Relocation of Acacia and Port Rex Gas Turbines to Ankerlig Power Station

Noise Impact Assessment

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GLOSSARY OF TERMS

Acoustics: The science of sound.

Ambient Noise: The distinctive acoustical characteristics of a given area consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition.

Attenuation: The reduction of noise.

A-Weighting: A method used to alter the sensitivity of a sound level meter with respect to frequency, so that the instrument is less sensitive at frequencies where the human ear is less sensitive. Also written as dBA.

Decibel or dB: Fundamental unit of sound, defined as ten times the logarithm of the ratio of the sound pressure squared over the reference pressure squared.

Frequency: The measure of the rapidity of alterations of a periodic acoustic signal, expressed in cycles per second or Hertz.

Hard Ground: An acoustically reflecting surface, such as concrete, most other paving materials and water. Contrasts with ‘soft ground’.

L_{eq}: Equivalent or energy-averaged sound level.

Noise Contour: Lines plotted on maps or drawings connecting points of equal sound levels.

Noise: Unwanted sound.

Noise-sensitive receptor: Location where noise can interrupt ongoing activities and can result in community annoyance, especially in residential areas. These areas may include schools, libraries, hospitals, residences, retirement communities and nursing homes as examples of noise-sensitive receptors.

Receiver/Receptor: A stationary far-field position at which noise levels are specified via measurement or calculated via a noise model.

Soft Ground: Acoustically absorbent surface, such as grass, or tilled earth, which attenuates sound propagating over it, notably for points near the ground. See also ‘hard ground’.

Sound Power: The total sound energy radiated by a source per second.

Sound Pressure Level: The amplitude of the changes in pressure level of a sound wave, measured in either pressure units (Pa) or using the decibel logarithmic reference scale.

Study Area: Refers to the entire study area as indicated on the study area map.

1 INTRODUCTION

Savannah Environmental (Pty) Ltd has appointed DDA in order to provide input regarding noise for the Environmental Impact Assessment (EIA) phase of the relocation and commissioning of four existing Aero Derivative Gas Turbine units to the Ankerlig Power Station, located in Atlantis Industrial. Three units are to be relocated from the Acacia Power Station (situated near Goodwood) and one unit from Port Rex (situated near East London).

1.1 Terms of Reference

The main aims of the noise study are to estimate the overall noise increase due to the relocation and determine the contribution of the operational noise emissions to the current noise levels in the area. Secondly, to assess compliance with guidelines along the boundaries, as well as in the surrounding community. Therefore, the study will cover the:

- Establishment of existing noise levels around the Ankerlig Power Station site and at selected communities.
- Identification of all potential noise-sensitive receptors that could be impacted upon by activities relating to operation of the proposed development.
- Development of a 3-dimensional noise model that represents the various scenarios.
- Estimation of resulting noise levels due to the relocation.
- Assessment of the impacts based on comparisons of the resulting noise levels against relevant standards and guidelines. The cumulative effect of existing noise levels will be taken into consideration in the impact assessment.
- Recommendations regarding noise mitigation procedures and measures, if proven to be necessary.

1.2 Study Area

The Ankerlig Power Station is situated on the western side of the Atlantis Industrial Zone (see Figure 1-1). This area is located 7 km inland from the Cape West Coast, approximately 40 km north of Cape Town. The existing Ankerlig Power Station is approximately 10 km northeast of Eskom’s Koeberg Nuclear Power Station.

Potentially sensitive receptors within the study area include:

- The residential township of Atlantis;
- The informal settlement of Witzand;

• Open farmlands around the power station site.

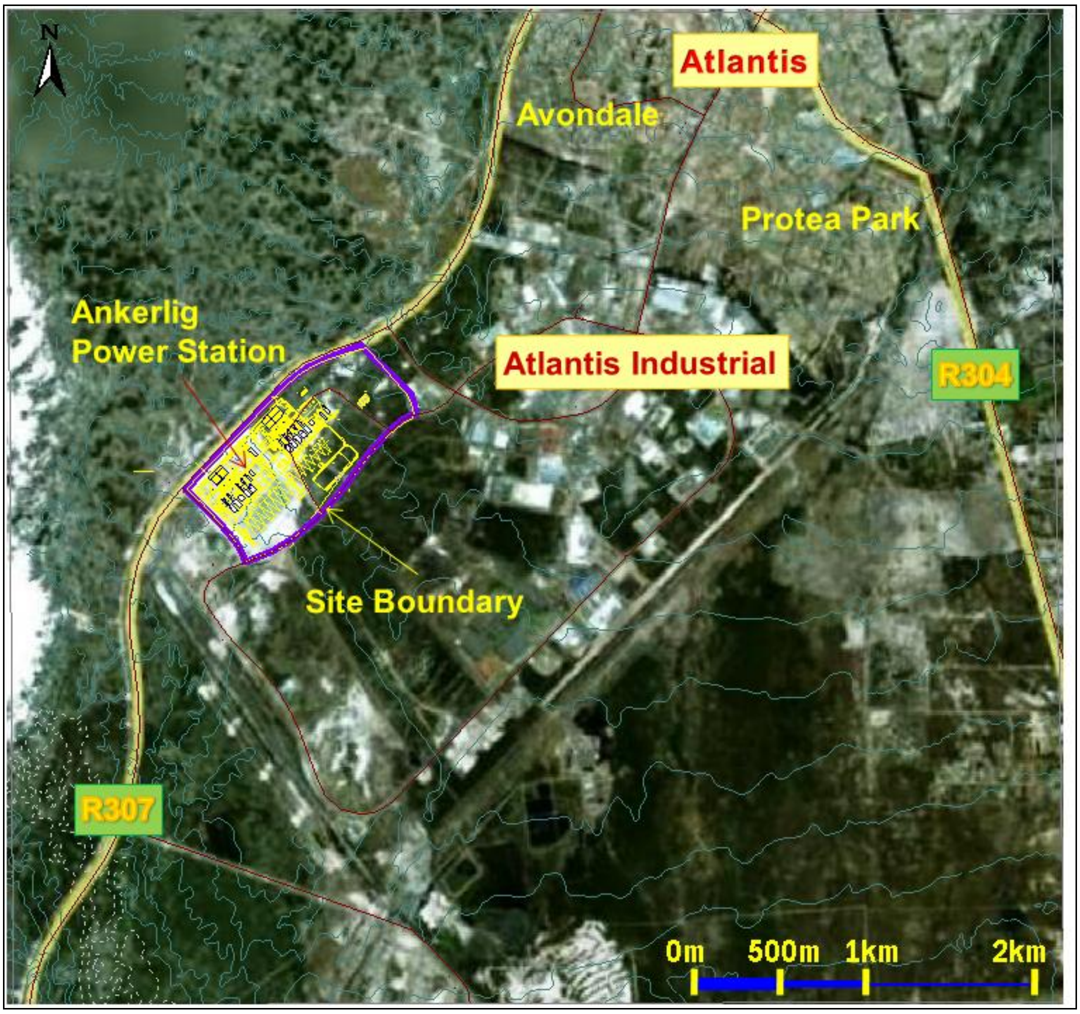

Figure 1-1. Locality Map

2 STUDY APPROACH AND ASSESSMENT METHODOLOGY

The study approach incorporated ambient noise measurements around the site during daytime and night-time, noise measurements at the Acacia units, noise modelling of the existing Ankerlig Power Station, noise modelling of the relocated units, as well as modelling of the cumulative effects of all units combined. Figure 2-1 below shows the location of the Ankerlig Power Station's existing open cycle gas turbine (OCGT) units and the Acacia relocation position.

The noise modelling results of the proposed relocation, as well as the cumulative results were utilised for the determination of the noise levels and the impact assessment in the surrounding areas.

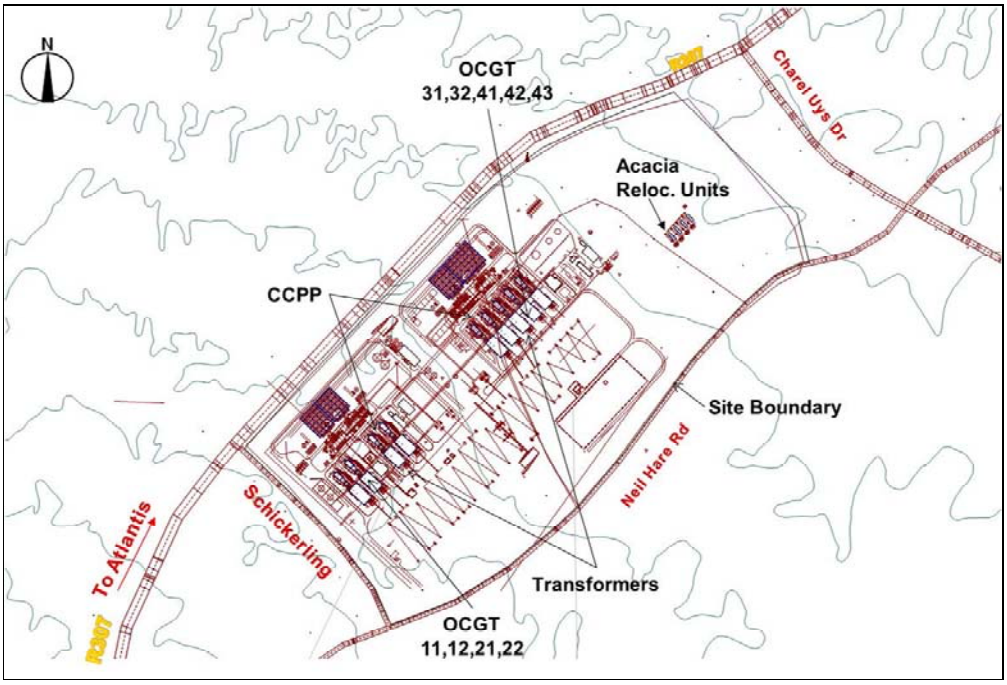

Figure 2-1. Site Layout

2.1 Noise Measurements

Noise measurements were performed for the establishment of the noise levels around the Atlantis Power Station, as well as at the closest noise-sensitive receptor to the site, i.e. Avondale. The ambient measurements were performed intermittently over two days, i.e. the 8th and 9th of April, which covered the daytime as well as night-time periods.

Three noise monitoring locations were selected. The first was positioned on the northern border of the site, the second within the Atlantis community, in the closest position to the power station, and the third on the western side of the site, towards the West Coast Biosphere Reserve. These locations are indicated as monitoring points MP1, MP2 and MP3 in Figure 2-2 below.

The measurement location was chosen for the following reasons:

- Easily definable and with easy future access in case of need for comparison measurements during construction and after completion of the project.
- Relevant to the concerns of potentially affected parties.

Details of the monitoring positions, the noise measurement datasheets and photographs of the locations can be found in APPENDIX A.

Additional measurements were performed at the Acacia Power Station around each generator, as well as at variable distances from the units. These measurements were then utilised for the determination of the sound power of the units, in order to be utilised in the noise modelling of the relocation.

All measurements were carried out in accordance with:

- The SOUTH AFRICAN NATIONAL STANDARD - Code of Practice, SANS 10103:2008, The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication;
- The regulations of the DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM. NO. R. 154. Noise Control Regulations in Terms of Section 25 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989). Govt. Gaz. No. 13717, 10 January 1992.

Figure 2-2. Locations of the Ambient Noise Monitoring Points

The measurements were performed with a 01dB, Type 1, Data-logging Precision Impulse Integrating Sound Level Meter SIP95 (see Table 2.1). The Sound Level Meter was calibrated before and after each measurement session with a 01dB Calibrator CAL21, Type 1, 94dB, 1 kHz. The above-mentioned equipment, i.e. sound level meter and calibrator, have valid calibration certificates from the testing laboratories of De Beer Calibration Services and comply with the following international standards:

- IEC 651 & 804 – Integrating sound level meters.
- IEC 942 – Sound calibrators.

Table 2.1: Sound Level Measurement Instrumentation

Instrument	Type	Serial No
1. Precision Integrating Sound Level Meter	01dB SIP 95	10741
1a. Microphone	01dB MK 250	3857
1b. 1/3rd Octave Band Filter	01dB Real Time Digital Filter	10741
2. Field Calibrator	01bB CAL 01 S	40182

The continuous A-weighted equivalent sound pressure levels (L_{Aeq}) of at least a 10-minute duration were taken. Abnormal disturbances, such as loud noise generation in close proximity or sudden noise bursts that affect the measurement, were discarded. In addition, the occurring maximum (L_{max}) and minimum levels (L_{min}) during the measurement period, as well as the L_{90} were also recorded.

All the noise measurements were performed in compliance with the weather condition requirements as specified by the SANS Codes. Therefore, measurements were not performed in the presence of fog, rain, wind with a steady speed exceeding 5 ms^{-1} or wind with gusts exceeding 10 ms^{-1}. The wind speed was monitored at each location with a portable meter capable of measuring the wind in meters per second. Additional meteorological parameters, such as temperature, humidity and barometric pressure were also recorded.

2.2 Noise Modelling

The noise modelling approach included estimations of the noise levels within and around the site for all the stages of the proposed development. In addition, noise levels were estimated at several discrete receptors, positioned around the site boundaries and noise-sensitive locations. These estimations were performed via the internationally accepted prediction software package CadnaA (Computer Aided Noise Abatement). The latter was selected for the following specific reasons:

- It provides an integrated environment for noise predictions under varying scenarios of operation.
- The cumulative effects of various sources can be estimated in a three-dimensional environment.
- The ground elevations around the entire site can be entered into the model, and their screening effects can be taken into consideration.

- The noise propagation influences of the meteorological parameters of a specific area can also be accounted for.
- It provides noise barrier optimisation in terms of location, height, type and absorbent material coverage.

CadnaA has been utilised in many countries in the European Union (EU) and the USA for the modelling of environmental noise and town planning. It is comprehensive software for 3-dimensional calculations, presentation, assessment and prediction of environmental noise, covering noise emissions of industrial plants, parking lots, roads, railway schemes or entire towns and urbanized areas.

The CadnaA currently incorporates more than 30 international implemented standards and guidelines. The selected standards to be utilised in the Apollo Brick noise modelling study are the recommended computational methods in the EC Directive on Environmental Noise 2002/49/EC for noise emission and noise propagation estimations.

2.2.1 Noise Emission Sources

The relocation of the Acacia and Port Rex Power Stations will introduce additional noise sources to the Ankerlig Power Station. These noise sources are (refer to Figure 2-3):

- the diesel generator enclosures;
- the fan coolers;
- the stacks;
- the electricity transformers.

For the noise modelling, it was assumed that the Port Rex units are similar to the Acacia units.

The sound power of all the sources utilised in the noise modelling, including the existing units, the combined cycle units and the relocated units can be seen in APPENDIX B.

For the scenarios pertaining to the existing Ankerlig units, the sound power of the nine open cycle equipment was obtained from the Siemens Report W7P/2005/031. The tables with the sound power from this report are included in APPENDIX E.

