions on the R545. Modeling and assessment of R545 traffic noise also takes into account the WSP estimate of additional trips expected to be generated by the proposed New Largo Colliery development by horizon year 2025. With coal transported by conveyor, New Largo Colliery trip generation will not have a transport truck component. It will comprise primarily of employee public and private transport traffic concentrated within peak hours. Trip generation outside peak hours will be negligible.

### Table 2.2

Traffic data used for modeling R545 traffic noise
From WSA traffic impact assessment report

<table>
<thead>
<tr>
<th>Category</th>
<th>Existing Traffic</th>
<th>New Largo trip generation 2025</th>
<th>Total 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vehicles/24 h</td>
<td>AM Peak</td>
<td>PM Peak</td>
</tr>
<tr>
<td>Light</td>
<td>2694</td>
<td>364</td>
<td>364</td>
</tr>
<tr>
<td>Heavy</td>
<td>1160</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>3854</td>
<td>370</td>
<td>370</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Road design</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Road surface</td>
<td>Paved</td>
<td></td>
</tr>
<tr>
<td>Average speed</td>
<td>100 km/h</td>
<td></td>
</tr>
</tbody>
</table>

C Decommissioning and Closure

Decommissioning and closure is assumed to involve removal of surface infrastructure and rehabilitation of disturbed areas.
2.4 Noise regulations and assessment criteria

2.4.1 South African noise regulations

In 1994, with the devolution of regulatory power from governmental to provincial level, the authority to promulgate noise regulations was ceded to provinces. Each province could henceforth decide whether to develop their own regulations, or to adopt and adapt existing regulations. As yet, however, only three provinces (Gauteng, Free State and Western Cape) have promulgated such regulations. Elsewhere, including Mpumalanga Province, no provincial noise regulations have been put in place.

Consequently, in noise studies undertaken in provinces lacking official noise regulations, specialists usually consider the old national noise regulations [5] to apply by default. For further guidance, it is noted that noise criteria in all previous national and current provincial regulations, as well as current metropolitan noise policies, are all derived from SANS 10103 [3]. SANS 10103 defines the relevant acoustic parameters that should be measured, gives guidelines with respect to acceptable levels and assessment criteria and specifies test methods and equipment requirements.

In the assessments made in this noise study the provisions of the old national noise regulations are taken into account, but noise assessment is based by and large on the principles, guidelines and criteria of SANS 10103.

Prohibitions

Prohibition of disturbing noise

In accordance with international and South African standard practice, noise impact assessments are made with respect to outdoor noise levels. Noise regulations prohibit any changes to existing facilities, or uses of land, or buildings or the erection of new buildings, if it will house activities that will cause a disturbing noise, unless precautionary measures to prevent disturbing noises have been taken to the satisfaction of the local authority. Noise is deemed to be disturbing, if it exceeds certain limits. Depending on what data is available, SANS 10103 allows for different formulations of the excess.

- **If the actual residual ambient level is known:** The excess is taken to be the difference between the noise under investigation and the residual noise measured in the absence of the specific noise under investigation. This definition, based on the *noise emergence criterion*, finds application in both predictive and noise monitoring assessments, if baseline noise data is available.

- **If the actual residual ambient level is unknown:** Alternatively, the excess may also be defined as the difference between the ambient noise under investigation and the acceptable ambient rating for the type of district under consideration in accordance with SANS 10103. This definition, based on the *acceptable level criterion*, is employed in predictive noise studies and in noise monitoring assessments, if there is no baseline data available or if an existing source of intrusive noise cannot be switched off for purposes of measuring the residual background level.

In terms of the old national noise regulations, a disturbing noise means a noise that causes the ambient sound level to increase by 7 dB or more above the designated zone level, or if no zone level has been designated, the ambient sound level measured at the same point. Noise regulations also require that the measurement and assessment of ambient noise comply with the guidelines of SANS 10103.
It should be cautioned, however, that the legal limit of 7 dB should not be construed as the upper limit of acceptability. SANS 10103 (See Table 2.4 in this report) warns that an increase of 5 dB is already significant and that an increase of 7 dB can be expected to evoke widespread complaints from the community. Hence, although the applicant would be within legal limits if the noise impact is prevented from exceeding 7 dB, that would not prevent a community from being disturbed and to complain about the noise. In the EIA phase, i.e. in the design and planning stage of a new development, it is advised the target be set much lower at 3 dB. The 4 dB margin is required as a matter of good planning and to maintain good relations with neighbors. It also brings the assessment in line with World Bank guidelines. Once in operation, an appropriate limit in EMP noise monitoring of the actual levels would be an excess of 5 dB, which is still 2 dB below the legal limit.

Prohibition of a noise nuisance

Noise regulations also prohibit the creation of a noise nuisance, defined as any sound which disturbs, or impairs the convenience or piece of any person. The intent of this clause is to make provision for the control of types of noise not satisfactorily covered by measurement and assessment criteria applicable to disturbing noises. These are noises which are either difficult to capture\(^2\), or noises for which the readings registered on sound level meters do not correlate satisfactorily with the annoyance it causes, when assessed against standard criteria. Noise regulations list specific activities which are prohibited if exercised in a manner to cause a noise nuisance, such as\(^3\):

- The playing of musical instruments and amplified music;
- Allowing an animal to cause a noise nuisance.
- Discharging fireworks;
- Discharge of explosive devices, firearms or similar devices which emit impulsive sound, except with the prior consent in writing of the local authority concerned and subject to conditions as the local authority may deem necessary;
- Load, unload, open, shut or in any other way handle a crate, box, container, building material, rubbish container or any other article, or allow it to be loaded, unloaded, opened, shut or handled, (if this may cause a noise nuisance).
- Drive a vehicle on a public road in such a manner that it may cause a noise nuisance.
- Use any power tool or power equipment used for construction work, drilling or demolition work in or near a residential area, (if this may cause a noise nuisance).

And:

- Except in an emergency, emit a sound, or allow a sound to be emitted, by means of a bell, carillon, siren, hooter, static alarm, whistle, loudspeaker or similar device (if it may cause a noise nuisance).

One or more of these activities may occur on industrial sites and in project activities. A common cause of noise nuisance are reverse hooters, the last item listed above.

\(^2\) For example, barking dogs. Not only is the occurrence of the noise unpredictable and erratic, but the presence of a person investigating the problem with a noise meter is likely to attract attention and trigger incessant barking.

\(^3\) See Noise Regulations [5] for the full list of prohibited activities.
The essential difference between a disturbing noise and a noise nuisance is as follows:

**Noise disturbance** – Is quantifiable and its assessment is based on estimated or measured sound levels, expressed in decibel (dBA). Investigation and assessment of existing noise disturbance problems involve the measurement of ambient levels in the presence of a specific source under investigation and comparison of this level with either the level measured in the absence of the source, or a table value deemed to be an acceptable level for the type of district under consideration.

**Noise nuisance** – Is difficult to quantify and is not confirmed or assessed by measurement. Judging whether a noise qualifies as a nuisance is based purely on its character and audibility, in conjunction with subjective considerations such as the perceived intent of the noise maker and connotations attributable to the source of noise. Where measurement is possible, measured data may serve as supplementary information.

**SANS 10103**

As mentioned before, noise regulations require that the measurement and assessment of noise comply with the guidelines of in SANS 10103. The concept of noise nuisance, however, only features in the regulations. SANS 10103 only deals with quantifiable noise (noise disturbance), without any guidelines for, or reference to noise nuisance whatsoever.

It is normally expected of an EIA noise study to make findings based on noise modelling and quantitative assessment of predicted noise levels, i.e. based on noise disturbance considerations. The same applies to noise monitoring conducted in terms of an EMP, where the report is expected to make findings based on measured data, assessed in terms of noise disturbance criteria as well. But once an industrial site or mine starts operating, predictable as well as unexpected sources of noise nuisance may emerge. If present, they often constitute a major cause of complaints. It is therefore imperative that, in addition to quantitative predictions and measurements, noise studies as well as monitoring surveys also identify potential and actual sources of noise nuisance.

### 2.4.2 SANS 10103 - Acceptable ambient levels

Noise regulations require that the rating level of the ambient noise be compared with the rating level of the residual noise (where this can be measured), or alternatively (where the noise source cannot be switched off or interrupted), with the appropriate rating level given in Table 2 of SANS 10103. Neither the noise regulations, nor SANS 10103 defines or refers to the term noise impact. It is however generally understood and defined for purposes of this study, as the amount in dBA by which the total noise level exceeds the nominal or the measured ambient level rating, whichever is applicable, for the area under consideration.

Table 2.3 in this report summarises SANS 10103 criteria for acceptable ambient levels in various districts. Note that ratings increase in steps of 5 dBA from one to the next higher category and that, in general, regardless of the type of district, ambient noise levels tend to decline by typically 10 dBA from daytime to night-time. It follows that, for the same level of intrusive noise, the noise impact would typically increase by 10 dBA from daytime to night-time.
### Table 2.3

Typical outdoor ambient noise levels in various districts (SANS 10103)

<table>
<thead>
<tr>
<th>Type of district</th>
<th>Noise level</th>
<th>Day-Night $L_{dn}$</th>
<th>Day-time $L_d$</th>
<th>Night-time $L_n$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Rural</td>
<td></td>
<td>45</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td>(b) Suburban – With little road traffic</td>
<td></td>
<td>50</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>(c) Urban</td>
<td></td>
<td>55</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>(d) Urban - With some workshops, business premises &amp; main roads</td>
<td></td>
<td>60</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>(e) Central business districts</td>
<td></td>
<td>65</td>
<td>65</td>
<td>55</td>
</tr>
<tr>
<td>(f) Industrial districts</td>
<td></td>
<td>70</td>
<td>70</td>
<td>60</td>
</tr>
</tbody>
</table>

The periods in Table 2.3 into which a 24 hour cycle is divided, are defined as follows:

- **Day-time** (06:00 – 22:00)
- **Night-time** (22:00 – 06:00)
- **Day-Night** (24-hour day-night period)

The day-night level $L_{dn}$ represents a 24-hour average of the ambient noise level, with a weighting of +10 dB applied to night-time levels, yielding numerically equal values for daytime and day-night levels.

SANS 10103 also gives guidelines in relation to expected community response to different levels of noise impact (increase in noise level), as summarized in Table 2.4.

### Table 2.4

Expected community response to an increase in ambient noise level (SANS 10103)

<table>
<thead>
<tr>
<th>Increase in ambient level [dB]</th>
<th>Expected community reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 10</td>
<td>Sporadic complaints</td>
</tr>
<tr>
<td>5 – 15</td>
<td>Widespread complaints</td>
</tr>
<tr>
<td>10 – 20</td>
<td>Threats of community action</td>
</tr>
<tr>
<td>More than 15</td>
<td>Vigorous community action</td>
</tr>
</tbody>
</table>
2.4.3 Road traffic noise

Unlike a typical 24-hour mining or industrial operation which emits noise at a constant rate throughout the day and night, public road traffic generates noise with a characteristic cyclic variation in amplitude. Coupled to traffic flow rates, maximum noise levels are reached during am and pm peak-hours. After about 18:00, traffic volumes on public roads and the corresponding noise levels start declining, reaching minimum levels sometime during the night. But traffic does not come to a complete standstill and the night-time noise level remains relevant, given that the environment becomes more sensitive to noise. To account for this, the acceptable night-time ambient noise rating is 10 dB lower than the corresponding daytime level for any given SANS district (See Table 2.3). Aimed specifically at dealing with cyclic road traffic noise, the day-night rating $L_{dn}$ has been formulated to cover a complete 24-hour cycle, with a 10 dB weighting (penalty) applied to the night-time level. It serves as a meaningful single-figure rating applied internationally in the assessment of road traffic noise.

In accordance with the guidelines outlined in Section 2.4.1, the good-practice planning target would be not to exceed the measured existing background ambient level or the acceptable ambient level in accordance to noise district criteria defined in SANS 10103. Table 2.5 summarises criteria for various districts. For road traffic noise the internationally accepted rating criterion is the outdoor 24-hour weighted average (day-night) rating $L_{dn}$ dBA. Because of the characteristic 24-hour profile of traffic noise, it is not necessary, in addition to the 24-hour assessment, to consider daytime and night-time conditions as well. The outcome and findings of any given traffic noise assessment will be the same, regardless of whether daytime, night-time or day-night level ratings are used, as long as the integration period used for determination of average intrusive noise and the reference levels are the same.

Table 2.5

Day-night rating $L_{dn}$ for outdoor ambient noise in road traffic noise assessments
District categories are as defined in SANS 10103

<table>
<thead>
<tr>
<th>Noise District</th>
<th>Acceptable level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Town planning classification</td>
</tr>
<tr>
<td>Rural Residential</td>
<td>Rural, Agricultural</td>
</tr>
<tr>
<td>Urban Residential with little road traffic</td>
<td>Suburban Residential</td>
</tr>
<tr>
<td>Urban Residential</td>
<td>Urban Residential – Type 1</td>
</tr>
<tr>
<td>Urban – With business premises &amp; main roads</td>
<td>Urban Residential – Type 2</td>
</tr>
<tr>
<td>Central Business Districts</td>
<td>Office, Business</td>
</tr>
<tr>
<td>Industrial</td>
<td>Commercial, CBD</td>
</tr>
<tr>
<td></td>
<td>High-tech industry</td>
</tr>
<tr>
<td></td>
<td>Heavy Industry</td>
</tr>
</tbody>
</table>

A significant impact is deemed to occur if traffic noise levels exceed acceptable levels in Table 2.5 by 5 dB.
3 Baseline assessment

3.1 Current state of the environment - Background ambient noise levels

General

The proposed New Largo Colliery development will be located in a district where the character of ambient noise is to some extent determined by industrialisation and economic activity which over time has resulted in an increase in the background ambient level. Prior to commencement of the New Largo Colliery development, existing impact sources include the following:

- Small-scale mining activities scattered over the area which contribute to machinery, truck and road traffic noise;
- Agricultural activities where the main sources of noise are tractor diesel engines.
- Road traffic noise emanates from the N4 and N12 highways, the R545 provincial road, as well as from other secondary roads. The N4 and N12 highways have a significant effect on the ambient level within a zone of approximately 500 m from the road.