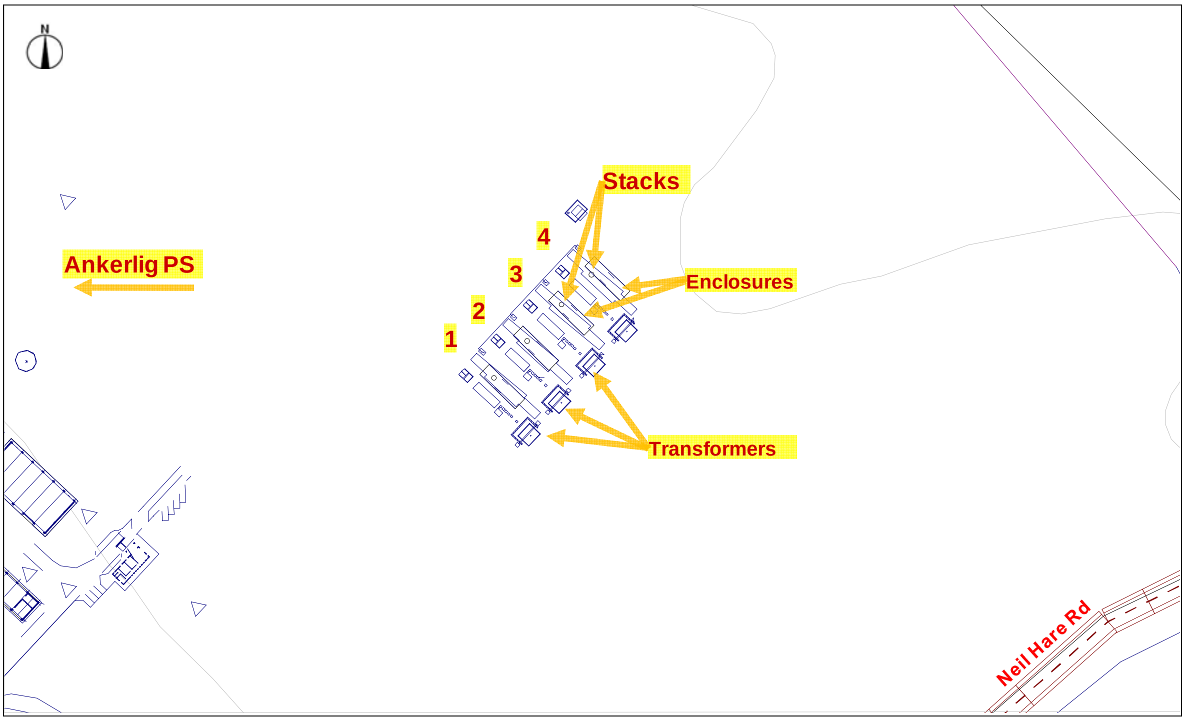

Figure 2-3. Acacia and Port Rex Units

The sound power of the proposed combined cycle equipment was provided by the design engineers Black & Veatch (B&V). The sound emission information tables can be found in APPENDIX F. Some of the combined cycle power plant equipment, such as the heat recovery steam generators, boilers, etc. will be placed within appropriately designed noise enclosures, in order to reduce the noise emissions to the environment and ensure compliance with relevant legislation and guidelines.

Details of the existing and proposed combined cycle Ankerlig units can be found in the DDA report No ATNIA-220908 of September 2008.

2.2.2 Main Noise Modelling Assumptions and Modelling Scenarios

The main assumptions utilised in the modelling were:

- For the noise propagation, the ground was considered partially noise-reflective.
- No mitigation measures in place, other than the existing ones applied to the open cycle units and the primary measures to the combined cycle units.
- Wind speed and direction favourable to the receivers.
- Daytime temperature and humidity 25°C and 60% respectively.
- Night-time temperature and humidity 12°C and 80% respectively.

- The sound power of the Port Rex unit was assumed to be similar to that of the Acacia units.

The ground elevations and the screening of noise due to buildings were both taken into consideration in the modelling. The existing and proposed relocation plant layout were digitised and introduced into the model. An example of the resulting three-dimensional representation of the proposed development in the CadnaA model is shown in the following Figure 2-4.

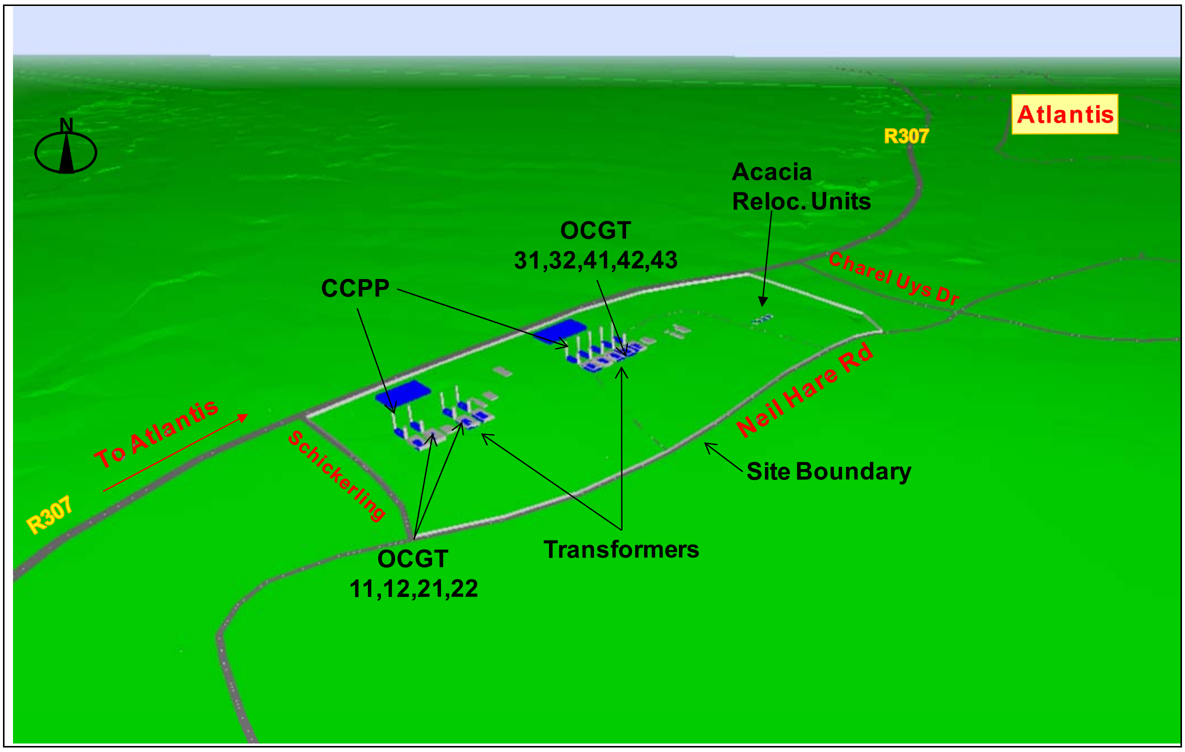

Figure 2-4. Three-Dimensional Representation of the Ankerlig Power Station with the Acacia and Port Rex Relocation Units

For comparison purposes, the future noise levels around the site were estimated for the following 4 scenarios:

Scenario 1: Existing Situation: Open Cycle Gas Turbine units (9 units).

Scenario 2: Acacia and Port Rex relocation: Aero Derivative Gas Turbine units (4 units).

Scenario 3: Existing Situation + Relocation units.

Scenario 4: Relocation units + Combined Cycle units with Substantial mitigation measures.

The modelling results are presented and discussed in Section 3.2 further below.

2.3 Noise Guidelines and Noise Control Regulations

Internationally, the standards applied by different countries are generally similar. The current trends are to apply more stringent criteria due to the deteriorating noise climate.

The World Health Organisation (WHO) has developed its own assessments on the effects of the exposure to environmental noise. Based on these assessments, several guideline values for different time periods and situations have been specified.

The WHO has recommended that a standard guideline value for average outdoor noise levels of 55 dBA be applied during daytime, in order to prevent significant interference with the normal activities of local communities. The relevant night-time noise level is 45 dBA. The WHO further recommends that, during the night, the maximum level of any single event should not exceed 60 dBA. This limit is to protect against sleep disruption. In addition, ambient noise levels have been specified for various environments. These are presented in the following Table 2.2.

Table 2.2: WHO Guidelines for Ambient Sound Levels

Environments	Ambient Sound Level L_{Aeq} (dBA)			
	Daytime		Night-time	
	Indoor	Outdoor	Indoor	Outdoor
Dwellings	50	55	-	-
Bedrooms	-	-	30	45
Schools	35	55	-	-

The noise impact on the areas surrounding the site was determined in terms of the difference between the existing measured or typical noise levels in that area and the predicted levels for the proposed development activities.

This difference was assessed in accordance with the guidelines provided in the SANS Code of Practice 10103:2008 ‘The measurement and rating of environmental noise with respect to annoyance and to speech communication’, as well as the noise regulations applicable to the Western Cape: Noise Control Regulations (Section 25), Environmental Conservation Act 73 of 1989 (DEAT, 1998). The latter regulations define noise as ‘disturbing’ if it causes the ambient noise level to increase by 7 dBA or more over the existing ambient level of the area.

The typical rating levels, $L_{Req,T}$, of noise within each of the area surrounding the proposed development site were measured or selected in accordance with the following Table 2.3 from the SANS 10103 Code.

Table 2.3: Typical Rating Levels for Ambient Noise

Type of District	Outdoors Rating Level $L_{Req,T}$ [1,2] (dBA)	
	Day-time	Night-time
Rural districts	45	35
Suburban districts with little road traffic	50	40
Urban districts	55	45
Urban districts with workshops, business premises and main roads	60	50
Central business districts	65	55
Industrial districts	70	60
[1] A-weighted equivalent continuous rating levels, which include corrections for total character and impulsiveness of the noise. [2] Day-time: 06:00 – 22:00, Night-time: 22:00 – 06:00		

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

- A change in noise level of 3 dBA is just detectable;
- A change in noise level of 5-6 dBA is clearly perceptible; and
- A change in noise level of 10 dBA is perceived roughly as doubling or halving of loudness.

SANS 10103 provides a guideline for predicting a community response to the increase in the ambient noise levels. The expected response of the local community to the noise impact, i.e. the increase of noise over the current ambient, is primarily based on Table 5 of SANS 10103, but expressed in terms of the effects of impact on a scale of 'very low' to 'very high' (see Table 2.4 and Table 2.5). The assessment of the noise impact magnitude or severity of the noise increase in the affected areas was based on the $L_{Req,T}$ excess ($\Delta L_{Req,T}$) according to Table 2.5.

Table 2.4: Categories of Community/Group Response

Excess of $L_{Req,T}$ [1] (dBA)	**Estimated Response**	
	Response Category	**Description**
0	None	No observed reaction
$0 < \Delta L_r \leq 3$	None to Little	Change slightly noticeable
$0 < \Delta L_r \leq 10$	Little	Sporadic complaints
$5 < \Delta L_r \leq 15$	Medium	Widespread complaints
$10 < \Delta L_r \leq 20$	Strong	Threats of community/group action
[1] Expected increase of ambient noise in an area due to a proposed development		

Table 2.5: Noise Impact Magnitude Assessment Criteria

Increase in $L_{Req,T}$ (dBA)	**Impact**
$\Delta L_r \leq 3$	Very low
$3 < \Delta L_r \leq 5$	Low
$5 < \Delta L_r \leq 10$	Medium
$10 < \Delta L_r \leq 15$	High
$15 < \Delta L_r$	Very High

The impact assessment in the noise study was conducted in accordance with the above-mentioned regulated permissible noise level increase of 7 dBA.

Two additional factors were taken into consideration for the noise impact assessment, in accordance with the SANS 10103 Code:

- The rural district guideline, and;
- The expected community reaction due to an existing noise level increase.

In order to establish a uniform approach regarding the assessment of impacts, Savannah has issued a procedure in terms of rating values for the determination of the overall noise impact due to the project. In accordance with this procedure, several aspects of the impact, such as the extent, duration, intensity and probability are to be taken into account. The detailed description of the methodology is provided in the following section.

2.4 Noise Impact Assessment of Significance – Method

The significance of potential environmental impacts identified will be determined using the following approach, taking into consideration the following aspects:

a) Probability of occurrence

b) Duration of occurrence

a) Magnitude of impact

b) Scale/extent of impact

In order to assess each of these factors for each impact, ranking scales were employed as follows:

Table 2.6: Noise Impact Ranking Scales

Probability:	**Duration:**
5 – Definite	5 - Permanent
4 - Highly probable	4 - Long-term (> 15 years)
3 – Probable	3 - Medium-term (5-15 years)
2 - Improbable	2 - Short-term (2-5 years)
1 - Very improbable	1 - Immediate (0 -1 years)
Extent:	**Magnitude:**
5 - International	10 - Very high
4 - National	8 – High
3 - Regional	6 - Moderate
2 - Local	4 - Low
1 - Site only	2 - Minor
	0 - None

Once the above factors had been ranked for each impact, the overall risk (environmental significance) of each impact will be assessed using the following formula:

S = (*scale* + *duration* + *magnitude*) x *probability*

The maximum value is 100 significance points (S). Environmental impacts will be rated as either of **High**, **Moderate** or **Low** significance on the following basis:

Table 2.7: Environmental Significance Rating

Environmental Significance	**Significance Points**
High	SP > 60
Moderate	30 ≤ SP ≤ 60
Low	SP < 30

The impact assessment will also include:

- The **nature**, a description of what causes the effect, what will be affected and how it will be affected.
- The **status**, which is described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The degree to which the impact can be mitigated.

3 AMBIENT NOISE MEASUREMENTS AND PREDICTED NOISE LEVELS

The current noise levels in the vicinity of the Ankerlig Power Station were measured, and the resulting noise levels from the operational phase of the proposed development were calculated for the various scenarios, utilising the methodology outlined in Section 2.

The noise measurements and future resulting noise levels are presented and discussed in the following sections.

3.1 Measured Ambient Noise Levels

Table 3.1 below shows the averaged values of the noise measurements at the three selected locations for representative daytime and night-time periods. The detailed measurement parameters can be found in APPENDIX A.

Table 3.1: Measured Noise Levels

Monitoring Point	Daytime	Night-time	District	SANS Guideline (dBA)	
	(dBA)	(dBA)		Daytime	Night-time
North-eastern side of site (MP1)	49.9	52.7	Industrial	70	60
Atlantis residential area (MP2)	48.8	48.3	Suburban	50	40
Western side of site (MP3)	53.9	50.6	Rural	45	35

During the measurements at positions MP1 and MP3, the main noise sources were:

- The earth moving and construction equipment.

- The adjacent industrial plant, north of the Ankerlig site.
- Vehicular traffic on the R307.

At the southern border of the Atlantis community (i.e. position MP2), the primary noise sources were:

- Human activities.
- Vehicular traffic on the local road network.
- Natural sounds.
- General industrial sound in the distance.

From Table 3.1, it can be seen that the average measured noise level on the north-eastern side of the plant, towards Atlantis and the existing industrial area, was 50 dBA and 53 dBA during daytime and night-time respectively. Both noise levels fall within the SANS daytime and night-time guidelines for industrial areas of 70 dBA and 60 dBA respectively.

The noise level on the southern border of the Atlantis residential area was 49 dBA during the daytime and 48 during night-time. The daytime level was within the 50 dBA SANS guideline for a suburban area. The night-time, however, exceeded the 40 dBA guideline.

The noise levels on the western side of the Ankerlig site, beyond the R307, were 54 dBA during daytime and 51 dBA during night-time. They are both in excess of the rural SANS guidelines of 45 dBA and 35 dBA for daytime and night-time respectively. This, however, was to be expected due to the existing vehicular traffic on the R307 and the current construction activities at the Ankerlig site.

3.2 Predicted Noise Levels

Based on the noise modelling methodology and input data outlined in Section 2, the noise contours around the site were estimated for the 4 scenarios. The noise contours for daytime and night-time conditions for each of the scenarios can be seen in APPENDIX D.

❖ Scenario 1: Existing Situation: Open Cycle Gas Turbine units (9 units):

From Figure D-1-a and Figure D-1-b for the open cycle units, it can be seen that the 40 dBA noise contour reached Avondale. The 60 dBA noise contour was contained within the Ankerlig site boundaries.

❖ Scenario 2: Acacia and Port Rex Relocation: Aero Derivative Gas Turbine units (4 units):

From Figure D-1-a and Figure D-1-b ,it can be seen that the 55 dBA noise contour was contained within the Ankerlig site boundaries, and the 35 dBA noise contour within the Atlantis Industrial area.

- Scenario 3: Existing Situation (9 OCGTs) + Acacia and Port Rex Relocated Units:

Similar results were generated for the cumulative impacts of the relocation of the Acacia and Port Rex units, with the Open Cycle Gas Turbine units only. No distinctive difference in noise contours was evident between Scenarios 1 and 3, see Figure D-1-a and Figure D-1-b.

- Scenario 4: Acacia and Port Rex Relocated Units + Combined Cycle units with Substantial mitigation measures:

The worst-case scenario for the relocation with the proposed combined cycle units would occur if the Substantial mitigation measures were in place. The cumulative noise levels can be seen in Figure D-1-a and Figure D-1-b for daytime and night-time respectively. As anticipated, the Acacia and Port Rex relocation did not generate any significant impact changes when compared to the scenario with only the Ankerlig combined cycle units.