Although traffic volumes on the R545 are low, traffic on the total road infrastructure collectively elevates the ambient level over most of the project area to about 5 dB above what is considered typical for a Rural Area in terms of SANS 10103 guidelines.

In terms of SANS 10103 guidelines (See Table 2.3) the area falls in the category between Rural and Urban, described as “Suburban – With little road traffic”. As such, one would expect typical ambient levels in the area to be in the order of 50 dBA (daytime) and 40 dBA night-time, respectively. The results of this baseline survey serve to verify the current status and establish the extent to which ambient levels are currently affected by abovementioned activities.

Ambient levels at M1 (Premises at Rockblend – Nelson family)

Average daytime and night-time ambient levels recorded at this location during the course of this investigation, were 55 dBA (daytime) and 37 dBA (night-time), respectively. The daytime ambient level was determined by:

- Noise from the R545 main road;
- Noise from work activities on this property;
- Trucks and other vehicles arriving at and leaving from the premises.

Audible sources of noise at night were road traffic from local roads, as well as insect and bird calls.

Ambient levels at M2 (Residence Mac Donald)

Average daytime and night-time ambient levels recorded at this location were 52 dBA (daytime) and 40 dBA (night-time). Audible sources of noise during daytime were found to be heavy mining vehicle traffic on the local unpaved road approximately 500 m from the residence, farming activities, livestock noise and distant traffic noise on the R545 main road. At night it was mainly road traffic in the distance, livestock noise, as well as insect and bird calls which contributed to audible noise.
Ambient levels at M3 (Residence Engelbrecht)

Average daytime and night-time ambient levels recorded at this location were 50 dBA (daytime) and 37 dBA (night-time). Audible sources of noise during daytime were found to be farming activity, livestock and barely audible levels of road traffic noise in the distance. At night it was mainly livestock, bird and insect calls, and at a much lower level, noise from traffic on distant roads.

Ambient levels at M4 (Residence Cloete)

Average daytime and night-time ambient levels recorded at this location were 52 dBA (daytime) and 43 dBA (night-time). The level of activity and the ambient levels are higher but the types of noise sources contributing to audible ambient noise were found to be the same as those recorded at M3.

Ambient levels at M5 (Residence Truter)

Average daytime and night-time ambient levels recorded at this location were 54 dBA (daytime) and 48 dBA (night-time). Daytime levels were determined by traffic on the R545 passing at a distance of approximately 250 m and by work activities and vehicle movement on the premises. Night-time levels are determined predominantly by traffic on the R545.

Ambient levels at M6 (Residence Van den Heever)

Average daytime and night-time ambient levels recorded at this location were 49 dBA (daytime) and 45 dBA (night-time). The types of noise sources contributing to audible ambient noise are similar to those recorded at M3. Night-time levels were elevated by dogs barking. In the absence of barking, the level dropped to 41 dBA.

Ambient levels at M7 (Area south of N17 highway)

Based on probing and short duration averaging, typical daytime and night-time ambient levels in this area are 54 dBA (daytime) and 46 dBA (night-time), respectively. Levels are elevated by traffic noise on the N12 and by mining noise in the area.

Summary

The results of the survey are summarised on the map in Figure 3.1. Daytime and night-time periods are as defined in SANS 10103 (See Section 2.4.2). Detailed results of the recordings made in 10-minute intervals at all monitoring locations are presented in Appendix A.
Figure 3.1

Results of baseline survey
Average daytime (06:00 to 22:00) and night-time (22:00 to 06:00) ambient levels

<table>
<thead>
<tr>
<th>Monitoring location</th>
<th>Coordinate</th>
<th>Monitoring location</th>
<th>Coordinate</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1 Premises Rockblend</td>
<td>S25 54 18.4 E28 58 27.2</td>
<td>M4 Residence Cloete</td>
<td>S25 57 44.3 E29 01 24.7</td>
</tr>
<tr>
<td>M2 Residence Mac Donald</td>
<td>S25 57 09.9 E28 55 57.0</td>
<td>M5 Residence Truter</td>
<td>S25 59 23.7 E29 00 43.6</td>
</tr>
<tr>
<td>M3 Residence Engelbrecht</td>
<td>S25 59 51.0 E28 55 47.9</td>
<td>M6 Residence V d Heever</td>
<td>S25 54 00.0 E29 04 04.8</td>
</tr>
<tr>
<td>M7 Area south of N12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.2 Baseline ratings

In assigning baseline ambient noise ratings for the project area, the following should be borne in mind:

(a) Ambient noise levels measured in any particular survey do not represent definitive (absolute) values, but samples only of what in practice is a variable parameter. Even relatively long-duration averages of day and night ambient levels at any location will vary over time. This is in response to variances in noise source emission levels, as well as unpredictable day, night and seasonal fluctuations in atmospheric conditions.

In rural areas in particular, the level measured at any location also depends on the proximity of the recording microphone to the nearest singing birds or insects, something that cannot be controlled at all and which is bound to change from one survey to the next. Experience shows that with insects calling within 10 m distance of the microphone, night-time levels may easily rise to well above 55 dBA.

(b) The results of the survey show that ambient noise climate is homogeneous over the largest part of the project area. With the exception of M5 and M7, night-time levels vary between 37 and 43 dBA, which is in good agreement with the typical level (40 dBA) expected in accordance with SANS 10103 guidelines for this type of district. Two locations where the ambient levels are markedly higher, are M5 situated in close proximity of the R545 and M7 affected by traffic noise on the N12.

(c) For purposes of noise impact assessment, noise contours in noise impact assessments for EIA's are calculated at nominal intervals best suited for evaluation of specific locations of concern, as well as for the global study area.

With these considerations in mind, the ratings assigned to the New Largo Colliery project area are determined by rounding the levels obtained in the survey to the nearest 5 dB day or night interval of typical levels for district categories in accordance with SANS 10103 guidelines (See Table 2.4). The result is presented in Table 3.1. These are realistic best estimates of baseline ambient noise ratings for the area used to define limits in the noise impact assessment.

<table>
<thead>
<tr>
<th>Area</th>
<th>Baseline ambient noise level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L_{Aeq} (dBA)</td>
</tr>
<tr>
<td></td>
<td>L_d</td>
</tr>
<tr>
<td>Day-time</td>
<td>Night-time</td>
</tr>
<tr>
<td>All areas &gt; 500 m from the N4 and N12 highways</td>
<td>50</td>
</tr>
</tbody>
</table>
3.3 Recommended limits

3.3.1 Noise from mining operations

24-hour operation noise - Maximum impact occurs at night

Daytime intrusive noise levels created by distant industrial noise sources such as the proposed New Largo Colliery Project are as a general rule substantially lower than the levels created by the same sources at night. The reason is that typical daytime meteorological conditions result in skyward refraction of sound propagation, in contrast with downward diffraction caused by typical night-time temperature profiles (vertical gradients). During the day, most of the noise emitted by a large source does not reach the ground, while at night, both direct sound and a portion of the energy radiated skywards are focussed back to earth. This contrast between day and night levels is further accentuated by a considerable drop at night in the residual ambient level due to a decline in road traffic and human activity noise. As a consequence, not only are the levels of intrusive noise from distance sources much higher at night, but the sensitivity of the environment increases sharply, as well.

It follows that for continuous noise from a 24-hour operation, such as opencast mining, conveyors, processing plant operation and truck movements, maximum impact will occur at night and that for all practical purposes, provided the night-time impact is contained to acceptable levels, the daytime impact would not be of any consequence or concern at all.

Significant impact criterion

With reference to the principles explained in Section 2.4, a significant impact on properties bordering the New Largo Colliery Project area is deemed to occur if the specific level of an intrusive noise exceeds the existing ambient rating in Table 3.1 (deemed to be the acceptable level) by 5 dB or more. For the main study area this implies that up to 40 dBA is still considered an acceptable level for specific noise generated by the Project, while 45 dBA is deemed to be a disturbing noise resulting in a significant impact. For zones within 500 m from the N4 and N12 highways, the corresponding night-time limits are 45 dBA (acceptable) and 50 dBA (significant impact), respectively.

3.3.2 R545 road traffic noise

For reasons explained in Section 2.4.3, the ratings and criteria used to assess traffic noise with its cyclic character are different from that used for mining noise where emission at source is nominally constant and where maximum noise impact occurs at night. Instead of the night-time average rating used for assessing the impact of mining noise, traffic noise is assessed in terms of the (24-hour average) day-night rating \( L_{dn} \) which covers a full 24-hour cycle.

In the assessment of traffic noise on the relocated R545 main road, a significant impact on properties bordering the road is deemed to occur if the specific day-night level \( L_{dn} \) of traffic noise exceeds the existing day-night \( L_{dn} \) ambient rating in Table 3.1 (deemed to be the acceptable level) by 5 dB or more. For the main study area this implies that in terms of \( L_{dn} \), up to 50 dBA is still considered an acceptable level for specific noise generated by R545 road traffic, while 55 dBA is deemed to be a disturbing noise resulting in a significant impact. For zones within 500 m from the N4 and N12 highways, the corresponding night-time limits are 55 dBA (acceptable) and 60 dBA (significant impact), respectively.

Considering the differences in assessment criteria, it stands to reason that R545 traffic noise and noise from the proposed New Largo Colliery mining operation (pit and plant) cannot be combined (added together) and cannot be represented by the same noise contour on a noise map.
4 Noise impact assessment
Base Case Mine Plan 6

4.1 Noise impact – Construction phase

4.1.1 Phase 1

Construction in Phase 1 is expected to take place over a period of approximately 30 months from Nov 2012 to June 2015. It will entail general construction, the development of the first opencast box-cut in the northern section of the mining area and commissioning of one dragline to move overburden. There will be no plant construction activities during this phase.

General construction noise

Potential noise-generating construction activities in Phase 1 include:

- Construction of access road
- Topsoil stripping prior to mining
- Dragline removing overburden

Apart from road construction, only the initial site clearance and ground works which will take place at the first box-cut can be defined as construction noise. Subsequent stripping and removal of overburden will be an on-going process throughout the life of the mine. Hence, in assessing the noise impact of the project, the latter is considered to be an integral part of operational noise.

The dominant and for all practical purposes the only audible source of noise in each of the above-mentioned activities will be the diesel engines of trucks, dozers, loaders and other earth-moving equipment. Buffered by the Kusile Power Station on the western side, construction in the area at and around the first box-cut is not expected to have any noise implications in the external surroundings. General construction noise in Phase 1 will be insignificant and of no consequence.

Blasting

Drilling and blasting of overburden will occur during development of the box-cut and pit. Although it is likely to be clearly audible up to several kilometres away, it will be of short duration and is not expected to be a cause of regular or significant noise disturbance at residences on neighbouring farms and small-holdings.

4.1.2 Phase 2

Phase 2 will be commissioned in 2023 and will entail the development of the second opencast box-cut in the southern section of the mining area, commissioning of a second dragline in this southern section, as well as commissioning of a coal processing plant to process lower grade coal and coal associated with the old underground workings that will be mined from approximately 2023 onwards. Construction of the coal processing plant will take approximately 24 months and is scheduled to occur from 2021 to 2023. This means that construction in Phase 2 will coincide with Phase 1 mining operations still taking place in the northern mining area.
General construction noise

Potential noise-generating construction activities during Phase 2 include:

- Topsoil stripping prior to mining
- Drilling and blasting of overburden
- Draglines removing overburden
- Construction of the coal processing plant near Kusile Power Station

The consequences of general construction noise (stripping, site clearing and removal of overburden) in Phase 2 will be similar to those in Phase 1. An additional source of noise in Phase 2 will be site preparation and construction of the coal processing plant in close proximity, east of Kusile Power Station. Because such activities do not constitute a constant source of noise quantifiable in the same way as noise in the operational phase, noise assessment is based on qualitative considerations. Plant construction noise, by and large, is expected to occur during daytime only. Activities and equipment which can be expected to contribute to construction noise are summarised in Table 4.1.

Table 4.1

Sources of noise during construction of the coal processing plant

<table>
<thead>
<tr>
<th>Construction Activity</th>
<th>Sources of Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power generation at construction site</td>
<td>Generator set – Diesel Engine</td>
</tr>
<tr>
<td>Site preparation: Clearing, soil stripping</td>
<td>Bulldozer, loading, truck movement</td>
</tr>
<tr>
<td>Blasting</td>
<td>Air blast noise</td>
</tr>
<tr>
<td>Road works</td>
<td>Bulldozer, grader, compactor, trucks</td>
</tr>
<tr>
<td>Building construction</td>
<td>Cutting, sawing, grinding, hammering</td>
</tr>
<tr>
<td>Delivery – Equipment and materials</td>
<td>Trucks &amp; other vehicles on access road</td>
</tr>
</tbody>
</table>

Like construction noise at the first box-cut in Phase 1, plant construction noise will be buffered by the Kusile Power Station on the western side. Moreover, taking into account that the intensity of noise is relatively low and that most of the work will take place during daytime, plant construction is not expected to have any noise implications in the external surroundings.

R545 road construction

Road construction will involve the use of standard road building and earth-moving equipment, including dozers, loaders, trucks and compactors where the primary sources of noise are the diesel engines, rather than the work activities performed by the equipment. Considering that road construction by and large involves daytime operations only, noise from this activity, like tractor and vehicle noise in farming activities, is not expected to have a significant impact in the area.

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4 Construction of the Phola conveyor will be assessed in a separate noise study.
4.2 Noise impact – Operational phase

4.2.1 Worst-case assumptions

Depending on the time of day or night and on meteorological conditions in particular, noise levels produced by industrial sources over long distances vary by a considerable margin. Noise contours were derived from calculations intended to investigate probable worst-case conditions (Night-time levels and Concare model Meteorological Category 6). On average, typical levels are expected to be lower. “Probable worst-case” in the context of this study refers to levels that are higher than typical levels. Although less probable than typical levels, they are expected to occur from time to time during the course of the year, sometimes possibly for several days on end. Occurrence of worst-case conditions is not simplistically related to weather conditions and not limited to any particular season of the year.

Confidence in the predictions which are based on appropriately scaled data obtained in measurements at similar operational opencast mines, is high. It should nevertheless be cautioned that predicted noise levels and contours are not to be taken as absolute. Noise maps must be interpreted with caution. Although the confidence level in the acoustic model is high, predicted levels are valid for the assumptions made in respect of meteorological and other conditions. Since meteorological conditions in particular are highly variable, levels produced at a distance by a source at a constant acoustic output will vary considerably, even during the course of a single day-time or night-time period. Variance in noise level due to changes in atmospheric conditions increases with distance from the source. It should also be borne in mind that noise propagation is not only affected by distance and wind, but by temperature gradients in the atmosphere as well. The contours represent best estimates of continuous project activity noise levels averaged over a relatively long duration, in this case the nominal night-time period of 8 hours.

The noise impact at any location depends on wind direction. Annual average and day/night time wind roses (Kendal 2 weather station) in Figure 4.1 show that the most prevalent night-time wind direction in the New Largo Colliery study area is blowing from the east. Less frequently, it also blows from directions falling within the east-north-west sector.

It is assumed in the calculation of noise contours presenting the findings of this noise study, that Meteorological Category 6 atmospheric propagation conditions prevail at night, with the receiver situated down-wind relative to the source of noise.

Figure 4.1: Annual average and day/night time wind roses (Kendal 2 weather station)
4.2.2 Presentation of operational phase results

The operational noise footprint of the New Largo Colliery Project is presented with the aid of noise contour maps for each of Phases 1 and 2, as well as for the R545 relocation project. Noise contours delineate levels of specific project noise expected at night and were calculated for levels representing significant impacts (5 dB above the ambient level) for the main study area, for properties bordering on the mining area in particular. Specific noise means the noise produced by the project without the contribution of background ambient sound. To appreciate the significance of the various contour levels with respect to noise impact, it has to be noted first of all that if the specific level of mining noise at an observation point rises to the point where it equals the background level, the ambient level will rise by 3 dB above its initial level. This represents a noise impact of 3 dB, which is still acceptable in terms of noise regulations and SANS 10103 criteria. A significant impact is deemed to occur (See SANS 10103 criteria in Table 2.3) if the ambient level is exceeded by 5 dB or more.

There is no simple way of depicting the long-term noise impact of a project such as New Largo Colliery where one of the main noise-generating components (with its associated noise footprint) is moving all the time. Criss-crossing over a vast area, the noise footprint of the pit and dragline operation combined only matters when the group approaches or reaches the boundary of the mining zone. But even if the assessment focuses on the worst-case scenario where the moving operation is located at the boundary, the group can only be at one such location at a time, representing one out of an unlimited number of possibilities along the very long boundary. The noise footprint of the group at that location can be calculated and depicted as contours on a noise map, but to picture the long-term impact of the overall project, is not a simple task. Depiction of the impacts at multiple locations on the same map would create confusion. Depiction of the noise footprint at a series of singular locations on multiple maps would become unwieldy and difficult to read.

The method of explaining the results of the noise assessment and of picturing the impact of the project in this report is by presenting two maps for each phase of the project:

- The first map for each phase shows the noise footprint of the entire operation with the moving group positioned at singular locations P, P1, … etc. It is calculated for the worst-case condition where the recipient is down-wind relative to the source of noise.

- The second map for each phase attempts to show the long-term footprint of stationary and moving components combined.

Each map is a simplified depiction of the net footprint over the life of mine (per phase) for all possible wind directions. It is derived from the footprints of singular locations following the perimeter of the mining area and shows the locus delineated by the maximum reach of the 45 dBA noise contour if wind direction rotates through a full circle of 360°. The result is a line following the contour of the mining perimeter at a fixed distance. At or inside this contour at any location downwind from the mine, the level of general mining noise will be equal to or greater than 45 dBA, the level at which a significant impact is deemed to occur for the most sensitive and by far the largest part of the study area. Outside this contour the noise level gradually declines with distance. The level falls to below 45 dBA and the impact becomes insignificant. Moving further and further away from the mine, the level will keep falling until it is equal to and eventually lower than the background ambient noise, thus becoming completely inaudible.

Results are presented on Noise Maps 4.1-A and 4.1-B for Phase 1 and on Noise Maps 4.2-A and 4.2-B for Phase 2, respectively. Because of the different criteria used for road traffic noise assessment (See Section 3.3.2), the noise footprint of the R545 relocation options for Base Case Mine Plan 6 are shown separately on Noise Map 4.3.
4.2.3 Findings - Operational Phase Mining-related noise
Base Case Mine Plan 6 - Phase 1

A General mining noise

Summary of mining configuration and operating conditions

Phase 1 will involve opencast mining in the northern section of the New Largo Colliery coal reserve. Coal will be hauled to the crushers from where it will be dispatched directly to the Kusile Power Station. Coal will be crushed but there will be no beneficiation plant in Phase 1. Delivery of the first coal in Phase 1 is expected to commence in 2015. Mining is expected to build up to full production by 2018 and to continue until 2023.

Noise contours presented on the noise maps for Phase 1 account for all mining operations, which may be divided into a slowly moving (roaming) and a fixed group of noise generating equipment and activities, as follows:

Roaming operation

Within a short span of time (weeks or months) this group will be practically stationary, but will over the lifetime of the mine traverse at a very slow pace along strips in accordance with the mining plan. It comprises of:

- Draglines removing overburden
- Loading of overburden removed by draglines onto trucks
- Operation of bulldozers and other dragline support vehicles
- Opencast operations: drilling
- Opencast operations: excavation and loading by shovels on to trucks
- Tipping of backfill and movement of trucks on dumps located in the pit behind the pit operations
- Haulage from pit to crushers and tipping of coal

Stationary operations

- Crushing
- Coal stockpiling: coal discharge and stockpile maintenance
- Local conveyors
- Traffic noise on access roads
- Coal washing and water treatment
- Various workshops.
Findings

The significant noise impact footprint of the mine is determined by stationary operations near Kusile Power Station and by the roaming operation whenever it approaches or reaches the boundary of the mining area. To illustrate the noise impact of the mine for a typical configuration, Noise Map 4.1-A was calculated for a scenario in Phase 1 where pit and dragline operations are located at a point P along the eastern boundary of the mining area. Noise contours were calculated for night-time conditions and represent the total noise footprint of stationary and moving components combined.

The noise contours show that for a wind blowing in the direction of the receiver (in this case blowing from the west), the night-time significant noise impact footprint of the mine (delineated by the 45 dBA contour) is elongated downwind. For the moving operation, the footprint is expected to extend to a distance of roughly 1.5 km east from the boundary. This pattern of elongation in the downwind direction occurs for any wind direction and will repeat itself along the perimeter whenever pit and dragline operations are at close proximity or at the boundary of the total mining area.

The long-term consequence, taking all possible wind directions into account, is depicted by the broken line contour in Noise Map 4.1-B. Note that this is a simplified map (Please refer to Section 4.2.2) intended to give some indication of the long-term geographic extent of the project’s noise footprint. It should not be interpreted as the instantaneous condition prevailing at any given time. The practical consequences of general mining noise in Phase 1 may be summarised as follows:

Stationary operation noise

- The main sources of noise in the stationary operation are the crushers, local conveyors, trucks on the haul road and tipping. Although stockpiling is also taken into account in the calculations, its contribution to the total is negligible. The same applies to night-time traffic on the access road as well as beneficiation plant construction noise during the course of Phase 1.

- Within the 45 dBA contour where a significant impact is expected to occur, the main components of audible noise will be crushing, truck engines and tipping noises.

- The extent of the noise footprint is not a simple pattern and should be assessed by examination of the noise maps. Note that the extent of the noise-sensitive area that may be affected by noise from New Largo Colliery is greatly reduced by its location in proximity of Kusile Power Station. As well as reducing the extent of the noise-sensitive surroundings for New Largo Colliery, it also serves as a spatial buffer (creating distance) and acts as a physical barrier between New Largo Colliery operations and the nearest noise-sensitive receptors to the west.

Moving operation noise

- When removal of overburden takes place near the perimeter of the total mining area, noise from this group will have a significant night-time impact up to a distance of 1.5 km from the operation. This will be the extent of the footprint in a direction downwind from the source of noise. Statistically, during the course of any year, such down-wind conditions are likely to occur for recipients on any side of the mined area, more frequently so for recipients to the east, north and west of the mine (see wind rose in Figure 4.1).

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5 The part of the noise footprint over the mining area is of no significance or interest and is blanked out to enhance the readability of the map.
• In the moving operation, the main contribution to the overall noise footprint comes from drilling, bulldozing, loading and from diesel engine noise of all supporting equipment. The dragline, despite its extraordinary size, produces less noise than the bulldozers, drills and other equipment. This is because the large electrical machines constituting the power plant of a dragline are fully enclosed in a plant room which provides a good degree of acoustic insulation. On the outside, noise emitted from the dragline comprises primarily of fan and airflow noise emanating from the air intakes and outlets of the cooling and ventilation system. The level of this noise is controlled by fan and outlet attenuators.

• The contribution to the total level by noise coming from most of the pit operations will be negligible\(^6\). The reason is that, as the pit deepens, mining noise will be sharply attenuated by acoustic screening afforded by the pit walls. One exception is noise from truck movements and tipping at a high level on top of the dumps located inside the pit. For most of the time, however, such dumping activities will be located relatively far away from the perimeter of the mining area.

• When overburden operations are close to (less than 250 m) or at the mining boundary, residents located within the 45 dBA footprint (within approximately 1,5 km from the dragline) will under down-wind conditions at night be disturbed by noise from such operations. Most audible will be diesel engine, bulldozing and loading noises. Should drilling take place at night, it will contribute significantly to the overall noise level and to audible noise.

• There will be times when such residents will also hear bulldozing, truck movements, diesel engine and tipping noises coming from the top of waste dumps further away inside the pit. Another source of noise which should not be underestimated is reverse alarm and hooter noise. It is a common cause of noise complaints from residents near mines. It is difficult to quantify because it does not necessarily register as an increase in the measured ambient level, but is particularly audible and annoying due to its pure tone characteristics.

B Blast noise

Blasting is not included in the contours presented on the noise maps. Firstly, it involves single-event high-energy impulses which cannot be simplistically summed or combined with long-term averaged continuous machinery noise. Moreover, the inherent variability of the source rules out reliable prediction of blast noise levels. The noise output at source is highly variable, depending on pit depth, the depth of charge embedment and ore body properties. The level is also highly dependent on atmospheric and meteorological conditions. Consequently, blast levels at large distances (> 1 km) from the point of detonation are found to vary considerably for the same charge.

Because of these variances and uncertainties and because noise contour maps tend to be taken literally, no such maps were generated for blast noise.

Daily blasting will have a significant impact in the surroundings of the New Largo Colliery Project. A factor which has a strong influence on the level is the time of day (AM or PM) during which blasting takes place. Blasting during the afternoon will over large distances on average produce much lower noise levels.

\(^6\) Note that this does not include blast noise, which is considered separately.
4.2.4 Findings - Operational Phase Mining-related noise
Base Case Mine Plan 6 - Phase 2

A General mining noise

Summary of mining configuration and operating conditions

Phase 2 will be commissioned in 2023 and will involve opencast mining in the southern section of the New Largo Colliery coal reserve where a second dragline will be employed. In addition to opencast mining and all the other components already established in Phase 1, a coal processing plant will start operating to process lower grade coal and coal associated with the old underground workings that will be mined from approximately 2023 onwards. The life of New Largo Colliery is expected to last approximately 50 years.

Noise contours presented on the noise maps for Phase 2 account for all mining operations, which, as in the case of Phase 1, consist of a roaming and a fixed group of noise generating equipment and activities, as follows:

Roaming group

The roaming group is the same as in Phase 1 (See Section 4.2.3).

Stationary group

The stationary component of the New Largo Colliery mining operation will comprise of:

- Crushers
- The coal processing plant
- Coal stockpiling: coal discharge and stockpile maintenance
- Traffic noise of vehicles moving on the access road
- Coal washing and water treatment
- Various Workshops.