3.2.1 Noise Levels at Discrete Receptors

In addition to the noise contour maps, the noise levels were calculated at several discrete receptors around the Ankerlig site. These were positioned along the site's boundaries and at the noise monitoring positions (MP1, MP2 and MP3), as depicted in Figure 3-1 below.

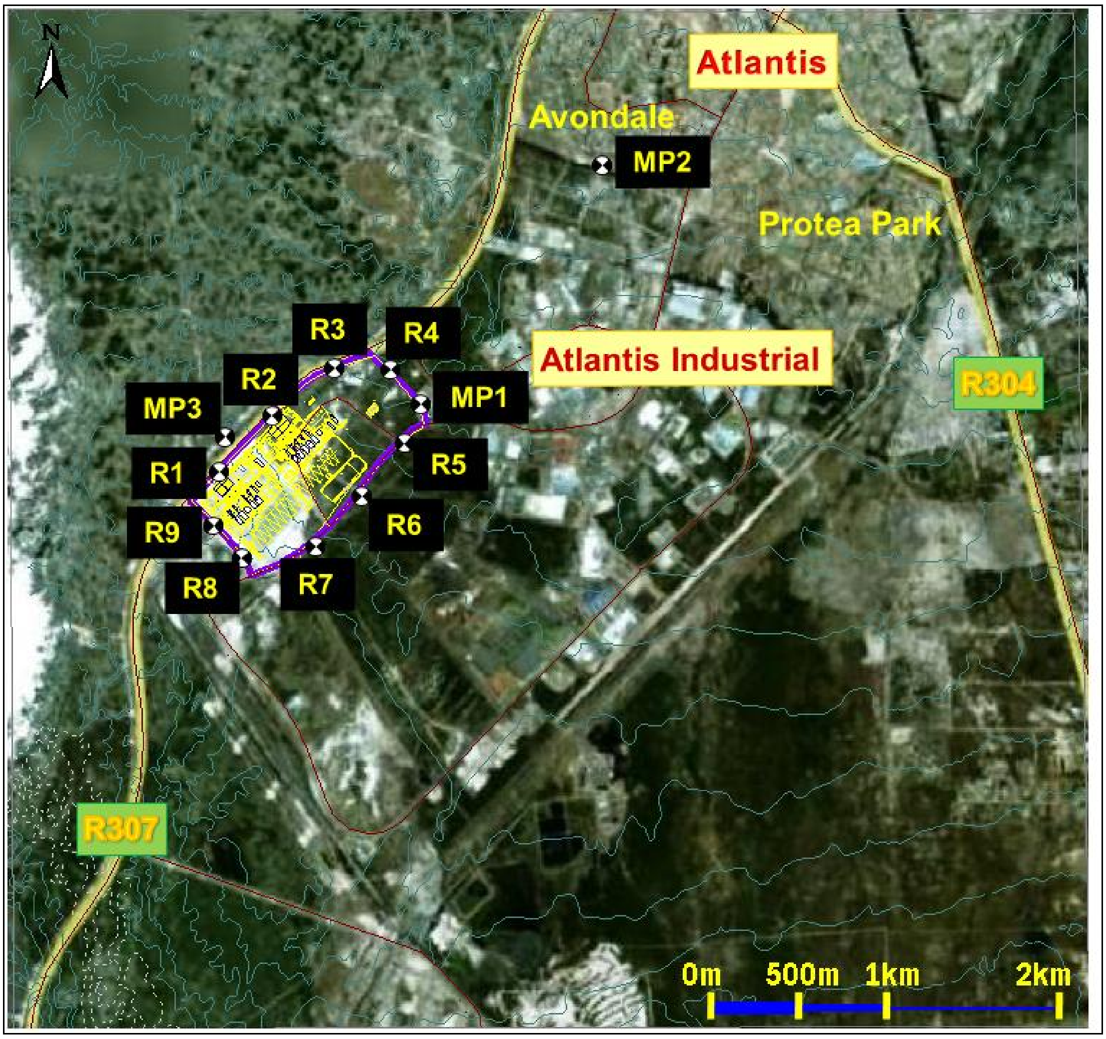

Figure 3-1. Locations of Discrete Receptors.

Figure 3-2 below shows the noise contribution of the Ankerlig Power Station for the various scenarios examined for daytime and night-time conditions at the southern border of the Atlantis Residential area. As can be seen, the open cycle units (OC) contributed between 42 dBA and 42.4 dBA for the daytime and night-time conditions respectively.

The introduction of the Acacia and Port Rex units resulted in an increase of the noise levels in the Avondale area of approximately 0.2 dBA, which is considered insignificant.

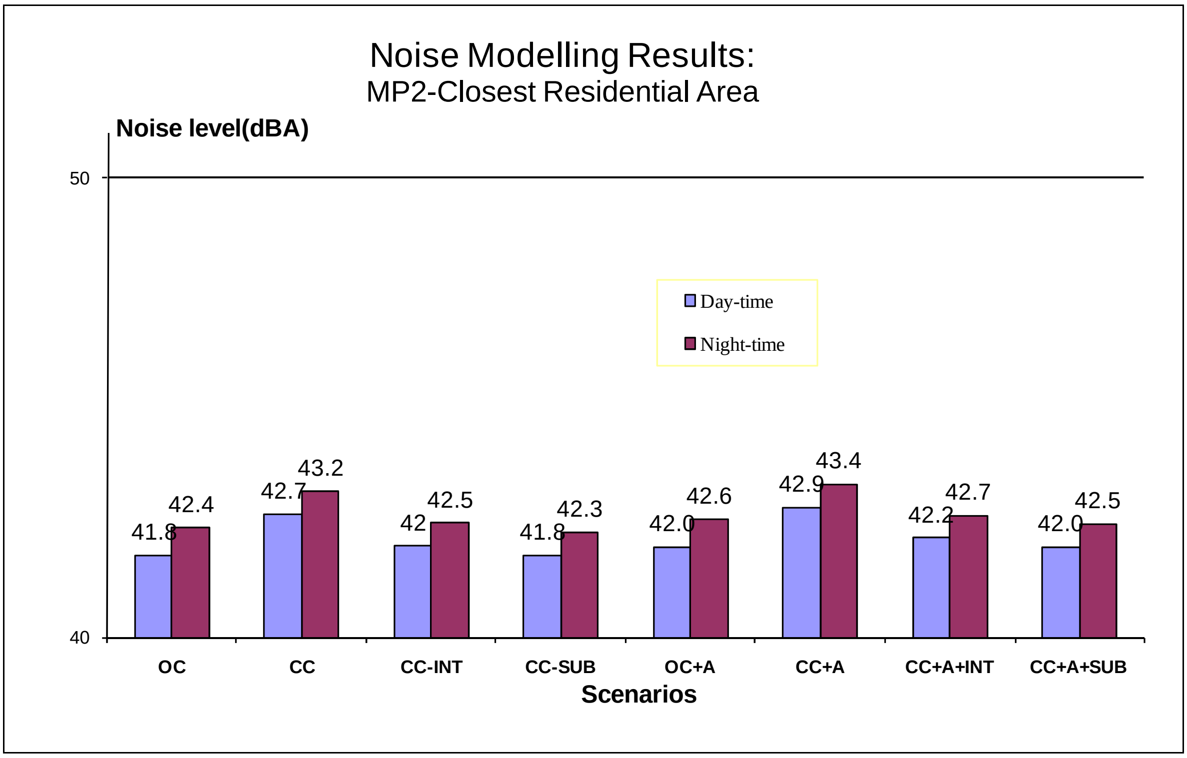

Figure 3-2. Discrete Receptor Results for the Atlantis Residential Area

Figure 3-3 and Figure 3-4 show the noise levels along the boundaries of the site, as well as at the MP1, MP2 and MP3 locations. The tables with the actual values can be found in APPENDIX C.

It can be seen that the relocation of the Acacia and Port Rex units has an effect on the noise levels along the north-eastern boundary (points R4, MP1 and R5) of the site. The level there increased approximately 3 dBA, but remained below the SANS daytime and night-time guideline for industrial areas of 70 dBA and 60 dBA respectively.

It can be seen that the SANS daytime industrial guideline of 70 dBA was not exceeded at any location for the cumulative scenario of the open cycle power station with the relocated units (OC + A).

The night-time SANS guideline of 60 dBA was exceeded along the north-western and western boundaries of the site for the open cycle plant, as well as the cumulative scenario for the relocation. It should be noted, however, that the contribution of the relocation units to this exceedance is negligible.

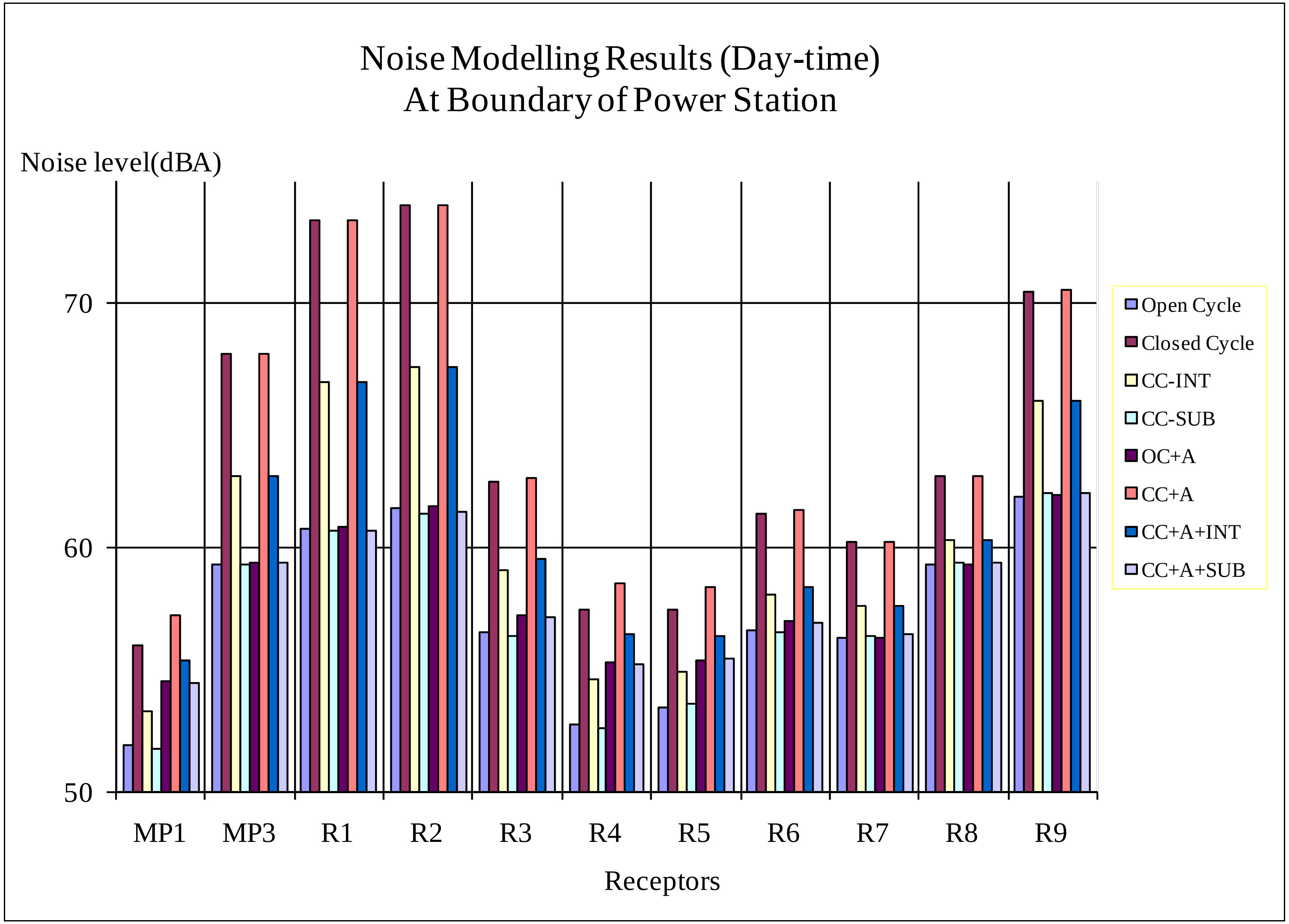

Figure 3-3. Noise Modelling Results at Boundary of Power Station (Day-time)

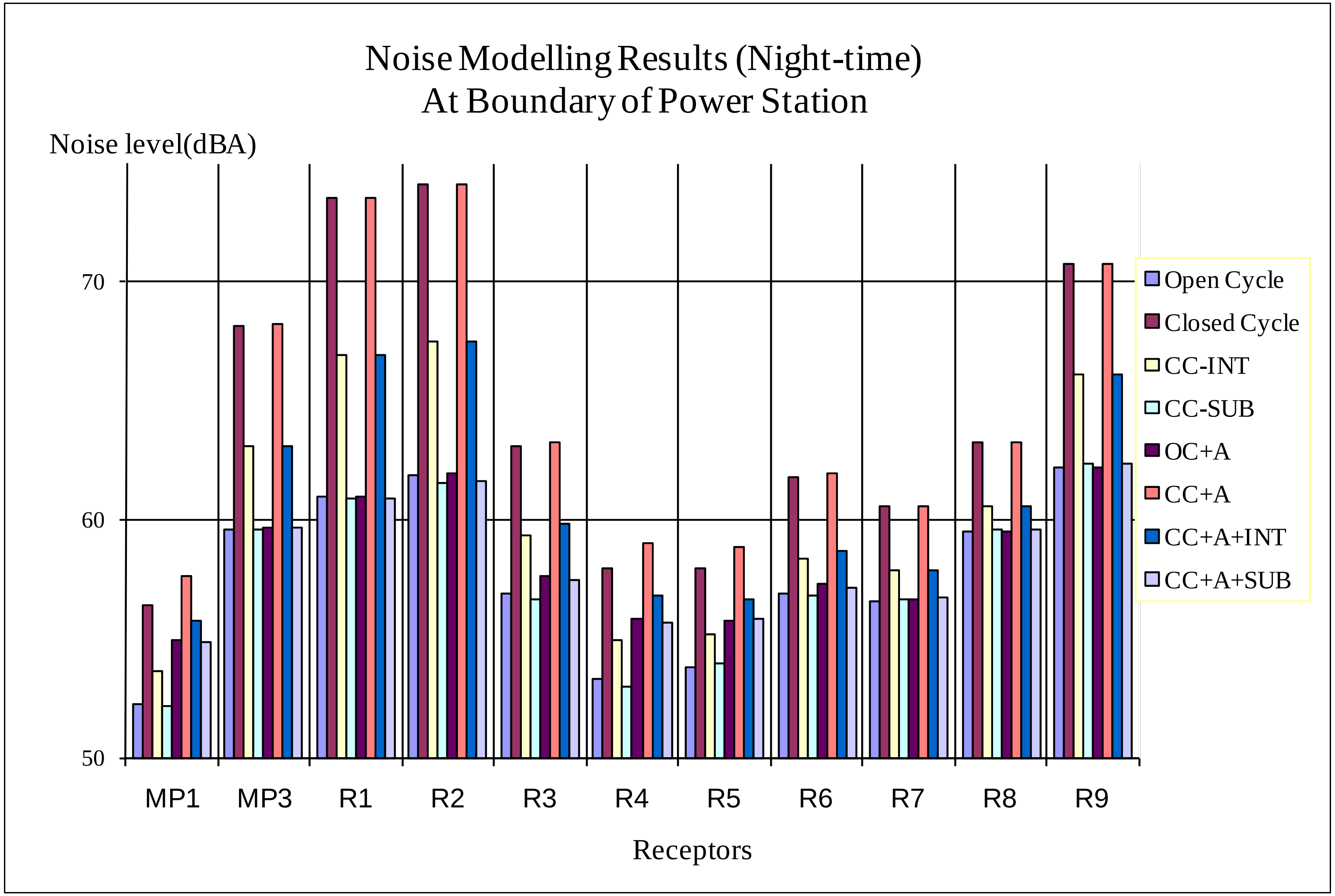

Figure 3-4. Noise Modelling Results at Boundary of Power Station (Night-time)

4 IMPACT ASSESSMENT AND RECOMMENDATIONS

4.1 Noise Impact Rating

Based on the impact ranking described in the impact assessment methodology, the resulting rating and significant points for the relocation of the Acacia and Port Rex Power Stations are as follows:

Table 4-1. Construction: Noise Impact Assessment Ranking and Environmental Significance

Nature: Increase of noise levels around the power station construction area.		
	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Immediate (1)	Immediate (1)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Low (12)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No loss	No loss
Can impacts be mitigated?	Yes	Yes
Mitigation: Systematic maintenance of equipment and training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events.		
Cumulative impacts: Cumulative impacts due to existing and proposed Ankerlig Power station units, industrial noise sources in the adjacent Atlantis Industrial area and vehicular traffic in the area.		
Residual Impacts: No residual impact after the activity ceases.		

Table 4-2. Operation: Noise Impact Assessment Ranking and Environmental Significance

Nature: Increase of noise levels around the power station area.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (20)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No loss	No loss
Can impacts be mitigated?	Yes	Yes
Mitigation: No additional mitigation is necessary other than the existing enclosures.		
Cumulative impacts: Cumulative impacts due to existing and proposed Ankerlig power station units, industrial noise sources in the adjacent Atlantis Industrial area and vehicular traffic in the area.		
Residual Impacts: No residual impact after the activity ceases.		

4.2 Conclusions

Based on the noise measurements and the noise modelling results, the following can be concluded:

- The existing noise environment around the Ankerlig Power Station has noise levels of around 50 dBA, primarily due to the construction activities currently taking place, the existing industrial sources and the R307.
- The noise levels in the most southern part of the Atlantis residential area, i.e. Avondale and Protea Park, were around 48 dBA during day and night-time. The industrial activity from the Atlantis Industrial area, as well as from construction activities were audible but not intrusive.
- The relocation of the Acacia and Port Rex Power Station units will have only a local impact around the north-western and north-eastern boundaries when compared to the open cycle levels, increasing the noise levels by 3 dBA.
- The Acacia and Port Rex units will not have any significant cumulative effect on the noise-sensitive receptors of Atlantis, since the increase above the closed cycle noise levels in the Avondale and Protea Park areas will be below 0.3 dBA.
- The cumulative impact of the proposed combined cycle units can potentially have a significant effect on the existing noise levels around the power station site. The introduction of Substantial mitigation measures, however, can reduce these levels to the ones generated by only the open cycle units.
- The overall noise impact due to the relocation of the Acacia units, assuming the same enclosures will be utilised and taking into consideration the resulting noise levels in the noise-sensitive area of Atlantis, was found to be *Low*.

4.3 Recommendations

During construction the following is recommended:

- Diesel-powered and other equipment should be maintained regularly and have appropriately fitted silencers.
- Personnel should be specifically trained, in order to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events.
- Perimeter noise measurements should be performed biannually. The monitoring to include one or two points within the Atlantis community.

For the operational phase of the Acacia units, the following is recommended:

- The mitigation measures, in terms of the existing enclosures at the Acacia Power Station, should be implemented at the new site.

- Perimeter noise monitoring should be performed annually. For comparison purposes, the measurement points should include the measurement locations utilised in the noise impact assessment.

4.4 Noise Management Measures

OBJECTIVE: The objective is to maintain the noise levels around the power station site within acceptable levels and minimise the impact on residential areas and communities.

Project Component/s	The components affecting the noise impact are the construction activities during the construction phase, and during the operational phase the additional noise sources related to the relocated Acacia units. The existing Ankerlig Power Station units and the proposed combined cycle units will have a cumulative effect on the area's noise levels.
Potential Impact	Increased noise levels in the surrounding areas, noise nuisance and sleep disturbance of the affected communities.
Activity/Risk Source	The activities and equipment which could impact on achieving the objective are: • Construction activities, i.e. excavating, loading and unloading of trucks, piling, material transport, general building activities, etc. • Electricity generation units and supporting equipment, such as stacks, transformers, air coolers, pumps, fans, etc.
Mitigation: Target/Objective	The measures required during the construction period are: • Regular maintenance of equipment and fitting of silencers where appropriate. • Training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events. The mitigation measures required for the operational phase of the relocated Acacia units are: • Maintain similar enclosures to the ones currently utilised at the Acacia units.

Mitigation: Action/Control	Responsibility	Timeframe
Construction Phase		
Maintenance of equipment and transport trucks.	Site engineer/ qualified construction employees	During construction period
Training of personnel to adhere to noise attenuation operational procedures.	Site engineer/ equipment operators	Initial training and seminars at regular intervals
Perimeter noise monitoring	Noise specialist	Biannual noise monitoring during construction lifespan

Operational Phase		
Incorporation of mitigation measures	Design engineers / Construction engineers	Throughout the operational lifespan
Proper maintenance of equipment	Site engineer/ qualified power station employees	Throughout the operational lifespan
Perimeter noise monitoring	Noise specialist	Annual noise monitoring throughout the operational lifespan

Performance Indicator	• The measured noise levels around the boundary of the site to be less than 70 dBA during day-time and 60 dBA during night-time. • The noise levels in Avondale and Protea Park residential areas not to exceed 50 dBA and 45 dBA during daytime and night-time respectively, due to the power station operations.
Monitoring	Noise monitoring should be performed biannually during construction and annually during the operational phase by a noise specialist. The closest residential area to the site and at two selected locations outside the perimeter should also be included. The noise monitoring should be performed in accordance with SANS 10103 and the report submitted to the appropriate authority.

REFERENCES

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Demos Dracoulides, DDA & JHC Consulting, (2008). Conversion of the Ankerlig Power Station Open Cycle Gas Turbine Units to Combined Cycle Units, Noise Modelling & Impact Assessment. Report No ATNIA-220908. September 2008.

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APPENDIX A

❖ Noise Monitoring Locations

- **Position MP1 (Atl.01)**

Access – Easy, from Neil Hare Road northbound, left into dead-end street between the north-eastern Ankerlig site boundary and existing industrial plant.

Position – 1 m from existing industrial plant's south-western boundary.

GPS co-ordinates – S33°3.190′ E18°28.250′

View east along the north-eastern boundary of the site

View north away from the Ankerlig site

- **Position MP2 (Atl.02)**

Access – Easy, from R307 northbound, right into Atlantis residential area, on Gouba Street. Right into Grosvenor Avenue southbound, until reaching the southern boundary of Avondale.

Position – 3 m south from the edge of the Bon Aventure Avenue, towards Ankerlig Power Station.

GPS co-ordinates – S33°34.437′ E18°28.949′

View east with the site to the right

View north towards the Atlantis Community

- **Position MP3 (Atl.03)**

Access – Easy, from R307, opposite the Ankerlig Power Station, next to nature reserve entrance.

Position – 1 m from existing manhole.

GPS co-ordinates – S33°35.411′ E18°27.529′

View northeast with the Ankerlig site ahead

View southeast with the site to the left

- **Measurements at the Acacia Power Station**

Measurements at the enclosures

Measurements at the cooling fans

Measurements from a distance towards the Acacia Power Station

Measurement Table

Date - Time	Pos	Ins. Pos	T (C°)	RH (%)	B	W (m/s)	$L_{Aeq,I}$ (dBA)	L_{Amin} (dBA)	L_{Amax} (dBA)	L_{90} (dBA)	L_{50} (dBA)	L_{10} (dBA)	L_1 (dBA)	Comments
8/04/08 – 12:43	Atl.01	P65	25.9	32.6	1001	3.5	50.8	44.6	58.2	47.1	49.8	53	56.7	Construction, plane, passing vehicles and factory hum audible
8/04/08 – 20:06	Atl.01	P69	21.8	55.9	999.7	1.4	52.5	50	64.6	50.8	51.9	53.1	57.7	Factory noise, forklift and container, insect and truck horn audible
8/04/08 – 22:44	Atl.01	P76	14.1	80.8	1001	0.3	52.2	49.7	55.9	50.6	51.9	53.4	54.7	Earthmoving equips. ,factory hum and rd. audible
9/04/08 – 09:18	Atl.01	P79	20.2	62.3	999.8	1.7	49	46	58.1	46.9	48.3	50.3	54.3	Earthmoving, factory hum, reverse horns, plane and rd., audible
9/04/08 – 14:08	Atl.01	P92	31.3	22.1	998	1.4	49.2	44.8	60.7	46.2	47.9	50.7	56.8	Earthmoving equips. , factory hum, reverse horns, birds, plane and car horn audible
9/04/08 – 14:19	Atl.01	P93	31.1	28.8	997.9	1.8	49	44.9	59.2	46.5	48	50.6	54.3	Same as previous except for car horn
9/04/08 – 23:31	Atl.01	P98	17.8	75.2	997.7	1.3	53.2	48.8	59	51.1	53.1	54.1	56.5	Earthmoving equip., factory hum and insect noises audible
8/04/08 – 10:09	Atl.02	P59	23.6	40.4	999.9	2.5	44.7	38.7	57.3	40.2	42	47.8	53.7	Voices across rd. audible
8/04/08 – 13:17	Atl.02	P67	27.7	37.1	998.7	1.3	46.5	39.1	61.5	40.9	43.5	47.7	57.3	Birds, voices, construction, dog barking, vehicles and plane audible
8/04/08 – 20:41	Atl.02	P71	17	73.8	999.5	0	52.7	46.2	69.8	47.6	49	52.8	63.1	Factory, earthmoving and vehicles audible
8/04/08 – 23:19	Atl.02	P78	14	77.4	998.9	0.2	51.7	45.8	68.1	47.1	48.9	51.4	63.1	Police sirens, factory hum and dogs barking
9/04/08	Atl.02	P81	22.9	52.9	997.2	1.1	48.5	40.9	68.6	41.9	43.8	47.7	59.5	Factory and earthmoving, reverse

– 09:53														horns, surrounding rds., dogs barking and voices in background
9/04/08 – 13:11	Atl.02	P88	28.6	38.6	995.7	2.2	54.8	39.3	77.3	40.3	42.5	53.5	68	Earthmoving, reverse horns, birds, kids playing and trucks in background audible
9/04/08 – 13:21	Atl.02	P89	29.3	35.6	995.7	1.8	45.4	38.5	59.6	40.3	41.8	47.9	56.1	Same as previous only music audible in background
9/04/08 – 22:54	Atl.02	P96	17.2	74	995.6	1.3	48.8	42.7	64.4	43.7	45.5	48.7	62.1	Earthmoving equip., factory hum, vehicles and dog barking audible
8/04/08 – 09:44	Atl.03	P58	21.7	36.8	1003	2.3	56.1	45	67.2	47.4	53	60.1	63.4	Construction, passing vehicles and truck reverse horn audible
8/04/08 – 12:58	Atl.03	P66	27	35	1002	1.4	50.6	39.9	64.5	41.4	45.4	54	61.3	Vehicles, factory and earthmoving equip. audible
8/04/08 – 20:22	Atl.03	P70	19	66.6	1001	1.5	53.1	45.4	68.3	46.3	47.9	55.4	64.3	Factory hum, vehicles and horn audible
8/04/08 – 23:00	Atl.03	P77	14.3	83.8	1003	1.1	51.6	45.8	62.5	47.1	48.6	55	60.3	Factory hum
9/04/08 – 09:35	Atl.03	P80	21.1	62.9	1001	1.7	58.8	45	69.3	50	56.6	62.6	66.9	Construction/earthmovings, reverse horns, rd. and plane audible
9/04/08 – 13:39	Atl.03	P90	30.3	35.4	999.4	2.9	52	41.3	64.9	44.8	49	55.3	60.4	Earthmoving, reverse horns, plane and rd. audible
9/04/08 – 13:51	Atl.03	P91	35.2	22.1	999.6	2.9	52.9	41.3	69.2	44	48.8	56.1	62.2	Same as previous
9/04/08 – 23:13	Atl.03	P97	16.4	74.4	999.5	1.1	49.6	45.9	58.6	46.9	48.1	51.5	57.2	Earthmoving equip., factory hum and road audible

APPENDIX B

Noise Model Sound Power Input Data

Operational Phase Equipment Sound Power Emissions

The modelling set-up was based on information provided by the Siemens report and the B&V engineers. The table below shows the noise power levels of all the major noise sources for the various phases of the Ankerlig Power Station.

Table B-1. Open Cycle and Combined Cycle Equipment Sound Power Emission Levels

Description	Source ID	Sound Power	Daytime Operation	Night-time Operation	Coordinates		
		dBA	(min)	(min)	(X)	(Y)	(Z)
11_Air_Exh_Un_N	11	85	960	480	-50091	-3718500	128
11_Air_Exh_Un_S	11	88	960	480	-50088	-3718503	128
11_Air_Sup_Op_E	11	93.6	960	480	-50059	-3718495	128
11_Air_Sup_Op_N	11	84.5	960	480	-50068	-3718487	129
11_Air_Sup_Op_S	11	88.6	960	480	-50052	-3718539	128
11_CW_URB	11	103.2	960	480	-50092	-3718467	131
11_GT_Diff_MBR	11	106.1	960	480	-50085	-3718496	129
11_GT_Intk_MBL	11	99.4	960	480	-50069	-3718511	142
11_OCl_URC	11	99	960	480	-50079	-3718480	130
11_St_LS_UHN	11	104.1	960	480	-50091	-3718491	135
11_Trf_BAT	11	100.2	960	480	-50034	-3718528	129
11_Air_Sup_Op_N	12	84.5	960	480	-50095	-3718516	128
11_Air_Sup_Op_E	12	93.6	960	480	-50087	-3718524	127
11_Air_Sup_Op_S	12	88.6	960	480	-50079	-3718568	127
11_Air_Exh_Un_N	12	85	960	480	-50118	-3718529	127

11_Air_Exh_Un_S	12	88	960	480	-50115	-3718532	127
11_GT_Intk_MBL	12	99.4	960	480	-50096	-3718540	141
11_GT_Diff_MBR	12	106.1	960	480	-50112	-3718526	128
11_St_LS_UHN	12	104.1	960	480	-50118	-3718520	134
11_OCl_URC	12	99	960	480	-50106	-3718510	129
11_CW_URB	12	103.2	960	480	-50119	-3718497	130
11_Trf_BAT	12	100.2	960	480	-50061	-3718557	128
11_Air_Sup_Op_N	21	84.5	960	480	-50153	-3718578	127
11_Air_Sup_Op_E	21	93.6	960	480	-50144	-3718586	127
11_Air_Sup_Op_S	21	88.6	960	480	-50137	-3718629	127
11_Air_Exh_Un_N	21	85	960	480	-50176	-3718591	127
11_Air_Exh_Un_S	21	88	960	480	-50173	-3718594	127
11_GT_Intk_MBL	21	99.4	960	480	-50153	-3718602	141
11_GT_Diff_MBR	21	106.1	960	480	-50170	-3718587	128
11_St_LS_UHN	21	104.1	960	480	-50175	-3718582	134
11_OCl_URC	21	99	960	480	-50164	-3718571	128
11_CW_URB	21	103.2	960	480	-50176	-3718558	129
11_Trf_BAT	21	100.2	960	480	-50118	-3718619	128
11_Ununden	21	0	960	480	-50161	-3718595	136
11_Air_Sup_Op_N	22	84.5	960	480	-50180	-3718607	127
11_Air_Sup_Op_E	22	93.6	960	480	-50171	-3718615	127
11_Air_Sup_Op_S	22	88.6	960	480	-50164	-3718659	127
11_Air_Exh_Un_N	22	85	960	480	-50203	-3718620	127
11_Air_Exh_Un_S	22	88	960	480	-50200	-3718623	127
11_GT_Intk_MBL	22	99.4	960	480	-50180	-3718631	141
11_GT_Diff_MBR	22	106.1	960	480	-50197	-3718616	128
11_St_LS_UHN	22	104.1	960	480	-50202	-3718611	134
11_OCl_URC	22	99	960	480	-50191	-3718600	128