Findings

In essence, the findings with respect to the character of noise and the extent of impact in Phase 2 are the same as discussed in Section 4.2.3 for Phase 1. As in Phase 1, the significant noise impact footprint of the mine will be determined by stationary operations near Kusile Power Station and by the roaming operation whenever it approaches or reaches the boundary of the mining area. To illustrate the noise impact of the mine for a typical configuration, Noise Map 4.2-A was calculated for a scenario in Phase 2 where pit and dragline operations are located at a point P1 along the eastern boundary of the mining area. Noise contours were calculated for night-time conditions and represent the total noise footprint of stationary and moving components combined.

As in Phase 1, the night-time significant noise impact footprint of the mine (delineated by the 45 dBA contour) extends to a distance of roughly 1.5 km east from the boundary. The long-term consequence, taking all possible wind directions into account, is depicted by the broken line contour in Noise Map 4.2-B. By interpolation of the solid line contours calculated for the moving operation at a large number of fixed locations (P1 to P4 shown as examples only), the map illustrates how the long-term contour is derived. It is the locus demarcated by the
maximum reach of the noise footprint of the moving operation when it is near or at the boundary of the mining area. The map also shows the noise footprint of the stationary operation near Kusile Power Station. The practical consequences of general mining noise in Phase 2 may be summarised as follows:

**Stationary operation noise**

- In addition to the sources of noise included in Phase 1, Phase 2 now also introduces the beneficiation plant and its associated infrastructure.

- Within the 45 dBA contour where a significant impact is expected to occur, the main components of audible noise will be the plant, crushing, screening, truck engines and tipping noises.

- As explained in for Phase 1, the area which may be affected is greatly reduced in size and plant noise is buffered as a result of its location relative to Kusile Power Station.

**Moving operation noise**

As in Phase 1, noise from the moving operation will have a significant night-time impact up to a distance of 1.5 km from the operation. This will be the extent of the footprint in a direction down-wind from the source of noise. The discussion in Section 4.2.3 of the consequences of noise generated by the moving operation also applies in respect of Phase 2.

Despite the 1.5 km extent of the long-term impact trajectory as depicted on the noise maps, it should be borne in mind that for any given noise-sensitive location within that range, the duration of the impact of pit and overburden removal operations will be relatively short in the sense that it will approach the area and then move away after a certain time. Exposure of residents to noise from moving operations will on average be much shorter than the life of the mine.

**B Blast noise**

(Please refer to the discussion of blast noise in Section 4.2.3)
4.2.5 Findings – Traffic noise from Relocated Section of R545
Base Case Mine Plan 6

Noise Map 4.3 shows that the significant impact footprint delineated by the $L_{dn} = 55$ dBA contour is small, extending approximately 250 m on either side of the road. This is due to two factors:

(c) The relatively low baseline traffic volumes on the R545;

(d) The small rate of New Largo Colliery project trip generation due to the fact that coal will be transported by conveyor rather than road transport.

Note that apart from its contribution to the total volume of traffic, road transport of the mined product would have also distorted the characteristic profile of general road traffic. Unlike general public road traffic which declines and reaches a minimum during the night, road transport of mined product normally stays constant throughout the day and night, resulting in a much higher impact at night.

4.3 Noise impact – Decommissioning phase

Noise in the decommissioning phase will be of a similar nature, but at a lower intensity and of shorter duration compared to noise in the construction phase. Decommissioning noise will be inaudible in noise-sensitive areas and the noise impact will be negligible.

4.4 Noise impact – Closure phase

No residual noise impacts will remain after decommissioning of the mine.
Noise Maps

Base Case Mine Plan 6

Phase 1

Mining noise
Noise Map 4.1-A

New Largo Colliery Mine Plan 6 Phase 1
Mining noise only – Excluding traffic noise from relocated R545

Illustration of project noise footprint for a typical worst-case location of pit and dragline operations

Scenario: Pit and dragline operations located at the boundary of the mining area (Point P)

Project specific noise levels – Excluding background ambient noise
Night-time outdoor noise footprint

Significant impact occurs inside the 45 dBA contour
New Largo Colliery Mine Plan 6 Phase 1
Mining noise only – Excluding traffic noise from relocated R545

**Long-duration footprint for all wind directions**

The dotted line depicts the locus of the maximum extent of the 45 dBA noise contour of the moving operation over the duration of Phase 1 if the wind rotates through 360° (Receiver down-wind)

The solid contour near Kusile represents the 45 dBA noise footprint of the stationary operation
The dashed contour represents the footprint of the moving operation

Significant impact occurs inside the 45 dBA locus
Base Case Mine Plan 6

Phase 2

Mining noise
Illustration of project noise footprint for a typical worst-case location of pit and dragline operations

**Scenario:** Pit and dragline operations located at the boundary of the mining area (Point P1)

*Project specific noise levels – Excluding background ambient noise*

*Night-time outdoor noise footprint*

*Significant impact occurs inside the 45 dBA contour*
Noise Map 4.2-B

New Largo Colliery Mine Plan 6 Phase 2
Mining noise only – Excluding traffic noise from relocated R545

**Long-duration footprint for all wind directions**

The dotted line depicts the locus of the maximum extent of the 45 dBA noise contour of the moving operation over the duration of Phase 2 if the wind rotates through 360° (Receiver down-wind)

The solid contour near Kusile represents the 45 dBA noise footprint of the stationary operation
The dashed contour represents the footprint of the moving operation

Significant impact occurs inside the 45 dBA locus
Relocated Section of R545

Base Case Mine Plan 6
Noise Map 4.3

Relocated Section of R545
New Largo Colliery Mine Plan 6
Traffic noise from relocated R545

Road traffic noise levels – Excluding background ambient noise
Day-night average $L_{dn}$ outdoor noise footprint

Significant impact occurs inside the 55 dBA contour
4.5 Mitigation
Base Case Mine Plan 6

4.5.1 Mitigation - Construction noise

General construction noise

Construction noise in Phases 1 and 2 will be buffered by the Kusile Power Station on the western side. Since the intensity of noise will be relatively low and assuming that most of the work will take place during daytime, plant construction is not expected to have any noise implications in the external surroundings. It is not expected to be noticeable at noise-sensitive locations during daytime hours. Potential noise disturbance at night, should such a problem arise, can only be prevented if construction is restricted to daytime hours, i.e. by stopping all construction activities between 22:00 and 06:00.

Blast noise

To minimize the noise impact, it is recommended that blasting be scheduled to take place in the afternoon; under no circumstances during the morning hours of the day.

4.5.2 Mitigation - Operational noise

Stationary group

Because of its favourable placement and the buffering afforded by Kusile Power Station, the significant impact footprint of beneficiation plant will be a small in terms of spatial extent. An area that stands to be affected by noise from the stationary operation is the area further south of the plant which will be exposed to noise from the haul road and primary crushers.

Crusher noise should not be considered as uncontrollable. It can be and has been reduced at existing coal mines by partial enclosure and selective acoustic screening of units. The concept of noise screening applied to a typical crusher is illustrated below.

**Primary Crusher:** Example illustrating the concept of a noise reduction scheme

In the example shown, the unit is screened off on the sides from ground level up to the top of equipment on the upper platform. At the front of the lower platforms the screens could in this case be left open for operational access. In the case shown above, no roof cover was required over the screened area.
Noise screens comprise of removable acoustic panels mounted against a steel supporting framework which have to be designed for each particular case. The specific solution will depend on the specific plant size and configuration.

**Reverse alarms and truck hooters**

This noise study report cannot be prescriptive about specific measures to be implemented, considering that they may have operational and safety implications.

- The mine is advised to instruct drivers and fleet owners of trucks to use hooters in a disciplined manner for purposes of safety only, not for signalling or any other purpose. The mine should be very strict in enforcing this rule and should verify compliance.

- It should be considered to replace conventional beeping type reverse alarms (which produce a pure-tone or whistle) with buzzer types (which produce a hissing sound) on vehicles operating on the mine, waste rock dumps in particular. This measure will only be successful if implemented on all vehicles and if adherence by contractors is strictly enforced and monitored on a continual basis.

**Haul road noise - Screening by means of waste rock dumps and berms**

Construction of berms and placement of waste rock dumps along the full length of haul road routes can be an effective measure to screen off truck noise. The problem in practice, ironically, is that the trucks and bulldozers employed in the construction of such a noise barrier, for the duration of construction, generate more noise than what emanates from the noise source (haul road) which it is supposed to screen off. This is a common problem at opencast mines and lasts for as long as night-time construction of the berm continuous. This could take several months or longer.

For a berm to be effective as a noise screen, it has to be located close to the source of noise and be high and long enough to break the line-of-sight between source and receiver.

**Moving group**

As pointed out in Section 4.2.4, exposure of residents to noise from moving operations will on average be much shorter than the life of the mine. Notwithstanding, for those periods when noise-sensitive locations are within 1,5 km distance from the operation, a significant impact will be experienced. Measures that should be considered for noise reduction are:

- Temporary storage or placement of overburden and waste material on berms or dumps which can act as noise screens. For a berm to be effective as a noise screen, it has to be located close to the source of noise and be at least high and long enough to break the line-of-sight between the source of noise and the noise-sensitive receiver.

- Control of truck hooter and reverse alarm noise as explained above

**4.5.3 Mitigation – Decommissioning phase**

No mitigation will be required during decommissioning.

**4.5.4 Mitigation – Closure phase**

No mitigation will be required after decommissioning.
5 Noise impact assessment
   Base Case Mine Plan 7

5.1 Noise impact – Construction phase

5.1.1 Phase 1

Except for a slightly smaller footprint in the north-eastern corner of the mining area, construction noise generated by implementation of Mine Plan 7 will not differ from the noise generated by implementation of Mine Plan 6.

As in the case of Mine Plan 6, it will entail general construction, the development of the first opencast box-cut in the northern section of the mining area and commissioning of one dragline to move overburden. There will be no plant construction activities during this phase.

General construction noise

Potential noise-generating construction activities in Phase 1 include:

- Construction of access road
- Topsoil stripping prior to mining
- Dragline removing overburden

Apart from road construction, only the initial site clearance and ground works which will take place at the first box-cut can be defined as construction noise. Subsequent stripping and removal of overburden will be an on-going process throughout the life of the mine.

The dominant and for all practical purposes the only audible source of noise in each of the above-mentioned activities will be the diesel engines of trucks, dozers, loaders and other earth-moving equipment. Buffered by the Kusile Power Station on the western side, construction in the area at and around the first box-cut is not expected to have any noise implications in the external surroundings. General construction noise in Phase 1 will be insignificant and of no consequence.

Blasting

Drilling and blasting of overburden will occur during development of the box-cut and pit. Although it is likely to be clearly audible up to several kilometres away, it will be of short duration and is not expected to be a cause of regular or significant noise disturbance at residences on neighbouring farms and small-holdings.

5.1.2 Phase 2

Phase 2 will be commissioned in 2023 and will entail the development of the second opencast box-cut in the southern section of the mining area, commissioning of a second dragline in this southern section, as well as commissioning of a coal processing plant to process lower grade coal and coal associated with the old underground workings that will be mined from approximately 2023 onwards. Construction of the coal processing plant will take approximately 24 months and is scheduled to occur from 2020 to 2022 (for mine plan version 6). This means that construction in Phase 2 will coincide with Phase 1 mining operations still taking place in the northern mining area.
General construction noise

Potential noise-generating construction activities during Phase 2 include:

- Topsoil stripping prior to mining
- Drilling and blasting of overburden
- Draglines removing overburden
- Construction of the coal processing plant near Kusile Power Station

The consequences of general construction noise (stripping, site clearing and removal of overburden) in Phase 2 will be similar to those in Phase 1. An additional source of noise in Phase 2 will be site preparation and construction of the coal processing plant in close proximity, east of Kusile Power Station. Because such activities do not constitute a constant source of noise quantifiable in the same way as noise in the operational phase, noise assessment is based on qualitative considerations. Plant construction noise, by and large, is expected to occur during daytime only. Activities and equipment which can be expected to contribute to construction noise are summarised in Table 5.1.

**Table 5.1**

Sources of noise during construction of the coal processing plant

<table>
<thead>
<tr>
<th>Construction Activity</th>
<th>Sources of Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power generation at construction site</td>
<td>Generator set – Diesel Engine</td>
</tr>
<tr>
<td>Site preparation: Clearing, soil stripping</td>
<td>Bulldozer, loading, truck movement</td>
</tr>
<tr>
<td>Blasting</td>
<td>Air blast noise</td>
</tr>
<tr>
<td>Road works</td>
<td>Bulldozer, grader, compactor, trucks</td>
</tr>
<tr>
<td>Building construction</td>
<td>Cutting, sawing, grinding, hammering</td>
</tr>
<tr>
<td>Delivery – Equipment and materials</td>
<td>Trucks &amp; other vehicles on access road</td>
</tr>
</tbody>
</table>

Like construction noise at the first box-cut in Phase 1, plant construction noise will be buffered by the Kusile Power Station on the western side. Moreover, taking into account that the intensity of noise is relatively low and that most of the work will take place during daytime, plant construction is not expected to have any noise implications in the external surroundings.

**R545 road construction**

Road construction will involve the use of standard road building and earth-moving equipment, including dozers, loaders, trucks and compactors where the primary sources of noise are the diesel engines, rather than the work activities performed by the equipment. Considering that road construction by and large involves daytime operations only, noise from this activity, like tractor and vehicle noise in farming activities, is not expected to have a significant impact in the area.

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7 Construction of the Phola conveyor will be assessed in a separate noise study.
5.2 Noise impact – Operational phase

5.2.1 Worst-case assumptions

(See discussion and explanations Section 4.2.1)

5.2.2 Presentation of operational phase results

(See discussion and explanations Section 4.2.2)

To summarise: as for Mine Plan 6, the assessment and visualisation of the impact of the project for Mine Plan 7 is illustrated with the aid of two maps for each phase of the project:

- The first map for each phase shows the noise footprint of the entire operation with the moving group positioned at singular locations P, P1, ... etc. It is calculated for the worst-case condition where the recipient is down-wind relative to the source of noise.