11_CW_URB	22	103.2	960	480	-50203	-3718587	129
11_Trf_BAT	22	100.2	960	480	-50145	-3718648	128
11_Air_Sup_Op_N	31	84.5	960	480	-49735	-3718129	135
11_Air_Sup_Op_E	31	93.6	960	480	-49726	-3718137	135
11_Air_Sup_Op_S	31	88.6	960	480	-49719	-3718181	135
11_Air_Exh_Un_N	31	85	960	480	-49758	-3718142	134
11_Air_Exh_Un_S	31	88	960	480	-49755	-3718145	134
11_GT_Intk_MBL	31	99.4	960	480	-49735	-3718153	149
11_GT_Diff_MBR	31	106.1	960	480	-49752	-3718139	136
11_St_LS_UHN	31	104.1	960	480	-49757	-3718133	142
11_OCl_URC	31	99	960	480	-49746	-3718123	136
11_CW_URB	31	103.2	960	480	-49759	-3718110	137
11_Trf_BAT	31	100.2	960	480	-49700	-3718170	136
11_Air_Sup_Op_N	32	84.5	960	480	-49762	-3718159	135
11_Air_Sup_Op_E	32	93.6	960	480	-49753	-3718167	135
11_Air_Sup_Op_S	32	88.6	960	480	-49746	-3718210	135
11_Air_Exh_Un_N	32	85	960	480	-49785	-3718172	134
11_Air_Exh_Un_S	32	88	960	480	-49782	-3718174	134
11_GT_Intk_MBL	32	99.4	960	480	-49762	-3718183	149
11_GT_Diff_MBR	32	106.1	960	480	-49779	-3718168	136
11_St_LS_UHN	32	104.1	960	480	-49784	-3718162	141
11_OCl_URC	32	99	960	480	-49773	-3718152	136
11_CW_URB	32	103.2	960	480	-49786	-3718139	137
11_Trf_BAT	32	100.2	960	480	-49727	-3718199	136
11_Air_Sup_Op_N	41	84.5	960	480	-49789	-3718187	134
11_Air_Sup_Op_E	41	93.6	960	480	-49780	-3718195	134
11_Air_Sup_Op_S	41	88.6	960	480	-49773	-3718239	134
11_Air_Exh_Un_N	41	85	960	480	-49812	-3718200	134

11_Air_Exh_Un_S	41	88	960	480	-49809	-3718203	134
11_GT_Intk_MBL	41	99.4	960	480	-49789	-3718211	148
11_GT_Diff_MBR	41	106.1	960	480	-49806	-3718197	135
11_St_LS_UHN	41	104.1	960	480	-49811	-3718191	141
11_OCl_URC	41	99	960	480	-49800	-3718180	135
11_CW_URB	41	103.2	960	480	-49813	-3718168	136
11_Trf_BAT	41	100.2	960	480	-49754	-3718228	135
11_Air_Sup_Op_N	42	84.5	960	480	-49816	-3718217	134
11_Air_Sup_Op_E	42	93.6	960	480	-49808	-3718225	134
11_Air_Sup_Op_S	42	88.6	960	480	-49800	-3718269	134
11_Air_Exh_Un_N	42	85	960	480	-49839	-3718230	133
11_Air_Exh_Un_S	42	88	960	480	-49836	-3718233	133
11_GT_Intk_MBL	42	99.4	960	480	-49817	-3718241	148
11_GT_Diff_MBR	42	106.1	960	480	-49833	-3718226	135
11_St_LS_UHN	42	104.1	960	480	-49839	-3718221	140
11_OCl_URC	42	99	960	480	-49827	-3718210	135
11_CW_URB	42	103.2	960	480	-49840	-3718197	136
11_Trf_BAT	42	100.2	960	480	-49782	-3718258	135
11_Air_Sup_Op_N	43	84.5	960	480	-49843	-3718246	134
11_Air_Sup_Op_E	43	93.6	960	480	-49835	-3718254	134
11_Air_Sup_Op_S	43	88.6	960	480	-49827	-3718297	133
11_Air_Exh_Un_N	43	85	960	480	-49867	-3718259	133
11_Air_Exh_Un_S	43	88	960	480	-49864	-3718261	133
11_GT_Intk_MBL	43	99.4	960	480	-49844	-3718270	147
11_GT_Diff_MBR	43	106.1	960	480	-49861	-3718255	134
11_St_LS_UHN	43	104.1	960	480	-49866	-3718250	140
11_OCl_URC	43	99	960	480	-49854	-3718239	135
11_CW_URB	43	103.2	960	480	-49867	-3718226	136

11_Trf_BAT	43	100.2	960	480	-49809	-3718287	135
CC_BFP_Low	6221	102.6	960	480	-50107	-3718461	131
CC_BFP_High	6221	102.6	960	480	-50110	-3718459	131
CC_AUX_XFMR	6221	92.6	960	480	-50113	-3718456	130
CC_GSUT	6221	97.6	960	480	-50114	-3718454	132
CC_St_SO_UHN	6221	104.9	960	480	-50125	-3718458	177
CC_St_OD_UHN	6221	78.2	960	480	-50125	-3718459	157
CC_BFP_Low	6222	102.6	960	480	-50135	-3718490	130
CC_BFP_High	6222	102.6	960	480	-50137	-3718488	130
CC_AUX_XFMR	6222	92.6	960	480	-50140	-3718486	129
CC_GSUT	6222	97.6	960	480	-50142	-3718484	131
CC_St_SO_UHN	6222	104.9	960	480	-50153	-3718488	176
CC_St_OD_UHN	6222	78.2	960	480	-50152	-3718488	156
CC_BFP_Low	6223	102.6	960	480	-50192	-3718552	129
CC_BFP_High	6223	102.6	960	480	-50195	-3718549	129
CC_AUX_XFMR	6223	92.6	960	480	-50197	-3718547	128
CC_GSUT	6223	97.6	960	480	-50199	-3718545	130
CC_St_SO_UHN	6223	104.9	960	480	-50210	-3718549	175
CC_St_OD_UHN	6223	78.2	960	480	-50210	-3718549	155
CC_BFP_Low	6224	102.6	960	480	-49774	-3718104	137
CC_BFP_High	6224	102.6	960	480	-49777	-3718101	137
CC_AUX_XFMR	6224	92.6	960	480	-49779	-3718099	136
CC_GSUT	6224	97.6	960	480	-49781	-3718097	138
CC_St_SO_UHN	6224	104.9	960	480	-49792	-3718101	183
CC_St_OD_UHN	6224	78.2	960	480	-49792	-3718101	163
CC_BFP_Low	6225	102.6	960	480	-49802	-3718133	137
CC_BFP_High	6225	102.6	960	480	-49804	-3718131	137
CC_AUX_XFMR	6225	92.6	960	480	-49807	-3718128	136

CC_GSUT	6225	97.6	960	480	-49809	-3718126	138
CC_St_SO_UHN	6225	104.9	960	480	-49820	-3718130	182
CC_St_OD_UHN	6225	78.2	960	480	-49819	-3718131	162
CC_BFP_Low	6226	102.6	960	480	-49829	-3718162	136
CC_BFP_High	6226	102.6	960	480	-49831	-3718160	136
CC_AUX_XFMR	6226	92.6	960	480	-49834	-3718157	135
CC_GSUT	6226	97.6	960	480	-49836	-3718156	137
CC_St_SO_UHN	6226	104.9	960	480	-49847	-3718160	182
CC_St_OD_UHN	6226	78.2	960	480	-49846	-3718160	162
CC_BFP_Low	6227	102.6	960	480	-49856	-3718191	136
CC_BFP_High	6227	102.6	960	480	-49859	-3718189	136
CC_AUX_XFMR	6227	92.6	960	480	-49861	-3718187	135
CC_GSUT	6227	97.6	960	480	-49863	-3718185	137
CC_St_SO_UHN	6227	104.9	960	480	-49874	-3718189	182
CC_St_OD_UHN	6227	78.2	960	480	-49874	-3718189	162
CC_BFP_Low	6228	102.6	960	480	-49883	-3718221	135
CC_BFP_High	6228	102.6	960	480	-49886	-3718218	135
CC_AUX_XFMR	6228	92.6	960	480	-49889	-3718216	134
CC_GSUT	6228	97.6	960	480	-49891	-3718214	136
CC_St_SO_UHN	6228	104.9	960	480	-49901	-3718218	181
CC_St_OD_UHN	6228	78.2	960	480	-49901	-3718218	161
CC_BFP_Low	6229	102.6	960	480	-50219	-3718581	129
CC_BFP_High	6229	102.6	960	480	-50222	-3718579	129
CC_AUX_XFMR	6229	92.6	960	480	-50224	-3718576	128
CC_GSUT	6229	97.6	960	480	-50226	-3718574	130
CC_St_SO_UHN	6229	104.9	960	480	-50237	-3718578	175
CC_St_OD_UHN	6229	78.2	960	480	-50237	-3718579	155
CCCW Coolers	72	112.7	960	480	-50171	-3718393	133

CCCW Coolers	72	112.7	960	480	-50292	-3718520	129
Air Cooled Condenser	72	112.7	960	480	-50229	-3718495	130
Air Cooled Condenser	72	112.7	960	480	-50193	-3718457	130
CCCW Coolers	73	112.7	960	480	-49840	-3718039	138
CCCW Coolers	73	112.7	960	480	-49975	-3718186	136
Air Cooled Condenser	73	112.7	960	480	-49914	-3718158	136
Air Cooled Condenser	73	112.7	960	480	-49873	-3718113	137
CCCW Coolers TEST	7a2_test	97.6	960	480	-50653	-3718409	126
Ac_Trf1	8	100.3	960	480	-49559	-3718446	135
Ac_Trf2	8	100.3	960	480	-49544	-3718431	136
Ac_Trf3	8	100.3	960	480	-49529	-3718416	136
Ac_Trf4	8	100.3	960	480	-49514	-3718402	136
Ac_Trf1	9	100.3	960	480	-49394	-3718023	141
Ac_Trf2	9	100.3	960	480	-49381	-3718009	142
Ac_Trf3	9	100.3	960	480	-49367	-3717993	142
Ac_Trf4	9	100.3	960	480	-49354	-3717978	142
11_St_OD_UHN	s11	78.2	960	480	-50092	-3718489	152
11_St_SL_UHN	s11	97.6	960	480	-50092	-3718490	142
11_St_SO_UHN	s11	104.9	960	480	-50093	-3718489	156
11_St_SL_UHN	s12	97.6	960	480	-50119	-3718519	141
11_St_OD_UHN	s12	78.2	960	480	-50119	-3718518	151
11_St_SO_UHN	s12	104.9	960	480	-50120	-3718518	155
11_St_SL_UHN	s21	97.6	960	480	-50176	-3718581	141
11_St_OD_UHN	s21	78.2	960	480	-50177	-3718580	151
11_St_SO_UHN	s21	104.9	960	480	-50177	-3718580	155
11_St_SL_UHN	s22	97.6	960	480	-50203	-3718610	141
11_St_OD_UHN	s22	78.2	960	480	-50204	-3718609	151
11_St_SO_UHN	s22	104.9	960	480	-50204	-3718609	155

11_St_SL_UHN	s31	97.6	960	480	-49758	-3718132	149
11_St_OD_UHN	s31	78.2	960	480	-49759	-3718132	159
11_St_SO_UHN	s31	104.9	960	480	-49759	-3718131	163
11_St_SL_UHN	s32	97.6	960	480	-49785	-3718162	149
11_St_OD_UHN	s32	78.2	960	480	-49786	-3718161	159
11_St_SO_UHN	s32	104.9	960	480	-49786	-3718160	163
11_St_SL_UHN	s41	97.6	960	480	-49812	-3718190	148
11_St_OD_UHN	s41	78.2	960	480	-49813	-3718189	158
11_St_SO_UHN	s41	104.9	960	480	-49813	-3718189	162
11_St_SL_UHN	s42	97.6	960	480	-49840	-3718220	148
11_St_OD_UHN	s42	78.2	960	480	-49840	-3718219	158
11_St_SO_UHN	s42	104.9	960	480	-49841	-3718219	162
11_St_SL_UHN	s43	97.6	960	480	-49867	-3718249	147
11_St_OD_UHN	s43	78.2	960	480	-49868	-3718248	157
11_St_SO_UHN	s43	104.9	960	480	-49868	-3718247	161
Description	**Source ID**	**Sound Power**	**Daytime Operation**	**Night-time Operation**	**Coordinates**		
		dBA	**(min)**	**(min)**	**(X)**	**(Y)**	**(Z)**
11_GT_Roof	11	97.9	960	480	n/a	n/a	10.5
11_GT_Roof	12	97.9	960	480	n/a	n/a	10.5
11_GT_Roof	21	97.9	960	480	n/a	n/a	10.5
11_GT_Roof	22	97.9	960	480	n/a	n/a	10.5
11_GT_Roof	31	97.9	960	480	n/a	n/a	10.5
11_GT_Roof	32	97.9	960	480	n/a	n/a	10.5

11_GT_Roof	41	97.9	960	480	n/a	n/a	10.5
11_GT_Roof	42	97.9	960	480	n/a	n/a	10.5
11_GT_Roof	43	97.9	960	480	n/a	n/a	10.5
Description	**Source ID**	**Sound Power**	**Daytime Operation**	**Night-time Operation**	**Coordinates**		
		dBA	**(min)**	**(min)**	**(X)**	**(Y)**	**(Z)**
11UMB-E Gas Turbine Building East Wall	11	88	960	480	n/a	n/a	n/a
11UMB-N Gas Turbine Building North Wall	11	93	960	480	n/a	n/a	n/a
11UMB-S Gas Turbine Building South Wall	11	115	960	480	n/a	n/a	n/a
11UMB-W Gas Turbine Building West Wall	11	120	960	480	n/a	n/a	n/a
11UMB-S Gas Turbine Building South Wall	12	115	960	480	n/a	n/a	n/a
11UMB-W Gas Turbine Building West Wall	12	120	960	480	n/a	n/a	n/a
11UMB-N Gas Turbine Building North Wall	12	93	960	480	n/a	n/a	n/a
11UMB-E Gas Turbine Building East Wall	12	88	960	480	n/a	n/a	n/a
11UMB-S Gas Turbine Building South Wall	21	115	960	480	n/a	n/a	n/a
11UMB-W Gas Turbine Building West Wall	21	120	960	480	n/a	n/a	n/a
11UMB-N Gas Turbine	21	93	960	480	n/a	n/a	n/a

Building North Wall							
11UMB-E Gas Turbine Building East Wall	21	88	960	480	n/a	n/a	n/a
11UMB-S Gas Turbine Building South Wall	22	115	960	480	n/a	n/a	n/a
11UMB-W Gas Turbine Building West Wall	22	120	960	480	n/a	n/a	n/a
11UMB-N Gas Turbine Building North Wall	22	93	960	480	n/a	n/a	n/a
11UMB-E Gas Turbine Building East Wall	22	88	960	480	n/a	n/a	n/a
11UMB-S Gas Turbine Building South Wall	31	115	960	480	n/a	n/a	n/a
11UMB-W Gas Turbine Building West Wall	31	120	960	480	n/a	n/a	n/a
11UMB-N Gas Turbine Building North Wall	31	93	960	480	n/a	n/a	n/a
11UMB-E Gas Turbine Building East Wall	31	88	960	480	n/a	n/a	n/a
11UMB-S Gas Turbine Building South Wall	32	115	960	480	n/a	n/a	n/a
11UMB-W Gas Turbine Building West Wall	32	120	960	480	n/a	n/a	n/a
11UMB-N Gas Turbine Building North Wall	32	93	960	480	n/a	n/a	n/a
11UMB-E Gas Turbine Building East Wall	32	88	960	480	n/a	n/a	n/a
11UMB-S Gas Turbine Building South Wall	41	115	960	480	n/a	n/a	n/a
11UMB-W Gas Turbine Building West Wall	41	120	960	480	n/a	n/a	n/a