- The second map for each phase attempts to show the long-term footprint of stationary and moving components combined.

Results are presented on Noise Maps 5.1-A and 5.1-B for Phase 1 and on Noise Maps 5.2-A and 5.2-B for Phase 2, respectively. Because of the different criteria used for road traffic noise assessment (See Section 3.3.2), the noise footprint of the R545 relocation option for Mine Plan 7 are shown separately on Noise Map 5.3.

5.2.3 Findings - Operational Phase Mining-related noise

Base Case Mine Plan 7 - Phase 1

A General mining noise

Summary of mining configuration and operating conditions

Phase 1 will involve opencast mining in the northern section of the New Largo Colliery coal reserve. Coal will be hauled to the crushers from where it will be dispatched directly to the Kusile Power Station. Coal will be crushed but there will be no beneficiation plant in Phase 1. Delivery of the first coal in Phase 1 is expected to commence in 2015. Mining is expected to build up to full production by 2018 and to continue until 2023.

Noise contours presented on the noise maps for Phase 1 account for all mining operations, which may be divided into a slowly moving (roaming) and a fixed group of noise generating equipment and activities, as follows:

Roaming operation

Within a short span of time (weeks or months) this group will be practically stationary, but will over the lifetime of the mine traverse at a very slow pace along strips in accordance with the mining plan. It comprises of:

- Draglines removing overburden
- Loading of overburden removed by draglines onto trucks
- Operation of bulldozers and other dragline support vehicles
- Opencast operations: drilling
- Opencast operations: excavation and loading by shovels on to trucks
- Tipping of backfill and movement of trucks on dumps located in the pit behind the pit operations
- Haulage from pit to crushers and tipping of coal

**Stationary operations**
- Crushing
- Coal stockpiling: coal discharge and stockpile maintenance
- Local conveyors
- Traffic noise on access roads
- Coal washing and water treatment
- Various workshops.

**Findings**
Except for a slightly smaller footprint in the north-eastern corner of the mining area, operational noise generated by implementation of Mine Plan 7 will not differ from the noise generated by implementation of Mine Plan 6.

The significant noise impact footprint of the mine is determined by stationary operations near Kusile Power Station and by the roaming operation whenever it approaches or reaches the boundary of the mining area. To illustrate the noise impact of the mine for a typical configuration, Noise Map 5.1-A was calculated for a scenario in Phase 1 where pit and dragline operations are located at a point P along the eastern boundary of the mining area. Noise contours were calculated for night-time conditions and represent the total noise footprint of stationary and moving components combined.

The noise contours show that for a wind blowing in the direction of the receiver (in this case blowing from the west), the night-time significant noise impact footprint of the mine (delineated by the 45 dBA contour) is elongated down-wind. For the moving operation, the footprint is expected to extend to a distance of roughly 1.5 km east from the boundary. This pattern of elongation in the downwind direction occurs for any wind direction and will repeat itself along the perimeter whenever pit and dragline operations are at close proximity or at the boundary of the total mining area.

The long-term consequence, taking all possible wind directions into account, is depicted by the broken line contour in Noise Map 5.1-B. Note that this is a simplified map (Please refer to Section 5.2.2) intended to give some indication of the long-term geographic extent of the project’s noise footprint. It should not be interpreted as the instantaneous condition prevailing at any given time. The practical consequences of general mining noise in Phase 1 may be summarised as follows:

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8 The part of the noise footprint over the mining area is of no significance or interest and is blanked out to enhance the readability of the map.
Stationary operation noise

- The main sources of noise in the stationary operation are the crushers, local conveyors, trucks on the haul road and tipping. Although stockpiling is also taken into account in the calculations, its contribution to the total is negligible. The same applies to night-time traffic on the access road as well as beneficiation plant construction noise during the course of Phase 1.

- Within the 45 dBA contour where a significant impact is expected to occur, the main components of audible noise will be crushing, truck engines and tipping noises.

- The extent of the noise footprint is not a simple pattern and should be assessed by examination of the noise maps. Note that the extent of the noise-sensitive area that may be affected by noise from New Largo Colliery is greatly reduced by its location in proximity of Kusile Power Station. As well as reducing the extent of the noise-sensitive surroundings for New Largo Colliery, it also serves as a spatial buffer (creating distance) and acts as a physical barrier between New Largo Colliery operations and the nearest noise-sensitive receptors to the west.

Moving operation noise

Except for a slightly smaller footprint in the north-eastern corner of the mining area, operational noise generated by implementation of Mine Plan 7 will not differ from the noise generated by implementation of Mine Plan 6.

- When removal of overburden takes place near the perimeter of the total mining area, noise from this group will have a significant night-time impact up to a distance of 1.5 km from the operation. This will be the extent of the footprint in a direction down-wind from the source of noise. Statistically, during the course of any year, such down-wind conditions are likely to occur for recipients on any side of the mined area, more frequently so for recipients to the east, north and west of the mine (see wind rose in Figure 5.1).

- In the moving operation, the main contribution to the overall noise footprint comes from drilling, bulldozing, loading and from diesel engine noise of all supporting equipment. The dragline, despite its extraordinary size, produces less noise than the bulldozers, drills and other equipment. This is because the large electrical machines constituting the power plant of a dragline are fully enclosed in a plant room which provides a good degree of acoustic insulation. On the outside, noise emitted from the dragline comprises primarily of fan and airflow noise emanating from the air intakes and outlets of the cooling and ventilation system. The level of this noise is controlled by fan and outlet attenuators.

- The contribution to the total level by noise coming from most of the pit operations will be negligible. The reason is that, as the pit deepens, mining noise will be sharply attenuated by acoustic screening afforded by the pit walls. One exception is noise from truck movements and tipping at a high level on top of the dumps located inside the pit. For most of the time, however, such dumping activities will be located relatively far away from the perimeter of the mining area.

- When overburden operations are close to (less than 250 m) or at the mining boundary, residents located within the 45 dBA footprint (within approximately 1.5 km from the dragline) will under down-wind conditions at night be disturbed by noise from such operations. Most audible will be diesel engine, bulldozing and loading noises. Should drilling take place at night, it will contribute significantly to the overall noise level and to audible noise.

Note that this does not include blast noise, which is considered separately.
• There will be times when such residents will also hear bulldozing, truck movements, diesel engine and tipping noises coming from the top of waste dumps further away inside the pit. Another source of noise which should not be underestimated is reverse alarm and hooter noise. It is a common cause of noise complaints from residents near mines. It is difficult to quantify because it does not necessarily register as an increase in the measured ambient level, but is particularly audible and annoying due to its pure tone characteristics.

**B Blast noise**

Blasting is not included in the contours presented on the noise maps. Firstly, it involves single-event high-energy impulses which cannot be simplistically summed or combined with long-term averaged continuous machinery noise. Moreover, the inherent variability of the source rules out reliable prediction of blast noise levels. The noise output at source is highly variable, depending on pit depth, the depth of charge embedment and ore body properties. The level is also highly dependent on atmospheric and meteorological conditions. Consequently, blast levels at large distances (> 1 km) from the point of detonation are found to vary considerably for the same charge.

Because of these variances and uncertainties and because noise contour maps tend to be taken literally, no such maps were generated for blast noise.

Daily blasting will have a significant impact in the surroundings of the New Largo Colliery Project. A factor which has a strong influence on the level is the time of day (AM or PM) during which blasting takes place. Blasting during the afternoon will over large distances on average produce much lower noise levels.
5.2.4 Findings - Operational Phase Mining-related noise
Base Case Mine Plan 7 - Phase 2

A General mining noise

Summary of mining configuration and operating conditions

Phase 2 will be commissioned in 2023 and will involve opencast mining in the southern section of the New Largo Colliery coal reserve where a second dragline will be employed. In addition to opencast mining and all the other components already established in Phase 1, a coal processing plant will start operating to process lower grade coal and coal associated with the old underground workings that will be mined from approximately 2023 onwards. The life of New Largo Colliery is expected to last approximately 50 years.

Noise contours presented on the noise maps for Phase 2 account for all mining operations, which, as in the case of Phase 1, consist of a roaming and a fixed group of noise generating equipment and activities, as follows:

Roaming group

The roaming group is the same as in Phase 1 (See Section 5.2.3).

Stationary group

The stationary component of the New Largo Colliery mining operation will comprise of:

- Crushers
- The coal processing plant
- Coal stockpiling: coal discharge and stockpile maintenance
- Traffic noise of vehicles moving on the access road
- Coal washing and water treatment
- Various Workshops.

Findings

In essence, the findings with respect to the character of noise and the extent of impact in Phase 2 are the same as discussed in Section 5.2.3 for Phase 1. As in Phase 1, the significant noise impact footprint of the mine will be determined by stationary operations near Kusile Power Station and by the roaming operation whenever it approaches or reaches the boundary of the mining area. To illustrate the noise impact of the mine for a typical configuration, Noise Map 5.2-A was calculated for a scenario in Phase 2 where pit and dragline operations are located at a point P1 along the eastern boundary. Noise contours were calculated for night-time conditions and represent the total noise footprint of stationary and moving components combined.

As in Phase 1, the night-time significant noise impact footprint of the mine (delineated by the 45 dBA contour) extends to a distance of roughly 1.5 km east from the boundary. The long-term consequence, taking all possible wind directions into account, is depicted by the broken line contour in Noise Map 5.2-B. By interpolation of the solid line contours calculated for the moving operation at a large number of fixed locations (P1 to P4 shown as examples only), the map illustrates how the long-term contour is derived. It is the locus demarcated by the
maximum reach of the noise footprint of the moving operation when it is near or at the boundary of the mining area. The map also shows the noise footprint of the stationary operation near Kusile Power Station. The practical consequences of general mining noise in Phase 2 may be summarised as follows:

**Stationary operation noise**

Except for a slightly smaller footprint in the north-eastern corner of the mining area, operational noise generated by implementation of Mine Plan 7 will not differ from the noise generated by implementation of Mine Plan 6.

- In addition to the sources of noise included in Phase 1, Phase 2 now also introduces the beneficiation plant and its associated infrastructure.

- Within the 45 dBA contour where a significant impact is expected to occur, the main components of audible noise will be the plant, crushing, screening, truck engines and tipping noises.

- As explained in for Phase 1, the area which may be affected is greatly reduced in size and plant noise is buffered as a result of its location relative to Kusile Power Station.

**Moving operation noise**

Except for a slightly smaller footprint in the north-eastern corner of the mining area, operational noise generated by implementation of Mine Plan 7 will not differ from the noise generated by implementation of Mine Plan 6.

As in Phase 1, noise from the moving operation will have a significant night-time impact up to a distance of 1,5 km from the operation. This will be the extent of the footprint in a direction down-wind from the source of noise. The discussion in Section 5.2.3 of the consequences of noise generated by the moving operation also applies in respect of Phase 2.

Despite the 1,5 km extent of the long-term impact trajectory as depicted on the noise maps, it should be borne in mind that for any given noise-sensitive location within that range, the duration of the impact of pit and overburden removal operations will be relatively short in the sense that it will approach the area and then move away after a certain time. Exposure of residents to noise from moving operations will on average be much shorter than the life of the mine.

**B Blast noise**

(Please refer to the discussion of blast noise in Section 5.2.3)
5.2.5 Findings – Traffic noise from Relocated Section of R545
Base Case Mine Plan 7

From a noise perspective, there is practically no difference between the noise footprints of traffic on the relocated section of the R545 for Mine Plan 7 versus Mine Plan 6.

Noise Map 5.3 shows that the significant impact footprint delineated by the $L_{dn} = 55$ dBA contour is small, extending approximately 250 m on either side of the road. This is due to two factors:

(e) The relatively low baseline traffic volumes on the R545;

(f) The small rate of New Largo Colliery project trip generation due to the fact that coal will be transported by conveyor rather than road transport.

Note that apart from its contribution to the total volume of traffic, road transport of the mined product would have also distorted the characteristic profile of general road traffic. Unlike general public road traffic which declines and reaches a minimum during the night, road transport of mined product normally stays constant throughout the day and night, resulting in a much higher impact at night.

5.3 Noise impact – Decommissioning phase

Noise in the decommissioning phase will be of a similar nature, but at a lower intensity and of shorter duration compared to noise in the construction phase. Decommissioning noise will be inaudible in noise-sensitive areas and the noise impact will be negligible.