11UMB-N Gas Turbine Building North Wall	41	93	960	480	n/a	n/a	n/a
11UMB-E Gas Turbine Building East Wall	41	88	960	480	n/a	n/a	n/a
11UMB-S Gas Turbine Building South Wall	42	115	960	480	n/a	n/a	n/a
11UMB-W Gas Turbine Building West Wall	42	120	960	480	n/a	n/a	n/a
11UMB-N Gas Turbine Building North Wall	42	93	960	480	n/a	n/a	n/a
11UMB-E Gas Turbine Building East Wall	42	88	960	480	n/a	n/a	n/a
11UMB-S Gas Turbine Building South Wall	43	115	960	480	n/a	n/a	n/a
11UMB-W Gas Turbine Building West Wall	43	120	960	480	n/a	n/a	n/a
11UMB-N Gas Turbine Building North Wall	43	93	960	480	n/a	n/a	n/a
11UMB-E Gas Turbine Building East Wall	43	88	960	480	n/a	n/a	n/a
CC_CTG_Pkg	6221	98	960	480	n/a	n/a	n/a
CC_HRSG	6221	117	960	480	n/a	n/a	n/a
CC_CTG_Pkg	6222	98	960	480	n/a	n/a	n/a
CC_HRSG	6222	117	960	480	n/a	n/a	n/a
CC_CTG_Pkg	6223	98	960	480	n/a	n/a	n/a
CC_HRSG	6223	117	960	480	n/a	n/a	n/a
CC_CTG_Pkg	6224	98	960	480	n/a	n/a	n/a
CC_HRSG	6224	117	960	480	n/a	n/a	n/a
CC_CTG_Pkg	6225	98	960	480	n/a	n/a	n/a
CC_HRSG	6225	117	960	480	n/a	n/a	n/a

CC_CTG_Pkg	6226	98	960	480	n/a	n/a	n/a
CC_HRSG	6226	117	960	480	n/a	n/a	n/a
CC_CTG_Pkg	6227	98	960	480	n/a	n/a	n/a
CC_HRSG	6227	117	960	480	n/a	n/a	n/a
CC_CTG_Pkg	6228	98	960	480	n/a	n/a	n/a
CC_HRSG	6228	117	960	480	n/a	n/a	n/a
CC_CTG_Pkg	6229	98	960	480	n/a	n/a	n/a
CC_HRSG	6229	117	960	480	n/a	n/a	n/a
CC_STG_Pkg	72	118	960	480	n/a	n/a	n/a
CC_STG_Pkg	72	118	960	480	n/a	n/a	n/a
CC_STG_Pkg	73	118	960	480	n/a	n/a	n/a
CC_STG_Pkg	73	118	960	480	n/a	n/a	n/a
Ac_Ex1_GT1	8	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT1	8	96	960	480	n/a	n/a	n/a
Ac_En1_GT1	8	96	960	480	n/a	n/a	n/a
Ac_En2_GT1	8	96	960	480	n/a	n/a	n/a
Ac_En1_GT2	8	96	960	480	n/a	n/a	n/a
Ac_En2_GT2	8	96	960	480	n/a	n/a	n/a
Ac_En1_GT3	8	96	960	480	n/a	n/a	n/a
Ac_En2_GT3	8	96	960	480	n/a	n/a	n/a
Ac_En1_GT4	8	96	960	480	n/a	n/a	n/a
Ac_En2_GT4	8	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT2	8	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT2	8	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT3	8	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT3	8	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT4	8	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT4	8	96	960	480	n/a	n/a	n/a

Ac_Ex1_GT1	9	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT1	9	96	960	480	n/a	n/a	n/a
Ac_En1_GT1	9	96	960	480	n/a	n/a	n/a
Ac_En2_GT1	9	96	960	480	n/a	n/a	n/a
Ac_En1_GT2	9	96	960	480	n/a	n/a	n/a
Ac_En2_GT2	9	96	960	480	n/a	n/a	n/a
Ac_En1_GT3	9	96	960	480	n/a	n/a	n/a
Ac_En2_GT3	9	96	960	480	n/a	n/a	n/a
Ac_En1_GT4	9	96	960	480	n/a	n/a	n/a
Ac_En2_GT4	9	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT2	9	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT2	9	f96	960	480	n/a	n/a	n/a
Ac_Ex1_GT3	9	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT3	9	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT4	9	96	960	480	n/a	n/a	n/a
Ac_Ex1_GT4	9	96	960	480	n/a	n/a	n/a

APPENDIX C

Calculated Noise Levels at Discrete Receptors

Table C-1a. Calculated Noise Levels at Discrete Receptors

	Scenarios							
	OC		CC		CC-INT		CC-SUB	
	Day	Night	Day	Night	Day	Night	Day	Night
Receptors	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)
MP1	51.9	52.3	56	56.4	53.3	53.7	51.8	52.2
MP2	41.8	42.4	42.7	43.2	42	42.5	41.8	42.3
MP3	59.3	59.6	67.9	68.2	62.9	63.1	59.3	59.6
R1 nw	60.8	61	73.4	73.5	66.8	66.9	60.7	60.9
R2 nw	61.6	61.9	74	74.1	67.4	67.5	61.4	61.6
R3 nw	56.5	56.9	62.7	63.1	59.1	59.4	56.4	56.7
R4 ne	52.8	53.3	57.5	58	54.6	55	52.6	53
R5 se	53.5	53.8	57.5	58	54.9	55.2	53.6	54
R6 se	56.6	56.9	61.4	61.8	58.1	58.4	56.5	56.8
R7 se	56.3	56.6	60.2	60.6	57.6	57.9	56.4	56.7
R8 sw	59.3	59.5	62.9	63.3	60.3	60.6	59.4	59.6
R9 sw	62.1	62.2	70.5	70.8	66	66.1	62.2	62.4

	Scenarios							
	OC+A		CC+INT+A		CC+SUB+A		Acacia	
	Day	Night	Day	Night	Day	Night	Day	Night
Receptors	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)
MP1	54.5	55.0	55.3	55.8	54.5	54.9	51.1	51.6
MP2	42.0	42.6	42.2	42.7	42.0	42.5	28.2	28.7
MP3	59.4	59.7	62.9	63.1	59.4	59.7	40.1	40.6
R1 nw	60.8	61.0	66.8	66.9	60.7	60.9	39	39.6
R2 nw	61.7	62.0	67.4	67.5	61.5	61.7	43.5	44.1
R3 nw	57.2	57.6	59.5	59.8	57.1	57.5	49	49.5
R4 ne	55.3	55.8	56.4	56.9	55.2	55.7	51.8	52.3
R5 se	55.4	55.8	56.4	56.7	55.5	55.9	50.9	51.4
R6 se	57.0	57.3	58.4	58.7	56.9	57.2	46.2	46.7
R7 se	56.3	56.6	57.6	57.9	56.4	56.7	36.3	36.8
R8 sw	59.3	59.5	60.3	60.6	59.4	59.6	33.1	33.7
R9 sw	62.1	62.2	66.0	66.1	62.2	62.4	37.8	38.4

APPENDIX D

Graphical Results from Noise Modelling

1. **Existing Situation: Open Cycle Gas Turbine units (9 units, i.e. 4 existing and 5 in construction phase)**