5.4 Noise impact – Closure phase

No residual noise impacts will remain after decommissioning of the mine.
Noise Maps

Base Case Mine Plan 7

Phase 1

Mining noise
Illustration of project noise footprint for a typical worst-case location of pit and dragline operations

**Scenario:** Pit and dragline operations located at the boundary of the mining area (Point P)

Project specific noise levels – Excluding background ambient noise
Night-time outdoor noise footprint

Significant impact occurs inside the 45 dBA contour
Noise Map 5.1-B

New Largo Colliery Mine Plan 7 Phase 1
Mining noise only – Excluding traffic noise from relocated R545

Long-duration footprint for all wind directions

The dotted line depicts the locus of the maximum extent of the 45 dBA noise contour of the moving operation over the duration of Phase 1 if the wind rotates through 360° (Receiver down-wind)

The solid contour near Kusile represents the 45 dBA noise footprint of the stationary operation
The dashed contour represents the footprint of the moving operation

Significant impact occurs inside the 45 dBA locus
Base Case Mine Plan 7

Phase 2

Mining noise
Noise Map 5.2-A

New Largo Colliery Mine Plan 7 Phase 2
Mining noise only – Excluding traffic noise from relocated R545

Illustration of project noise footprint for a typical worst-case location of pit and dragline operations

**Scenario:** Pit and dragline operations located at the boundary of the mining area (Point P1)

Project specific noise levels – Excluding background ambient noise
Night-time outdoor noise footprint

Significant impact occurs inside the 45 dBA contour
Noise Map 5.2-B

New Largo Colliery Mine Plan 7 Phase 2
Mining noise only – Excluding traffic noise from relocated R545

**Long-duration footprint for all wind directions**

The dotted line depicts the locus of the maximum extent of the 45 dBA noise contour of the moving operation over the duration of Phase 2 if the wind rotates through 360° (Receiver down-wind)

The solid contour near Kusile represents the 45 dBA noise footprint of the stationary operation
The dashed contour represents the footprint of the moving operation

Significant impact occurs inside the 45 dBA locus
Relocated Section of R545

Base Case Mine Plan 7
Noise Map 5.3

Relocated Section of R545  
New Largo Colliery Mine Plan 7  
Traffic noise from relocated R545

Road traffic noise levels – Excluding background ambient noise  
Day-night average $L_{dn}$ outdoor noise footprint

Significant impact occurs inside the 55 dBA contour
5.5 Mitigation
Base Case (Mine Plan 7)

5.5.1 Mitigation - Construction noise

General construction noise

Construction noise in Phases 1 and 2 will be buffered by the Kusile Power Station on the western side. Since the intensity of noise will be relatively low and assuming that most of the work will take place during daytime, plant construction is not expected to have any noise implications in the external surroundings. Construction noise is not expected to be noticeable at noise-sensitive locations during daytime hours. Potential noise disturbance at night, should such a problem arise, can only be prevented if construction is restricted to daytime hours, i.e. by stopping all construction activities between 22:00 and 06:00.

Blast noise

To minimize the noise impact, it is recommended that blasting be scheduled to take place in the afternoon; under no circumstances during the morning hours of the day.

5.5.2 Mitigation - Operational noise

Stationary group

Because of its favourable placement and the buffering afforded by Kusile Power Station, the significant impact footprint of beneficiation plant will be small in terms of spatial extent. An area that stands to be affected by noise from the stationary operation is the area further south of the plant which will be exposed to noise from the haul road and primary crushers.

Crusher noise should not be considered as uncontrollable. It can be and has been reduced at existing coal mines by partial enclosure and selective acoustic screening of units. The concept of noise screening applied to a typical crusher is illustrated in Section 4.5.2.

Reverse alarms and truck hooters

This noise study report cannot be prescriptive about specific measures to be implemented, considering that they may have operational and safety implications.

- The mine is advised to instruct drivers and fleet owners of trucks to use hooters in a disciplined manner for purposes of safety only, not for signalling or any other purpose. The mine should be very strict in enforcing this rule and should verify compliance.

- It should be considered to replace conventional beeping type reverse alarms (which produce a pure-tone or whistle) with buzzer types (which produce a hissing sound) on vehicles operating on the mine, waste rock dumps in particular. This measure will only be successful if implemented on all vehicles and if adherence by contractors is strictly enforced and monitored on a continual basis.

Haul road noise - Screening by means of waste rock dumps and berms

Construction of berms and placement of waste rock dumps along the full length of haul road routes can be an effective measure to screen off truck noise. The problem in practice, ironically, is that the trucks and bulldozers employed in the construction of such a noise barrier, for the duration of construction, generate more noise than what emanates from the noise source (haul road) which it is supposed to screen off. This is a common problem at
opencast mines and lasts for as long as night-time construction of the berm continuous. This could take several months or longer.

For a berm to be effective as a noise screen, it has to be located close to the source of noise and be high and long enough to break the line-of-sight between source and receiver.

**Moving group**

As pointed out in Section 5.2.4, exposure of residents to noise from moving operations will on average be much shorter than the life of the mine. Notwithstanding, for those periods when noise-sensitive locations are within 1,5 km distance from the operation, a significant impact will be experienced. Measures that should be considered for noise reduction are:

- Temporary storage or placement of overburden and waste material on berms or dumps which can act as noise screens. For a berm to be effective as a noise screen, it has to be located close to the source of noise and be at least high and long enough to break the line-of-sight between the source of noise and the noise-sensitive receiver.

- Control of truck hooter and reverse alarm noise as explained above

**5.5.3 Mitigation – Decommissioning phase**

No mitigation will be required during decommissioning.

**5.5.4 Mitigation – Closure phase**

No mitigation will be required after decommissioning.
6 Summary of noise impact implications
Mine Plans 6 and 7

To the best of the information available and the accuracy of noise prediction methods, the noise impact implications of the New Largo Colliery Project are as summarised in Tables 6.1-A and 6.1-B (Mine Plan 6) and Tables 6.2-A and 6.2-B (Mine Plan 7).

From construction to full operation of the proposed mining development and relocation of the R545, noise generated by implementation of Mine Plan 7 differs from that of Mine Plan 6 in that it produces a slightly smaller footprint in the north-eastern corner of the mining area. The significance of this small difference will depend on the number of dwellings enclosed within the small additional noise zone created by the Mine Plan 6 noise footprint.

Validity of impact ratings and the findings of the study may be summarised as follows:

<table>
<thead>
<tr>
<th>Adequacy of predictive methods and tools used</th>
<th>Adequacy of underlying assumptions</th>
<th>Uncertainties in information provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise predictions are based on internationally accepted and proven Concave method</td>
<td>Sufficient information was available for acoustic modelling of mining and plant noise</td>
<td>The configuration and layout of pit operations, dumping and removal of overburden will not always be the same and the operation will roam over a very large area. Notwithstanding, it was possible to estimate with sufficient accuracy the extent of the noise footprint outside the boundary of the mining area. The effect of uncertainties is relatively small and does not compromise the validity of the significance ratings of impacts or the main findings of the study</td>
</tr>
</tbody>
</table>

Confidence in the predictions, to the extent that the current design information is valid, is high.
Table 6.1

Mining-related noise impact implications of the New Largo Colliery Project – Mine Plan 6 Phases 1 and 2

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Activity</th>
<th>Before Mitigation</th>
<th>After Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Magnitude</td>
<td>Duration</td>
</tr>
<tr>
<td>Mine and Plant</td>
<td>Overburden removal Plant &amp; Road construction</td>
<td>Minor</td>
<td>Medium Term</td>
</tr>
<tr>
<td></td>
<td>Blasting</td>
<td>Moderate</td>
<td>Short Term</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational Phase</td>
<td>Pit operations &amp; Haul road</td>
<td>Moderate</td>
<td>Long Term</td>
</tr>
<tr>
<td></td>
<td>Plant Crushers Washing Screening</td>
<td>Major</td>
<td>Long Term</td>
</tr>
<tr>
<td></td>
<td>Plant Infrastructure Draglines</td>
<td>Dismantling</td>
<td>Short Term</td>
</tr>
<tr>
<td></td>
<td>Infrastructure</td>
<td>No residual noise</td>
<td>Minor</td>
</tr>
</tbody>
</table>

Construction phase

Operational Phase

Decommissioning Phase

Closure Phase
Table 6.2
Mining-related noise impact implications of the New Largo Colliery Project – Mine Plan 7 Phases 1 and 2

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Activity</th>
<th>Activity (additional details)</th>
<th>Before Mitigation</th>
<th>After Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Magnitude</td>
<td>Duration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction phase</td>
<td>Minor</td>
<td>Medium</td>
</tr>
<tr>
<td>Mine and Plant</td>
<td>Overburden removal Plant &amp; Road construction</td>
<td>Moderate</td>
<td>Short Term</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>Blasting</td>
<td>Operational Phase</td>
<td>Moderate</td>
<td>Long Term</td>
</tr>
<tr>
<td></td>
<td>Pit operations &amp; Haul road</td>
<td>Major</td>
<td>Long Term</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>Crushers Washing Screening</td>
<td>Minor</td>
<td>Short Term</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>Infrastructure Draglines</td>
<td>Minor</td>
<td>Short Term</td>
<td>Local</td>
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<tr>
<td></td>
<td>Dismantling</td>
<td>Minor</td>
<td>Short Term</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>No residual noise</td>
<td>Minor</td>
<td>Short Term</td>
<td>Local</td>
</tr>
</tbody>
</table>
### Table 6.3

Road traffic noise impact implications of the proposed relocation of the R545 – Mine Plans 6 and 7

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Activity</th>
<th>Before Mitigation</th>
<th>After Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Magnitude</td>
<td>Duration</td>
</tr>
<tr>
<td>R545 Section Relocated</td>
<td>Road construction works</td>
<td>Minor</td>
<td>Medium</td>
</tr>
<tr>
<td>Relocated section of R545</td>
<td>Road Traffic</td>
<td>Moderate</td>
<td>Long</td>
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<tr>
<td>R545</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R545</td>
<td></td>
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</tbody>
</table>
7 Cumulative noise impacts

This section considers the cumulative noise impact of the proposed New Largo Colliery project in conjunction with other existing and developments in the area. To that end, a summary is first given of the findings discussed earlier in this report regarding the existing noise climate and the impacts expected from the New Largo Colliery development.

7.1 Existing noise climate

The proposed New Largo Colliery development will be located in a district where the character of ambient noise is to some extent determined by industrialisation and economic activity which over time has resulted in an increase in the background ambient level. Prior to commencement of the New Largo Colliery development, existing impact sources include the following:

- Small-scale mining activities scattered over the area which contribute to machinery, truck and road traffic noise;
- Agricultural activities where the main sources of noise are tractor diesel engines.
- Road traffic noise emanates from the N4 and N12 highways, the R545 provincial road, as well as from other secondary roads. The N4 and N12 highways have a significant effect on the ambient level within a zone of approximately 500 m from the road. Although traffic volumes on the R545 are low, traffic on the total road infrastructure collectively elevates the ambient level over most of the project area to about 5 dB above what is considered typical for a Rural Area in terms of SANS 10103 guidelines.

In terms of SANS 10103 guidelines (See Table 2.3) the area falls in the category between Rural and Urban, described as “Suburban – With little road traffic”. As such, one would expect typical ambient levels in the area to be in the order of 50 dBA (daytime) and 40 dBA nighttime, respectively. These are average equivalent continuous levels averaged over the corresponding day or night periods. The corresponding day-night level L_{dn} (see Section 2.4.2 and Table 2.3.) used for assessment of road traffic noise is 50 dBA.

7.2 Significant impact criteria

In terms of assessment criteria derived from SANS 10103 guidelines a significant noise impact at any location would occur if the specific level of an intrusive noise exceeds the existing ambient rating by 5 dB or more. The criteria for the rating and assessment of general mining noise on the one hand and road traffic noise on the other hand, are different and may be summarised as follows:

**General industrial and mining-related noise**

A significant impact occurs if the specific level of an intrusive noise exceeds the existing ambient rating by 5 dB or more. For the main study area this implies that 45 dBA is deemed to be a disturbing noise resulting in a significant night-time impact.

**Traffic noise from the proposed relocated section of the R545**

In the assessment of traffic noise on the relocated R545 main road, a significant impact on properties bordering the road is deemed to occur if the specific day-night level L_{dn} of traffic noise exceeds the existing day-night L_{dn} ambient rating by 5 dB or more. For the main study
area this implies that in terms of $L_{dn}$, 55 dBA is deemed to be a disturbing noise resulting in a significant impact over a 24 hour period.

7.3 **Noise impacts from New Largo Colliery**

As discussed in Chapters 4 and 5, this noise study finds that the proposed New Largo Colliery project is expected to have the following noise implications:

**Mining-related activities**

The proposed New Largo Colliery mining operation will comprise a roaming group (open-cast mining operations) and a fixed noise component (processing plant and haul roads). Noise contour maps presented in this report show contours delineating the significant noise impact footprints of the roaming and fixed components for Phases 1 and 2 of Mine Plans 6 and 7. For both Mine Plan 6 and 7 the noise impacts may be summarised as follows:

- **Roaming opencast operations**: Opencast pit operations will produce a 45 dBA footprint (significant noise impact) of approximately 1.5 km from the centre of activity. This footprint will be moving all the time, criss-crossing the mining area. Only when it reaches the perimeter of mining area will the noise footprint extend the full 1.5 km into the external environment. Hence the impact and the noise-sensitive targets that stand to be affected will vary all the time. At any given time, however, the expected impact can be described as localised.

- **Fixed operations (plant and haul roads)**: The significant noise impact footprint of the plant is approximately 2 km wide to the east and 2 km wide to the west of the plant. This footprint is of very little consequence to residents in the larger study area, because it impinges largely on the New Largo Colliery mining area on the eastern side and on the Kusile Power Station site on the western side.

  Haul road noise will have a significant impact footprint up to a distance of approximately 1 km from the road and is more likely to affect residents to the south of the New Largo plant. The primary sources of potentially disturbing noise emanating from the haul road will be the diesel engines of trucks, load tipping and reverse hooters.

**Relocation of a section of the R545 public road**

The significant impact footprint delineated by the $L_{dn}$ = 55 dBA contour is small, extending approximately 250 m on either side of the road. The small impact is due to two factors:

(a) The relatively low baseline traffic volumes on the R545;

(b) The small rate of New Largo Colliery project trip generation due to the fact that coal will be transported by conveyor rather than road transport.

7.4 **Future impacts expected from other developments**

**Proposed Phola-Kusile coal conveyor**

AAIC is proposing to construct an overland conveyor system, the Phola-Kusile Overland Coal Conveyor, to transport coal from the Phola Coal Processing Plant to Eskom's Kusile Power Station currently under construction. A noise study conducted by Acusolv [6], found that along the proposed route, the conveyor is expected to have a significant noise impact footprint extending to a distance of 450 m from the conveyor. Conveyor noise can be mitigated to reduce the footprint to 250 m. Hence, with or without mitigation, the noise impact of the Phola-Kusile Conveyor is localised with a small footprint.
Kusile Power Station

Kusile Power Station currently under construction, is located approximately 2 km west of the proposed New Largo Colliery plant. As such, it will occupy a large part of and will therefore reduce the size of the area to the west of New Largo Colliery that would otherwise have constituted a noise-sensitive target area for the proposed New Largo Colliery project.

A noise study for Kusile Power Station has been conducted by Jongens Keet Associates [7]. Presumably because it was not required, the report does not quantify and visually illustrate the expected noise impacts by means of noise contour maps as calculated in the New Largo noise study (this report). The report does find however, that the Kusile Power Station is expected to have a 46 dBA footprint inside a radius of approximately 3 km.

7.5 Cumulative impacts

7.5.1 Synthesis of impacts

Cumulative impact of Kusile Power Station and Phola-Kusile Conveyor

The respective significant noise impact footprints of Kusile Power Station and the Phola-Kusile Conveyor will only overlap inside the boundaries of the Kusile and the New Largo Colliery sites where no people will be living in the future. Kusile Power Station will create a significant noise footprint with an approximate radius of 3 km around the power station, while the Phola Kusile conveyor will affect a 250 m strip either side of the conveyor route in a different area. In other words, each development will create its own sphere of influence adding to the size of the overall impacted area in the district, yet without the two impacts overlapping anywhere on the same noise-sensitive terrain. Nowhere will the impact experienced by any person living in the area be significantly elevated by both developments.

Cumulative impact of New Largo Colliery – Stationary operations

Interface of stationary New Largo Colliery operations with Kusile Power Station: As in the case of the Phola-Kusile Conveyor, the respective impacts of stationary operations in the proposed New Largo Colliery operation and that of Kusile Power Station will only overlap inside the boundaries of the Kusile and the New Largo Colliery sites. It will not overlap in areas where people will be living in the future. The cumulative impact of the two developments at noise-sensitive locations in the study area will be negligible.

Interface of stationary New Largo Colliery operations with Phola-Kusile Conveyor: A measureable cumulative impact by New Largo Colliery and the Phola-Kusile Conveyor can be expected where the conveyor route approaches the plant along the haul road to the south of the plant. The magnitude of the cumulative impact is not constant and will depend on the distances of houses from either of the two sources of noise. Any house which at the same time is located within 250 m from the conveyor and 2 km from the haul road will experience specific impacts of 5 dB from each component resulting in a cumulative impact of 8 dB (the energy-based sum of two equal noise levels is equal to the individual source level plus 3 dB).

Cumulative impact of New Largo Colliery – Roaming operations

Interface of New Largo Colliery roaming operations with Kusile Power Station: With the roaming component of the New Largo Colliery operation continually moving across a large area, the potential cumulative impact will vary over time. Nowhere will the respective impacts of New Largo opencast operations and Kusile Power Station overlap in areas where people will be living in the future.
Interface of New Largo Colliery roaming operations with Phola-Kusile Conveyor: A measurable cumulative impact by New Largo Colliery opencast operations and the Phola-Kusile Conveyor can be expected where the moving opencast operation approaches the conveyor route. The magnitude of the cumulative impact will depend on the distances of houses from either of the two sources of noise. Over most of the life-of-mine the cumulative impact will be negligible. Only when the opencast operation approaches the conveyor will any house located both within a distance of 250 m from the conveyor and 1.5 km from the haul road experience specific impacts of 5 dB from each component. This would then result in a cumulative impact of 8 or dB or more.

Cumulative impact of relocated R545

Relocation of a section of the R545 will not result in a significant cumulative impact. The reason is that the small significant noise footprint of the road, which only extends about 250 m on either side of the road, will not overlap with that of the mining operation. The small road noise impact is due to two factors:

(c) The relatively low baseline traffic volumes on the R545;

(d) The small rate of New Largo Colliery project trip generation due to the fact that coal will be transported by conveyor rather than road transport.

Caution

It should be cautioned that the specific impacts of the various components are all localised to the respective project areas and cannot simply be summed and interpreted as a cumulative impact on the entire study area. Kusile Power Station only significantly elevates the ambient level in its own surroundings (3 km radius), with only a small physical overlap with the Phola-Kusile footprint and with the future New Largo project area. Phola-Kusile Conveyor only elevates the ambient level along a small zone (450 m unmitigated, 250 m mitigated) along the conveyor route. Over the largest part of the New Largo Colliery study area, the power station and the conveyor will not overlap and will not contribute to a cumulative elevation of the background ambient noise level in the noise study area. Moreover, what is not readily quantifiable, is that the implementation of the New Largo Colliery project will result in localised noise reductions and relief to the nearest residents due to cessation of some existing small-scale noise-generating mining operations scattered over the area.

By and large, the overall cumulative impact over the largest part of the study area will be the same as the specific impact of New Largo Colliery.
8 Monitoring programme

Construction phase

Noise during the construction phase is not expected to be audible at any of the noise-sensitive locations in the study area. No noise monitoring is required.

Operational phase

(a) A noise survey should be carried out shortly before and immediately after mining commences.

(b) Measure noise levels at reference points in the area most likely to be effected, selected on basis of a scoping assessment carried out prior to commencement of mining.

(c) Measure the A-weighted equivalent continuous noise level in a sequence of 10-minute intervals covering a period of preferably 24 hours, but at least the night-time period from 22:00 to 06:00.

(d) Process the data and determine the increase in ambient level caused by plant or opencast noise.

(e) Assess the noise impact of the mine and present the findings in a report. If applicable, make recommendations for steps required to mitigate excessive noise.

(f) On account of the findings of the survey, advise on the necessity for additional commissioning surveys and the procedures to follow.

(g) Monitoring locations and procedures for annual surveys must be revised prior to each survey and taking the findings of previous surveys into account.

(h) Equipment, calibration and measurement procedures must comply with the requirements laid down in SANS 10103.

Decommissioning phase

Noise during the commissioning phase is not expected to be audible at any of the noise-sensitive locations in the study area. No noise monitoring is required.

Closure phase

Noise during the closure phase is not expected to be audible at any of the noise-sensitive locations in the study area. No noise monitoring is required.
9 References


[3] SANS 10103: The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication.


Ben van Zyl MSc (Eng) PhD
Acoustical Engineer
Appendix A

Noise survey complete data sets
Figure A.1  Monitoring Point  M1  Premises Rockblend (Nelson)  14 to 15 Jun-2011

- Chart showing sound pressure level in dBA over time for Monitoring Point M1 at Premises Rockblend (Nelson) between 14 to 15 June 2011.
Figure A.2  Monitoring Point M2  Residence Mac Donald  14 to 15 Jun-2011

![Graph showing sound pressure level over time at Monitoring Point M2 for Residence Mac Donald between 14 and 15 June 2011.](image-url)
Figure A.3  Monitoring Point  M3  Residence Engelbrecht  20 to 21 Jun-2011

Sound Pressure Level dBA

M3 Engelbrecht

Time

12:00  13:00  14:00  15:00  16:00  17:00  18:00  19:00  20:00  21:00  22:00  23:00  00:00  01:00  02:00  03:00  04:00  05:00  06:00  07:00  08:00  09:00  10:00
Figure A.4  Monitoring Point  M4  Residence Cloete  20 to 21 Jun-2011
Figure A.5  Monitoring Point M5  Residence Truter  21 to 22 Jun-2011

Sound Pressure Level dBA

M5 Truter

Time

14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00
Appendix B

Curriculum Vitae

Barend Gideon van Zyl - ID No 4605105089082
P O Box 70 596, Die Wilgers, 0041; 542 Verkenner Ave, Die Wilgers, Pretoria

Qualifications

<table>
<thead>
<tr>
<th>Institution</th>
<th>Year Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) BSc (Eng) Elec University of Pretoria</td>
<td>1970</td>
</tr>
<tr>
<td>(2) BSc (Eng) Hon Elec University of Pretoria</td>
<td>1972</td>
</tr>
<tr>
<td>(3) MSc (Eng) (Cum Laude) University of Pretoria</td>
<td>1974</td>
</tr>
<tr>
<td>(4) PhD University of Natal</td>
<td>1986</td>
</tr>
</tbody>
</table>

MSc thesis: Sound intensity vector measurement
PhD thesis: Sound transmission analysis by measurement of sound intensity vector

Professional registration and membership

- Southern African Acoustics Institute Fellow (President 1994) Member since 1974

Career

CSIR 1971 – 1989
- Undertake basic and applied acoustic research & development projects;
- Pioneer technique and instrumentation for measurement of sound intensity vector, leading to sponsored research & consulting work in the Netherlands (TNO 1978) and Denmark (Brüel & Kjaer 1981).
- Acoustic consulting engineering services rendered in the fields of building acoustics, industrial noise control, acoustic materials development & environmental acoustics.

Advena 1989 – 1990
- SA Space Programme: Manager Systems Integration & Environmental Test Laboratories;
- Design and commissioning of ultra-high noise level simulation facilities for endurance testing of rocket launch vehicles, spacecraft, satellites, instrumentation and payload.

SABS 1991 – 1994
- Acoustic consulting engineering services rendered to industry
- Building acoustics, industrial noise control and environmental acoustics.

Private Practice Since 1995
- Private practice - Sole proprietor - Acoustic consulting engineering
- Noise studies; Environmental noise surveys; Blast noise measurement & assessment
- Design & problem solving: Building acoustics, Industrial & machinery noise reduction, Vehicle noise reduction (road, rail & air)
- Specialised services: Theoretical analysis & design of multi-layered acoustic panels.
- SABS Laboratory & field testing: Building systems and materials, Equipment & machinery noise

Papers and publications

- Several papers presented at international congresses and symposia.
- Several papers published in international acoustic journals, such as Journal of the Acoustical Society of America; Applied Acoustics; Noise Control Engineering Journal.

Other

- Part-time lecturer: Architectural acoustics, Department of Architecture, University of Pretoria;
- Associate of and specialist advisor to SABS Laboratory for Sound and Vibration
Practice Profile

**Sole Proprietor:** Dr Ben van Zyl

Practicing since 1995.

An independent sole proprietor acoustic consulting engineering practice with in-house expertise and experience in various acoustic disciplines, including building acoustics, noise impact studies, industrial noise control, test and evaluation and acoustic materials development. Based in Pretoria South Africa, specialist services have been rendered throughout the RSA, as well as in the United Kingdom, Taiwan, Pakistan, Madagascar, Mauritius and Botswana.

Equipped with state-of-the-art acoustic measuring instruments employed in noise monitoring surveys, measurement of blast noise, laboratory and field testing of systems and materials and as an aid in the investigation and solving of noise problems.
### Examples of projects

**Acoustic Field:** Noise studies

<table>
<thead>
<tr>
<th>Project</th>
<th>For</th>
<th>Aspects</th>
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<tr>
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<td>Swartland</td>
<td>Centurus</td>
<td>Residential and commercial development - traffic</td>
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<td>Mapoche II</td>
<td>Marlin Granite</td>
<td>Quarry Impact study: Blasting, opencast mining</td>
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<td>Delmas Extension; mining dev</td>
<td>Ingwe Coal Corp</td>
<td>Noise study – Plant, conveyors, trains, roads</td>
</tr>
<tr>
<td>Twistdraai new access roads</td>
<td>Sasol Coal</td>
<td>Noise study – Roads, conveyors</td>
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<td>Bosjespruit shaft ventilation fans</td>
<td>Sasol Coal</td>
<td>Noise study; shaft &amp; ventilation fan noise rural area</td>
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<td>Hillendale new mining development</td>
<td>Iscor Heavy Minerals</td>
<td>Noise study – Plant, road transport</td>
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<td>Iscor Heavy Minerals</td>
<td>Noise study – Large processing plant</td>
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<td>Rooiwater mining development</td>
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<td>Noise study – Plants, road &amp; rail transport</td>
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<td>Conveyors: Analyse sources of conveyor noise</td>
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<td>Gibb Africa</td>
<td>Noise study peer review: trains, slurry pipe</td>
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<td>Transvaal Suiker Bpk</td>
<td>Noise study &amp; Design for noise reduction</td>
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<td>Noise policy &amp; resources plan</td>
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<td>Parkdev</td>
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<td>V Z de Villiers</td>
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<td>Elmar College Pretoria</td>
<td>Iscor Pension Fund</td>
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<td>Dept Public Works</td>
<td>Noise impact design for control - Plant rooms</td>
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<td>Bulkrans</td>
<td>Noise study &amp; Design for noise control</td>
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<td>Country Lane Dev</td>
<td>Land use planning – Road traffic noise impact</td>
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<td>Randburg Water Front</td>
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<td>Advisor &amp; specialist court witness</td>
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<td>Syferfontein overlain conveyor</td>
<td>Sasol Coal</td>
<td>Noise impact as function of idler properties</td>
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<td>Twistdraai East mining noise</td>
<td>Sasol Coal</td>
<td>Mitigation of noise impact on neighbouring farm</td>
</tr>
<tr>
<td>Little Loftus – The Rest Nelspruit</td>
<td>TAP de Beer</td>
<td>Sports bar - Impact study</td>
</tr>
<tr>
<td>Blast noise</td>
<td>Somchem</td>
<td>Blast noise impact assess &amp; design noise control</td>
</tr>
<tr>
<td>Syferfontein overlain conveyor</td>
<td>Sasol Coal</td>
<td>Noise impact as function of conveyor design</td>
</tr>
<tr>
<td>Leeuwpan Mine Delmas district</td>
<td>Iscor/Ticor</td>
<td>Noise study – Plant noise, loading</td>
</tr>
<tr>
<td>Fairbreeze opencast mine KwaZulu</td>
<td>Iscor/Ticor</td>
<td>Noise study – Open cast mining; plant, transport</td>
</tr>
<tr>
<td>Brandspruit mine</td>
<td>Sasol</td>
<td>Noise study - Ventilation fan noise rural area</td>
</tr>
<tr>
<td>Irene Ext 47</td>
<td>Irene Land Dev Corp</td>
<td>Noise study - Mixed development; road traffic noise</td>
</tr>
<tr>
<td>Irene Ext 55</td>
<td>Irene Land Dev Corp</td>
<td>Noise study - Residential; road traffic noise</td>
</tr>
<tr>
<td>Lynnwood filling station &amp; car wash</td>
<td>Town Planning Hub</td>
<td>Noise study; Filling station &amp; car wash in residential</td>
</tr>
<tr>
<td>Lyttleton 190</td>
<td>Ferero</td>
<td>Noise study: Residential next to N1 highway</td>
</tr>
<tr>
<td>Twistdraai N-East Mine shaft</td>
<td>Sasol Mining</td>
<td>Noise study; shaft &amp; ventilation fan noise rural area</td>
</tr>
</tbody>
</table>
### Acoustic Field: Noise studies (Continued)