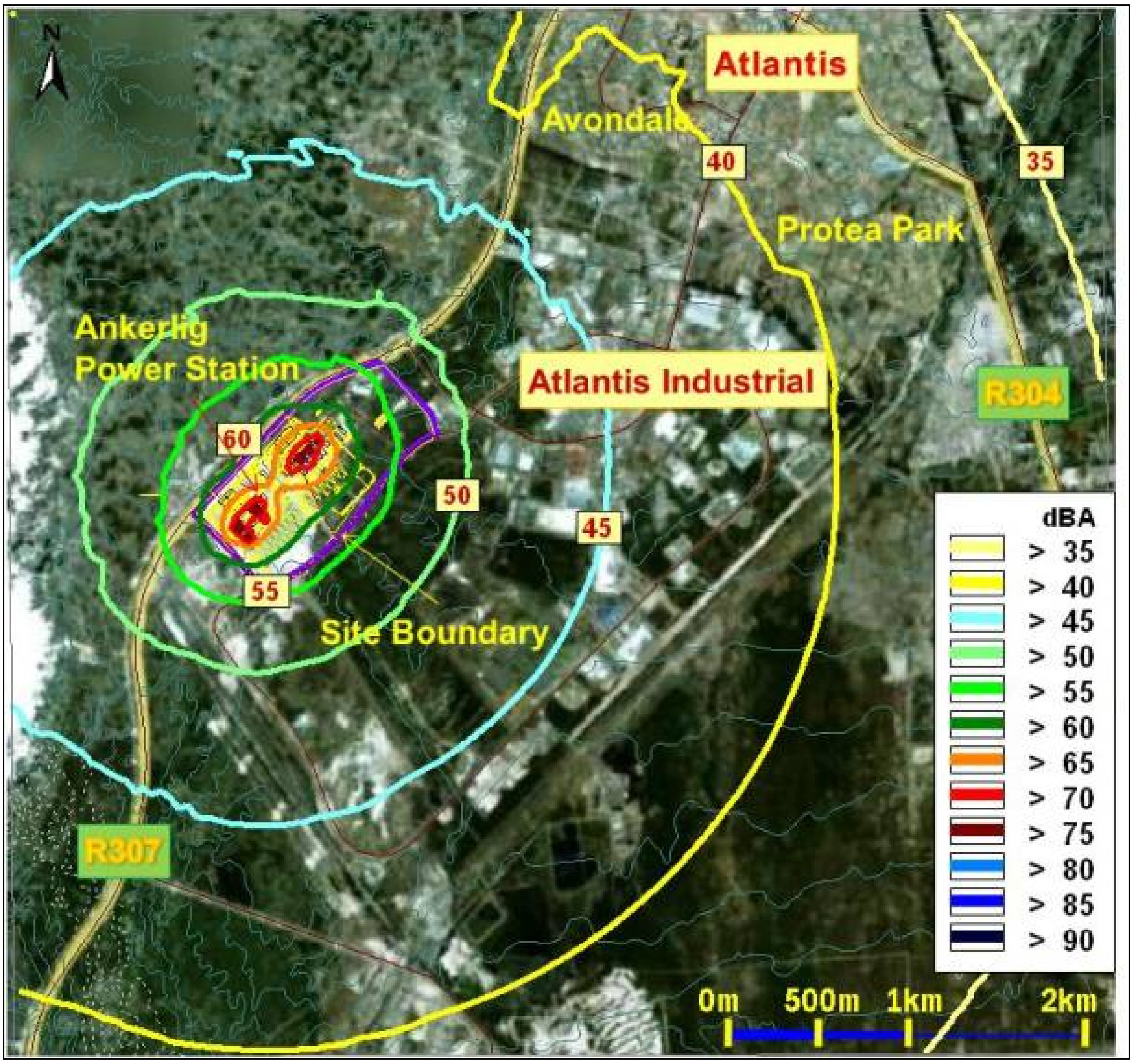

Figure D-1-a. Scenario 1: Day-time Noise Levels

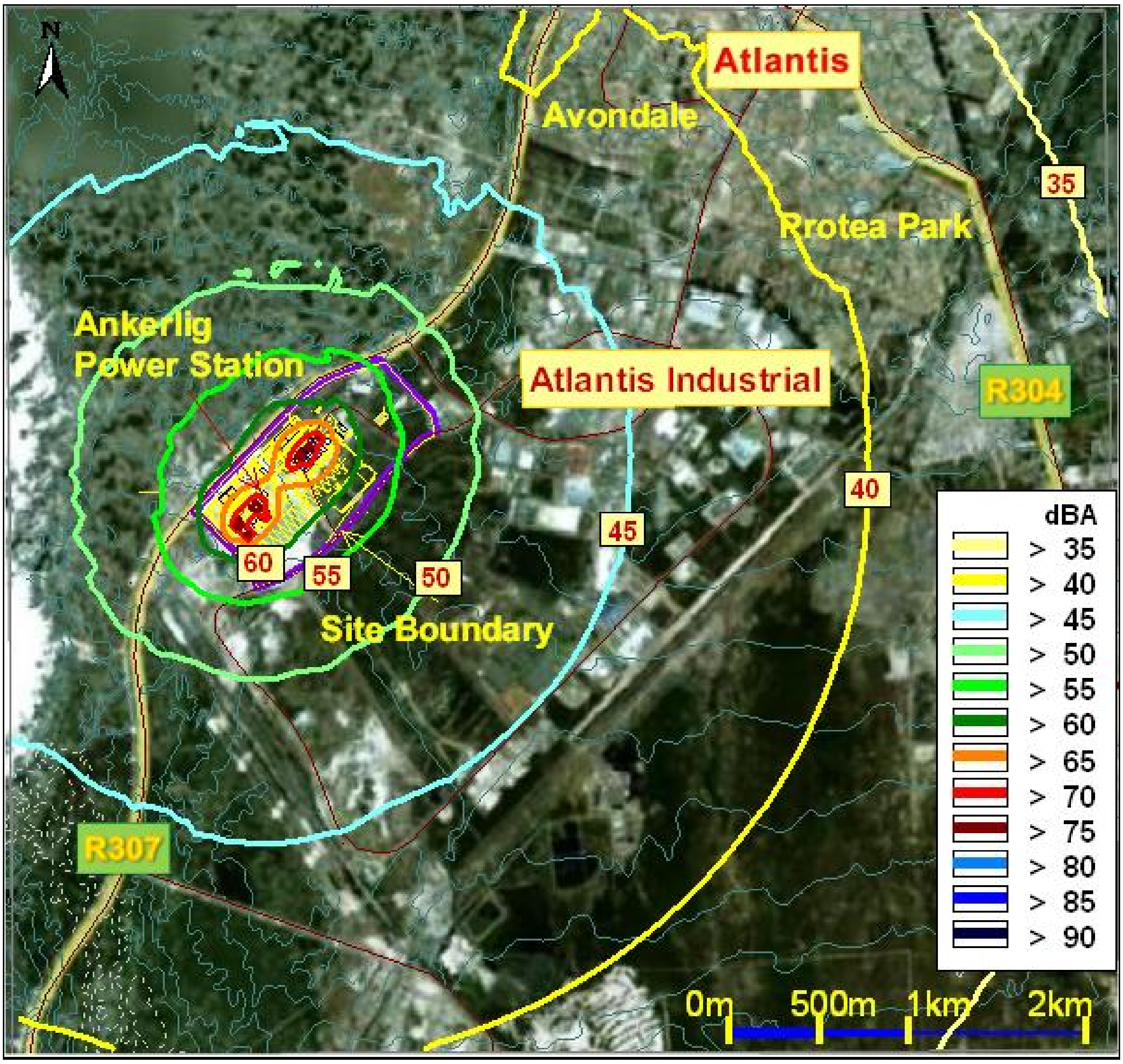

Figure D-1-b. Scenario 1: Night-time Noise Levels

2. Scenario 2: Acacia and Port Rex Relocation

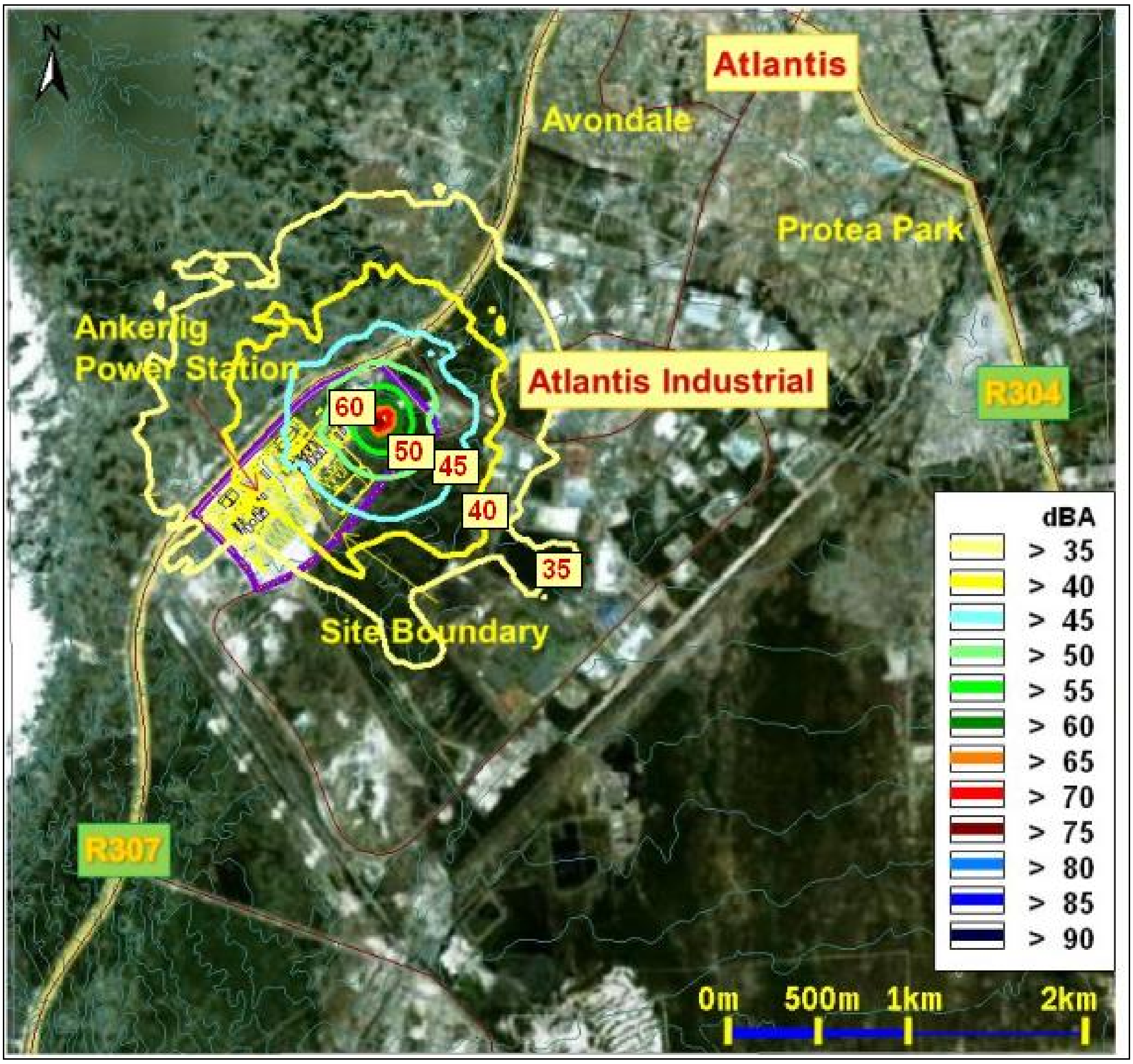

Figure D-2-a. Scenario 2: Day-time Noise Levels

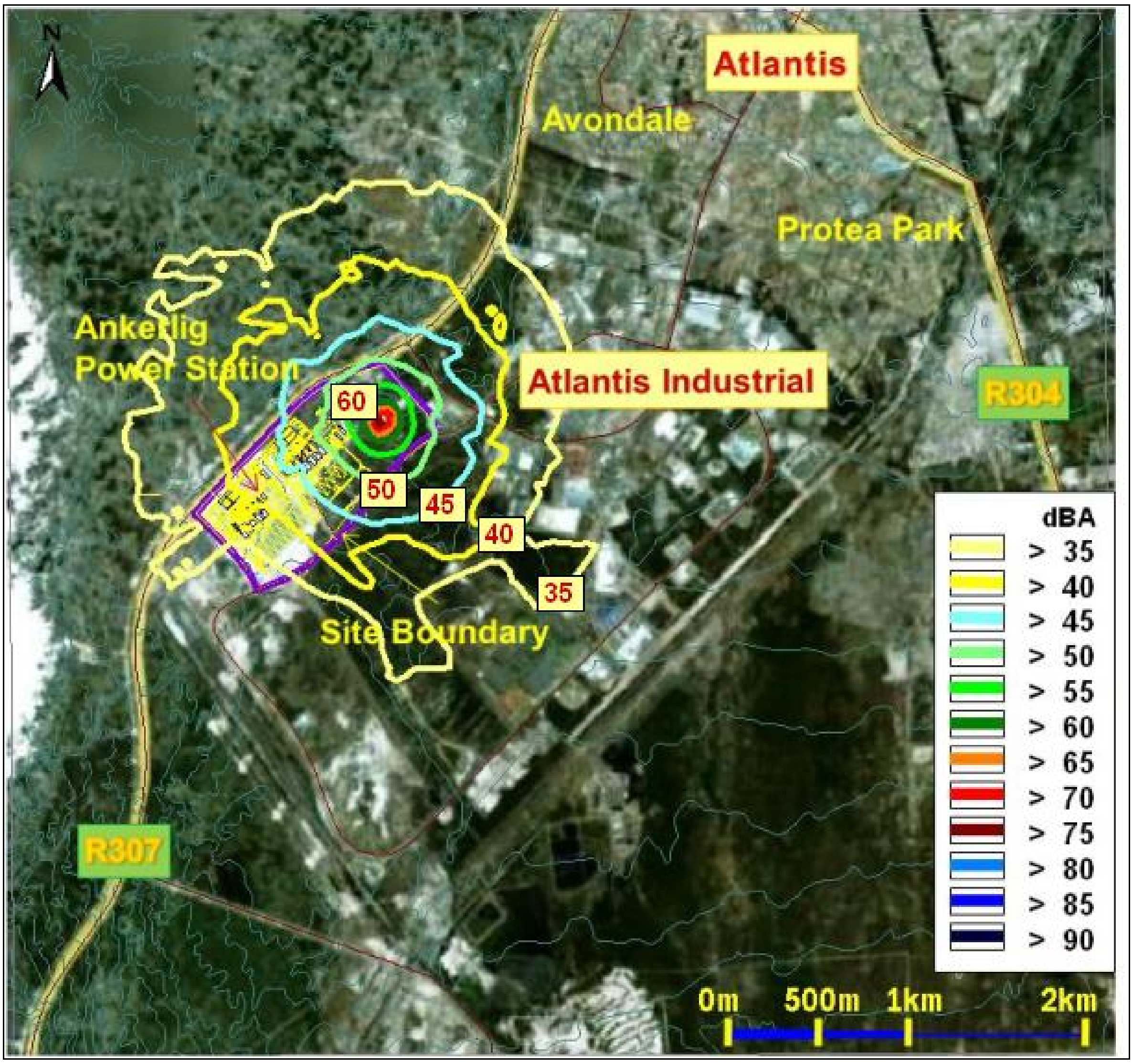

Figure D-2-b. Scenario 2: Night-time Noise Levels

3. Scenario 3: Open Cycle Gas Turbine units (9 units) + Acacia units

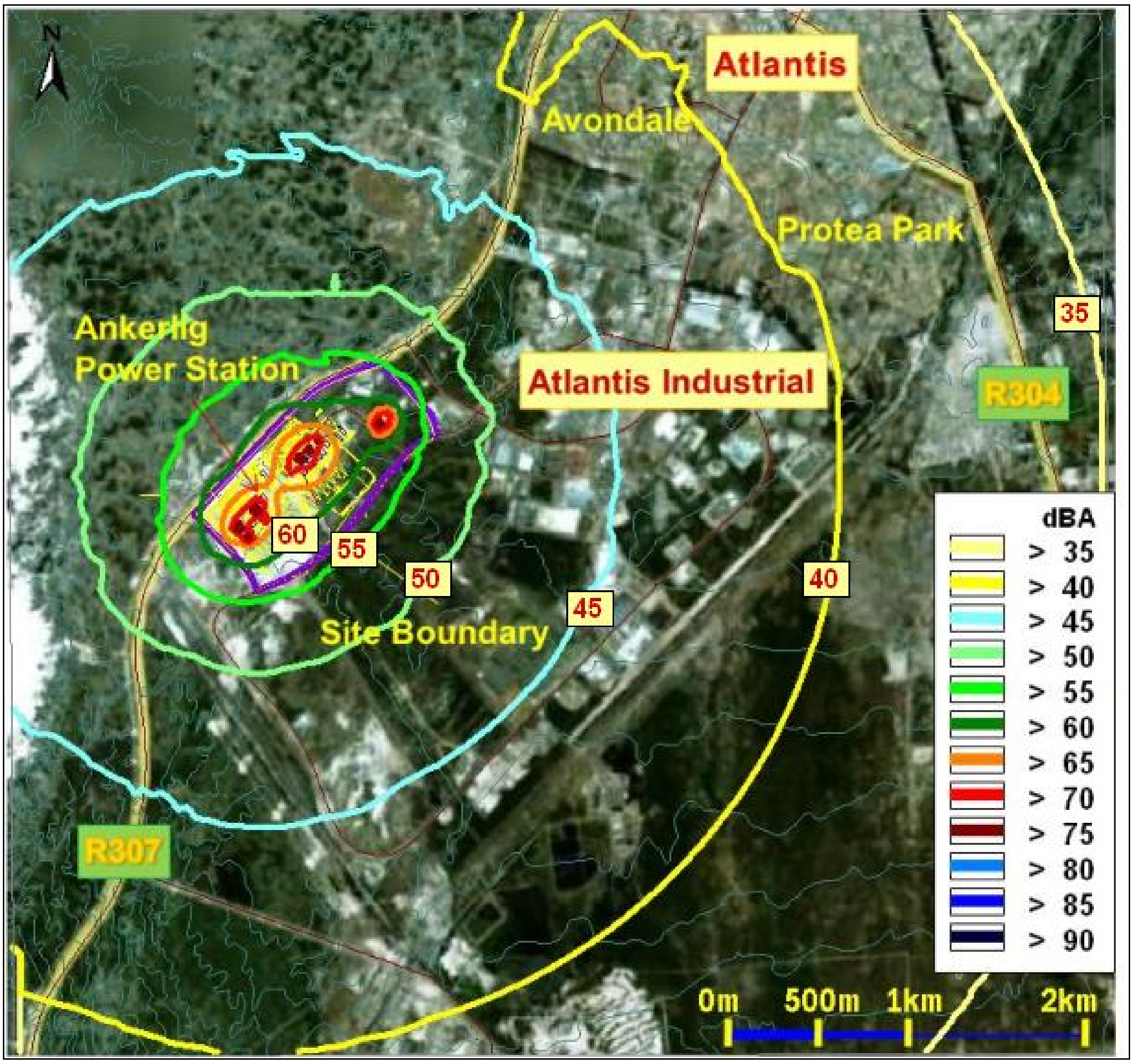

Figure D-3-a. Scenario 3: Daytime Noise Levels

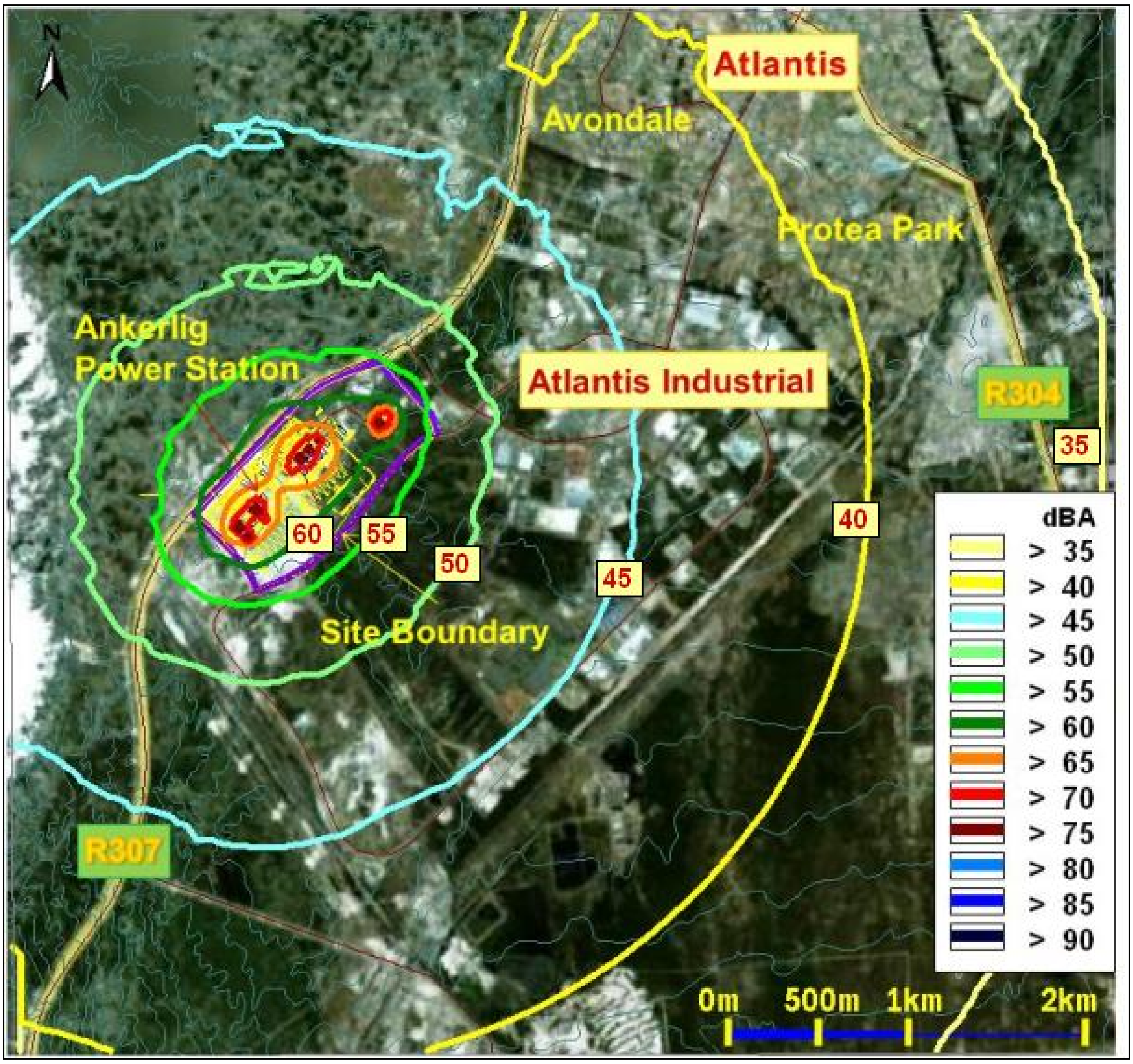

Figure D-3-b. Scenario 3: Night-time Noise Levels

4. **Scenario 4: Acacia diesel units+ Combined Cycle Gas Turbine units + Substantial Mitigation Measures**