<table>
<thead>
<tr>
<th>Project</th>
<th>For</th>
<th>Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wesput opencast mine</td>
<td>Petmin</td>
<td>Noise study: Blasting, excavation &amp; transport</td>
</tr>
<tr>
<td>Gedex opencast mine</td>
<td>Petmin</td>
<td>Noise study: Open cast excavation &amp; transport</td>
</tr>
<tr>
<td>Kensington college</td>
<td>Centurus</td>
<td>Noise study: Sport grounds, roads</td>
</tr>
<tr>
<td>Spandow mine shaft</td>
<td>Sasol Mining</td>
<td>Noise study: shaft &amp; ventilation fan noise rural area</td>
</tr>
<tr>
<td>Twistdraai Central Mine Shaft</td>
<td>Sasol Mining</td>
<td>Noise study: shaft &amp; ventilation fan noise rural area</td>
</tr>
<tr>
<td>Addington Hospital</td>
<td>Dellen Oudkerk</td>
<td>Equipment outdoor noise impact &amp; mitigation</td>
</tr>
<tr>
<td>Fourways Gardens Country Club</td>
<td>Fourways Gardens</td>
<td>Music noise impact assess &amp; design for mitigation</td>
</tr>
<tr>
<td>Irene Ext 29</td>
<td>Irene Land Dev Corp</td>
<td>Noise study: New township &amp; highway noise</td>
</tr>
<tr>
<td>Pick 'n Pay Warehouse Meadowbrook</td>
<td>Pick 'n Pay</td>
<td>Truck movement &amp; loading: Assessment</td>
</tr>
<tr>
<td>Irene Sports Academy</td>
<td>Centurus</td>
<td>Impact assessment: Sports grounds &amp; road traffic</td>
</tr>
<tr>
<td>Jameson substation transformer</td>
<td>ETekwini Municipal</td>
<td>Transformer noise: Assess &amp; design mitigation</td>
</tr>
<tr>
<td>Eugene Marais Hospital</td>
<td>Eugene Marais Hosp</td>
<td>Plantroom &amp; outdoor equipment impact &amp; mitigate</td>
</tr>
<tr>
<td>Klipspruit mine wash plant</td>
<td>Billiton &amp; DRA</td>
<td>Coal wash plant infra-sound: design for mitigation</td>
</tr>
<tr>
<td>Eagle Quarry</td>
<td>Mapochs Action</td>
<td>Quarry new application: peer review</td>
</tr>
<tr>
<td>Blast Test Facility Somchem</td>
<td>Denel</td>
<td>Blast noise impact: assess &amp; design for mitigation</td>
</tr>
<tr>
<td>Virgin Active Sandton Gym</td>
<td>Virgin Active</td>
<td>Aerobics, squash &amp; equipment: assess &amp; mitigate</td>
</tr>
<tr>
<td>Conveyor noise study</td>
<td>Bateman</td>
<td>Overland conveyor noise: Causes &amp; parameters</td>
</tr>
<tr>
<td>Zuid Afrikaans Hospital</td>
<td>Z A Hospital</td>
<td>Chiller outdoor noise: design for mitigation</td>
</tr>
<tr>
<td>K54 Road</td>
<td>Tshwane</td>
<td>Noise Study: Future road through residential</td>
</tr>
<tr>
<td>PWV6 Road</td>
<td>Gautrans</td>
<td>Noise Study: Future highway noise contours</td>
</tr>
<tr>
<td>Zandfontein mine shaft</td>
<td>Sasol Mining</td>
<td>Noise Study: Mine shaft &amp; fan noise outdoor impact</td>
</tr>
<tr>
<td>Pierre van Rynveld Ext 24</td>
<td>Van Vuuren Dev</td>
<td>Noise study: New township &amp; highway noise</td>
</tr>
<tr>
<td>PFG Glass new float plant</td>
<td>PFG Glass</td>
<td>Noise study: Future plant noise in residential area</td>
</tr>
<tr>
<td>Sterkfontein residential development</td>
<td>M&amp;T</td>
<td>Noise study: Road noise impact mitigation</td>
</tr>
<tr>
<td>Sasol future Irenedale mine</td>
<td>Sasol</td>
<td>Noise study: Prediction of shaft &amp; conveyor noise</td>
</tr>
<tr>
<td>Ammunition demolition</td>
<td>SA Army</td>
<td>Noise study: Long distance noise impact assess</td>
</tr>
<tr>
<td>Rietvlei Ridge residential development</td>
<td>M&amp;T</td>
<td>Noise study: Road noise impact mitigation</td>
</tr>
<tr>
<td>Mooiplaats / Hoekplaats</td>
<td>Chieftain</td>
<td>Noise study: Road noise impact mitigation</td>
</tr>
<tr>
<td>Sasol Syferfontein conveyor</td>
<td>Bateman</td>
<td>Noise study: Noise complaints from farmers</td>
</tr>
<tr>
<td>Madagascar Toliara Sands</td>
<td>Exxaro</td>
<td>Noise study: Future mining, plant, transport</td>
</tr>
<tr>
<td>Rooipoort Mine</td>
<td>Sasol Mining</td>
<td>Noise study: Mining and conveyor noise</td>
</tr>
<tr>
<td>Vlakplaats</td>
<td>Quantum</td>
<td>Noise study: Residential development</td>
</tr>
<tr>
<td>Polokwane 2010 Soccer stadium</td>
<td>Africon</td>
<td>Noise study: Stadium noise in residential area</td>
</tr>
<tr>
<td>New Clydesdale colliery</td>
<td>Exxaro</td>
<td>Noise study: Open cast mining, blasting and plant</td>
</tr>
<tr>
<td>Grootfontein ventilation shaft</td>
<td>Sasol Mining</td>
<td>Noise study: Ventilation shaft &amp; surface fan</td>
</tr>
<tr>
<td>Cicada Pycna mating call study</td>
<td>Anglo Platinum</td>
<td>Cicada mating call – Mining noise interference</td>
</tr>
<tr>
<td>Weltevreden ventilation shaft</td>
<td>Sasol Mining</td>
<td>Noise study: Ventilation shaft &amp; surface fan</td>
</tr>
<tr>
<td>Leandra North new colliery</td>
<td>Ingwe</td>
<td>Noise study: Mining development</td>
</tr>
<tr>
<td>PTM new platinum mine</td>
<td>PTM Platinum</td>
<td>Noise study: Mining development</td>
</tr>
<tr>
<td>Lyttleton X191</td>
<td>Pro-Direct</td>
<td>Noise study, new residential development</td>
</tr>
<tr>
<td>Barking noise nuisance</td>
<td>Vd Merwe</td>
<td>Barking noise measurements, specialist report</td>
</tr>
</tbody>
</table>
**Acoustic Field:** Noise studies (Continued)

<table>
<thead>
<tr>
<th>Project</th>
<th>For</th>
<th>Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanggatfontein</td>
<td>Exxaro/Metago</td>
<td>Noise study: Open-cast mine</td>
</tr>
<tr>
<td>Forfar clay mining extension</td>
<td>Forfar/Zimbiwe</td>
<td>Noise study: Open-cast clay mining operations</td>
</tr>
<tr>
<td>Luhfereng Doringkop development</td>
<td>Bigen</td>
<td>Noise study: Mixed development, train noise</td>
</tr>
<tr>
<td>K113 Road noise study</td>
<td>Heartland/Bokamoso</td>
<td>Noise study: Road, mixed development</td>
</tr>
<tr>
<td>Eland Mine</td>
<td>Extrata/Metago</td>
<td>Noise study: New access road for product transport</td>
</tr>
<tr>
<td>Sheraton Hotel</td>
<td>Pan Pacific Property</td>
<td>Noise study: Hotel impact on residential area</td>
</tr>
<tr>
<td>Sishen Infrastructure Relocation</td>
<td>Kumba/Synergistics</td>
<td>Noise study: Railway route options evaluation</td>
</tr>
<tr>
<td>Tharisa Mine noise monitoring</td>
<td>Tharisa/Metago</td>
<td>Baseline noise monitoring surveys</td>
</tr>
<tr>
<td>Sishen Mine baseline monitoring</td>
<td>Kumba/Synergistics</td>
<td>Baseline noise monitoring surveys</td>
</tr>
<tr>
<td>Sishen Mine Protea discard dump</td>
<td>Kumba/Synergistics</td>
<td>Discard dump location - Noise screening assess</td>
</tr>
<tr>
<td>Eastplats</td>
<td>Barplats/Metago</td>
<td>Noise study: New vertical shaft</td>
</tr>
<tr>
<td>Inyanda Mine noise disturbance</td>
<td>Exxaro</td>
<td>Noise surveys: Noise complaints investigation</td>
</tr>
<tr>
<td>Irenedale Mine commissioning</td>
<td>Sasol Mining</td>
<td>Noise Monitoring: New shaft operational phase</td>
</tr>
<tr>
<td>Honey Ridge indoor shooting range</td>
<td>Insul-Coustic</td>
<td>Design for noise reduction</td>
</tr>
<tr>
<td>Sishen Mine expansion project 2</td>
<td>Kumba/Synergistics</td>
<td>Noise study: New processing plant Sishen mine</td>
</tr>
<tr>
<td>Sishen Mine noise monitoring</td>
<td>Kumba/Synergistics</td>
<td>Peer review: Baseline survey</td>
</tr>
<tr>
<td>Sishen Mine new 10 MTon plant</td>
<td>Kumba/AGES</td>
<td>Noise study: New 10 MTon processing plant</td>
</tr>
<tr>
<td>Khameni Kalkfontein/Tamboti Mine</td>
<td>Khameni/Metago</td>
<td>Noise study: New opencast mine and plant</td>
</tr>
<tr>
<td>Exxaro Kalbasfontein/Tamboti Mine</td>
<td>Exxaro</td>
<td>Noise survey: Assess impact of railway loud-out</td>
</tr>
<tr>
<td>Sishen Mine Lylyveld development</td>
<td>Kumba/EGES</td>
<td>Noise study: New opencast mine &amp; transport</td>
</tr>
<tr>
<td>Haasfontein new opencast mine</td>
<td>Exxaro/Synergistics</td>
<td>Noise study: New underground mine + conveyor</td>
</tr>
<tr>
<td>Westlake mixed development</td>
<td>Heartland/SEF</td>
<td>Noise study: New urban mixed development</td>
</tr>
<tr>
<td>Marlboro road M60</td>
<td>Heartland/SEF</td>
<td>Noise study: New road traffic noise modelling</td>
</tr>
<tr>
<td>Driefontein Mine</td>
<td>Goldfields</td>
<td>Noise scoping assessment and recommendations</td>
</tr>
<tr>
<td>Bokfontein Chrome Mine</td>
<td>Hernic/Metago</td>
<td>Noise study: New furnaces and beneficiation plant</td>
</tr>
<tr>
<td>Eland opencast mine extensions</td>
<td>Extrata/Metago</td>
<td>Noise study: Open cast mine extensions</td>
</tr>
<tr>
<td>Tharisa Mine EMP noise monitoring</td>
<td>Tharisa/Metago</td>
<td>EMP noise monitoring survey 1</td>
</tr>
<tr>
<td>Dragline noise reduction Kriel</td>
<td>Anglo Coal</td>
<td>Dragline noise – Design for noise reduction</td>
</tr>
<tr>
<td>Ivory Coast noise studies</td>
<td>Metago</td>
<td>Peer review</td>
</tr>
<tr>
<td>Eskom Grootvlei Power Station</td>
<td>Insul-Coustic</td>
<td>Design for noise reduction - internal</td>
</tr>
<tr>
<td>Inyanda Mine</td>
<td>Exxaro</td>
<td>Design for plant noise reduction - enviromental</td>
</tr>
</tbody>
</table>