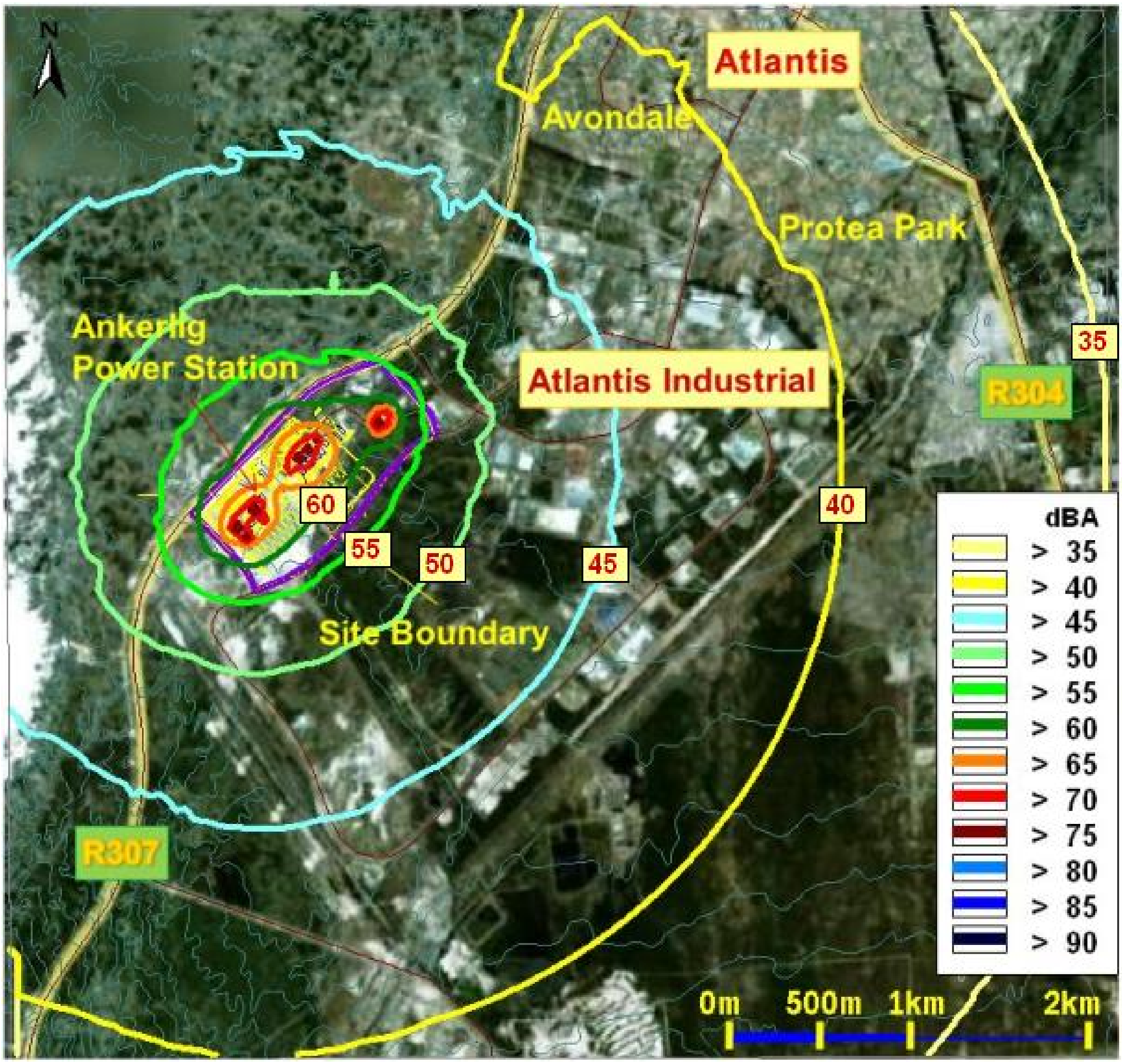

Figure D-4-a. Scenario 4: Day-time Noise Levels

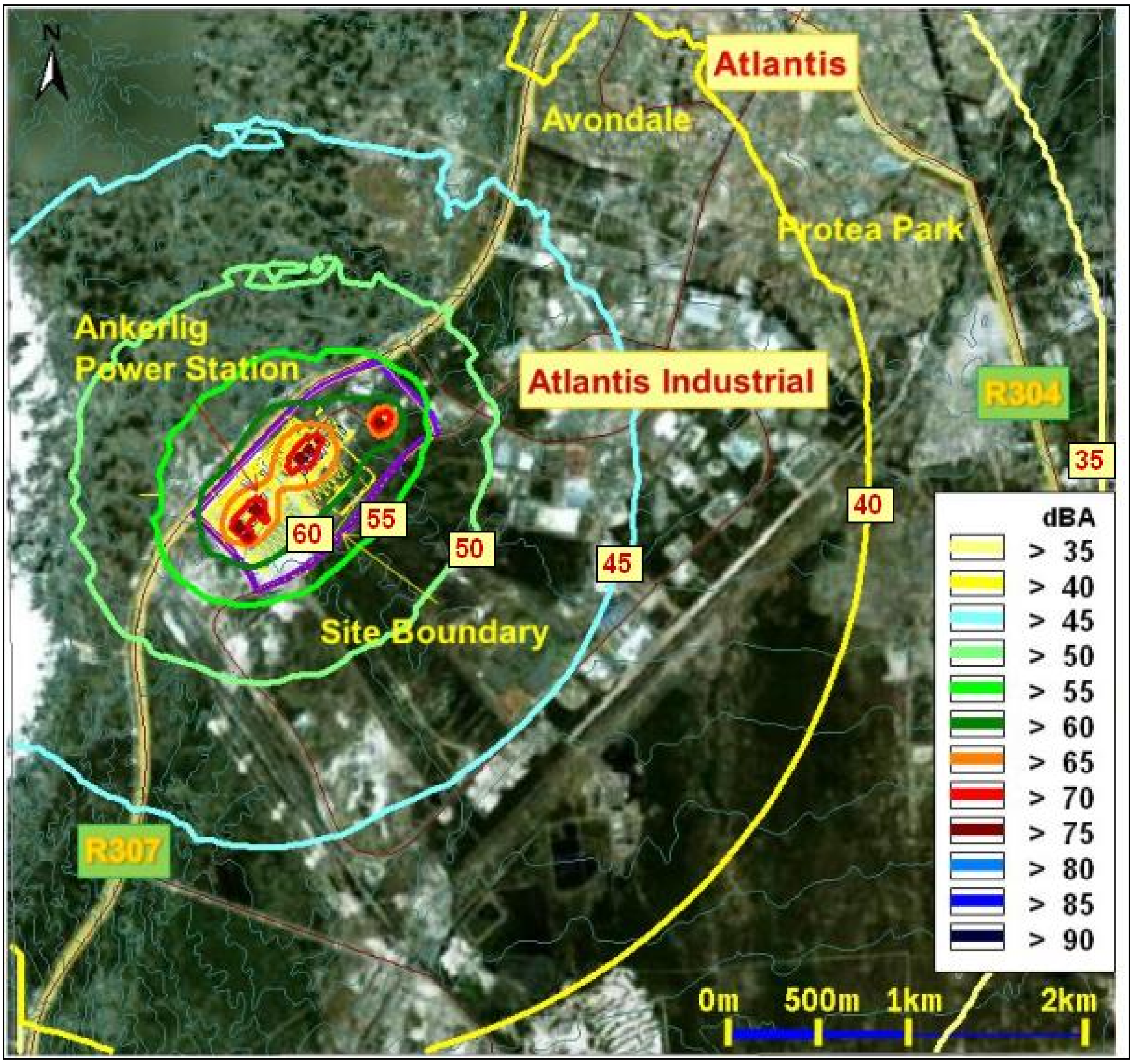

Figure D-4-b. Scenario 4: Night-time Noise Levels

APPENDIX E

Noise Emission Sources from Siemens

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Annex A

Content

Table of sound power levels of the noise sources

This table shows the sound power levels of the noise sources installed which have optionally been calculated with or without time rating.

Column:	
Noise source	Short designation of the noise source
Spectrum	Short designation of the spectrum
Trans./Insert. loss	Short designation of sound reduction indices; if more than one reduction index (maximum 4) is indicated, the short designations 2 to 4 will be listed in the 2nd line and separated by '+'
Coordinates [m]	X-, Y-coordinates and the height of the noise source above ground
Number [Stk]	Number of noise sources summarized to one
Surface [m²]	Measuring surface, enveloping or radiating surface of the noise source
diff [dB]	Correction index for the sound field transition from the inside to the outside
Time [dB]	Time rating for discontinuously emitting sources (option)
32 - 8k [Hz]	A-weighted sound power levels within the individual octave bands
L_{WA} [dB(A)]	A-weighted added sound power levels calculated based on the sound power levels within the individual octave bands

The energetic sum of the power spectra of source groups is indicated as subtotal. Finally, the total sound power level of all the sources is shown.

Siemens / PG

Table 1 OCGT Eskom Atlantis 4xSGT5-2000
Names and Descriptions of the Sound Sources

Short name and	Description
Gas Turbine Package 11UMB	
wall N	wall north
wall E	wall east
wall S	wall south
wall W	wall west
roof	roof
gate E	gate east
gate W	gate west
doors	doors
air suppl. op. N	air supply openings in wall north
air suppl. op. E	air supply openings in wall east
air suppl. op. S	air supply openings in wall south
air exh. Unit N	air exhaust ventilation unit north
air exh. Units S	air exhaust ventilation units south
Gas Turbine Filterhouse 11MBL	
EB casing	elbow casing
SL casing	silencer casing
FHA intakes	filterhouse air intakes
Gas Turbine Diffuser Extension Duct 11MBR	
diff. ext. duct	diffuser extension duct
Exhaust Stack 11UHN	
LS part	lower part of the exhaust stack
SL casing	exhaust silencer casing
outlet duct	outlet duct
stack outlet	stack outlet
Lube Oil Coolers 11URC (MBV-System)	
FFC air int.	fin-fan cooler fan (air intake)
FFC air outl.	fin-fan cooler fan (air outlet)
Forced Cooling Water Cooler 11URB (MPR-System)	
FFC air int.	fin-fan cooler fan (air intake)
FFC air outl.	fin-fan cooler fan (air outlet)
Transformers 11BAT/BBT/BFT	
11BAT TF UBF	generator transformer 165MVA
11BBT TF UBE	HV-auxiliary transformer
11BFT TFUBD	low voltage transformers
Power Control Centers 11UBA01-02	
11UBA, ACU	air conditioning unit of a power control centre
Unidentified Noise Sources Unit 11	
UIF-NC	unidentified noise sources
Gas Turbine Package 12UMB	
wall N	wall north
wall E	wall east
wall S	wall south
wall W	wall west
roof	roof
gate E	gate east

Table4 OCGT Eskom Atlantis 4xSGT5-2000
Sound Power Levels emitted to the Environment

A-weighted octave band sound power level [dB(A)]

Noise source	Spectrum	Trans./Insert.loss	32	63	125	250	500	1k	2k	4k	8kHz	x[m]	y[m]	h[m]	Number	Surface [m²]	diff [dB]	L_{WA} [dB(A)]
Gas Turbine Package 11UMB																		
wall N	SPL ins. UMB	0,6(S/MW/TS)	76	86	87	88	82	73	70	64	56	-5	51	7	1	252	-6	*93*
wall E	SPL ins. UMB	0,6(S/MW/TS)	77	88	89	90	84	75	72	66	58	7	33	7	1	378	-6	*94*
wall S	SPL ins. UMB	0,6(S/MW/TS)	76	86	87	88	82	73	70	64	56	-5	15	7	1	252	-6	*93*
wall W	SPL ins. UMB	0,6(S/MW/TS)	77	88	89	90	84	75	72	66	58	-17	33	7	1	378	-6	*94*
roof	SPL ins. UMB	0,6(S/MW/TS)	81	91	93	93	88	78	75	70	61	-5	33	10,5	1	864	-6	*98*
gate E	SPL ins. UMB	steel s. gate	61	74	79	82	84	85	80	71	64	7	33	7	1	9	-6	*90*
gate W	SPL ins. UMB	steel s. gate	61	74	79	82	84	85	80	71	64	-17	31	7	1	9	-6	*90*
doors	SPL ins. UMB	steel s. gate	61	73	78	81	83	84	80	70	63	-5	33	7	1	8	-6	*89*
air suppl. op. N	SPL ins. UMB	[SL 2/1/5]	57	72	78	80	76	68	73	74	71	-4	51	2	1	2,25	-6	*84*
air suppl. op. E	SPL ins. UMB	[SL 2/1/5]	66	81	87	89	85	77	83	83	80	7	33	2	3	6,25	-6	*94*
air suppl. op. S	SPL ins. UMB	[SL 2/1/5]	62	76	82	84	80	72	78	78	75	-9	15	2	1	6,25	-6	*89*
air exh. Unit N	House, Fan	[SL 2/1/7,5]	65	75	81	81	73	59	63	65	63	6	56	1,5	1			*85*
air exh. Units S	House, Fan	[SL 2/1/7,5]	68	78	84	84	76	62	66	68	66	8	11	1,5	2			*88*
Gas Turbine Package 11UMB			**85**	**96**	**98**	**99**	**94**	**90**	**88**	**85**	**82**							***104***
Gas Turbine Filterhouse 11MBL																		
EB casing	GT compr. ait.	[S/120MW/S]	61	69	68	67	79	82	90	83	78	0	26	13	1	3,16		*92*
SL casing	GT compr. ait.	1 elbow 0,25 x AIS + [S/120MW/S]	55	62	60	54	60	63	71	65	69	0	28	14,5	1	1,803		*75*
FHA intakes	GT compr. ait.	1 elbow 2 x filter + AI silencer	77	84	88	74	64	73	74	71	98	0	36	16	1			*99*
Gas Turbine Filterhouse 11MBL			**77**	**84**	**88**	**75**	**79**	**83**	**90**	**83**	**98**							***100***
Gas Turbine Diffuser Extension Duct 11MBR																		
diff. ext. duct	GT diff. exh.	3 ST/150/10 ST insertion loss value SBW	67	86	93	97	102	98	99	94	87	0	10	3	1	10,67		*106*
Gas Turbine Diffuser Extension Duct 11MBR			**67**	**86**	**93**	**97**	**102**	**98**	**99**	**94**	**87**							***106***
Exhaust Stack 11UHN																		
LS part	GT diff. exh.	[3SS+200CW+8S] [1SE]-barrier wall	92	101	94	91	93	90	91	95	86	0	0	8,5	1	7,429		*104*
SL casing	GT diff. exh.	1 elbow 0,25 x ES + 3SST+150CW+6ST	79	89	95	84	84	81	88	85	80	0	0	16	1	4,571		*97*

Table4 OCGT Eskom Atlantis 4xSGT5-2000
Sound Power Levels emitted to the Environment

A-weighted octave band sound power level [dB(A)]															
Noise source			Spectrum			Trans./Insert.loss			Coordinates			Num-	Surface	diff	L_{WA}
32	63	125	250	500	1k	2k	4k	8kHz	x[m]	y[m]	h[m]	ber	[m²]	[dB]	[dB(A)]
outlet duct			GT diff. exh.			1 elbow			0	0	26	1	8		*78*
						E silencer + 3SST+150CW+6ST									
69	74	75	59	56	48	48	45	40							
stack outlet			GT diff. exh.			1 elbow			0	0	30	1			*105*
						E silencer + SRD+SRO + Cor6									
92	103	91	89	94	93	93	88	81							
Exhaust Stack 11UHN															
95	**105**	**98**	**93**	**97**	**95**	**96**	**96**	**88**							***108***
Lube Oil Coolers 11URC (MBV-System)															
FFC air int.			LOC air int.						-15	4	2	3			*95*
52	68	80	88	89	88	87	85	82							
FFC air outl.			LOC air outl.						-15	4	3,5	3			*97*
54	70	82	90	91	90	89	87	84							
Lube Oil Coolers 11URC (MBV-System)															
57	**72**	**84**	**92**	**93**	**92**	**91**	**89**	**86**							***99***
Forced Cooling Water Cooler 11URB (MPR-System)															
FFC air int.			LOC air int.						-15	-11	2	8			*99*
57	72	84	92	93	92	91	89	86							
FFC air outl.			LOC air outl.						-15	-11	4,5	8			*101*
59	74	86	94	95	94	93	91	88							
Forced Cooling Water Cooler 11URB (MPR-System)															
61	**76**	**88**	**97**	**97**	**96**	**95**	**93**	**90**							***103***
Transformers 11BAT/BBT/BFT															
11BAT TF UBF			GT gen. transf.						-12	75	3	1			*100*
40	63	87	93	96	94	88	84	72							
11BBT TF UBE			UBE transf.						-12	66	2	1			*85*
24	51	76	82	76	77	71	63	50							
11BFT TFUBD			UBD transf.						-10	56	1,5	2			*81*
23	47	72	78	72	73	67	59	46							
Transformers 11BAT/BBT/BFT															
40	**63**	**87**	**94**	**96**	**94**	**88**	**84**	**72**							***100***
Power Control Centers 11UBA01-02															
11UBA, ACU			UBA, ACU						-11	47	3	2			*87*
52	64	73	80	82	81	77	71	62							
Power Control Centers 11UBA01-02															
52	**64**	**73**	**80**	**82**	**81**	**77**	**71**	**62**							***87***
Unidentified Noise Sources Unit 11															
UIF-NC			UIF-NC			Cor3			-5	27	10	1			*107*
82	95	100	103	100	97	92	86	80							
Unidentified Noise Sources Unit 11															
82	**95**	**100**	**103**	**100**	**97**	**92**	**86**	**80**							***107***
Gas Turbine Package 12UMB															
wall N			SPL ins. UMB			0,6(S/MW/TS)			35	51	7	1	252	-6	*93*
76	86	87	88	82	73	70	64	56							
wall E			SPL ins. UMB			0,6(S/MW/TS)			47	33	7	1	378	-6	*94*
77	88	89	90	84	75	72	66	58							
wall S			SPL ins. UMB			0,6(S/MW/TS)			35	15	7	1	252	-6	*93*
76	86	87	88	82	73	70	64	56							
wall W			SPL ins. UMB			0,6(S/MW/TS)			23	33	7	1	378	-6	*94*
77	88	89	90	84	75	72	66	58							
roof			SPL ins. UMB			0,6(S/MW/TS)			35	33	10,5	1	864	-6	*98*
81	91	93	93	88	78	75	70	61							
gate E			SPL ins. UMB			steel s. gate			47	33	7	1	9	-6	*90*
61	74	79	82	84	85	80	71	64							

APPENDIX F

Noise Emission Sources from B&V

BLACK & VEATCH

MEMORANDUM

B&V Project 149106
Atlantis
January 11, 2008
Preliminary Noise Evaluation

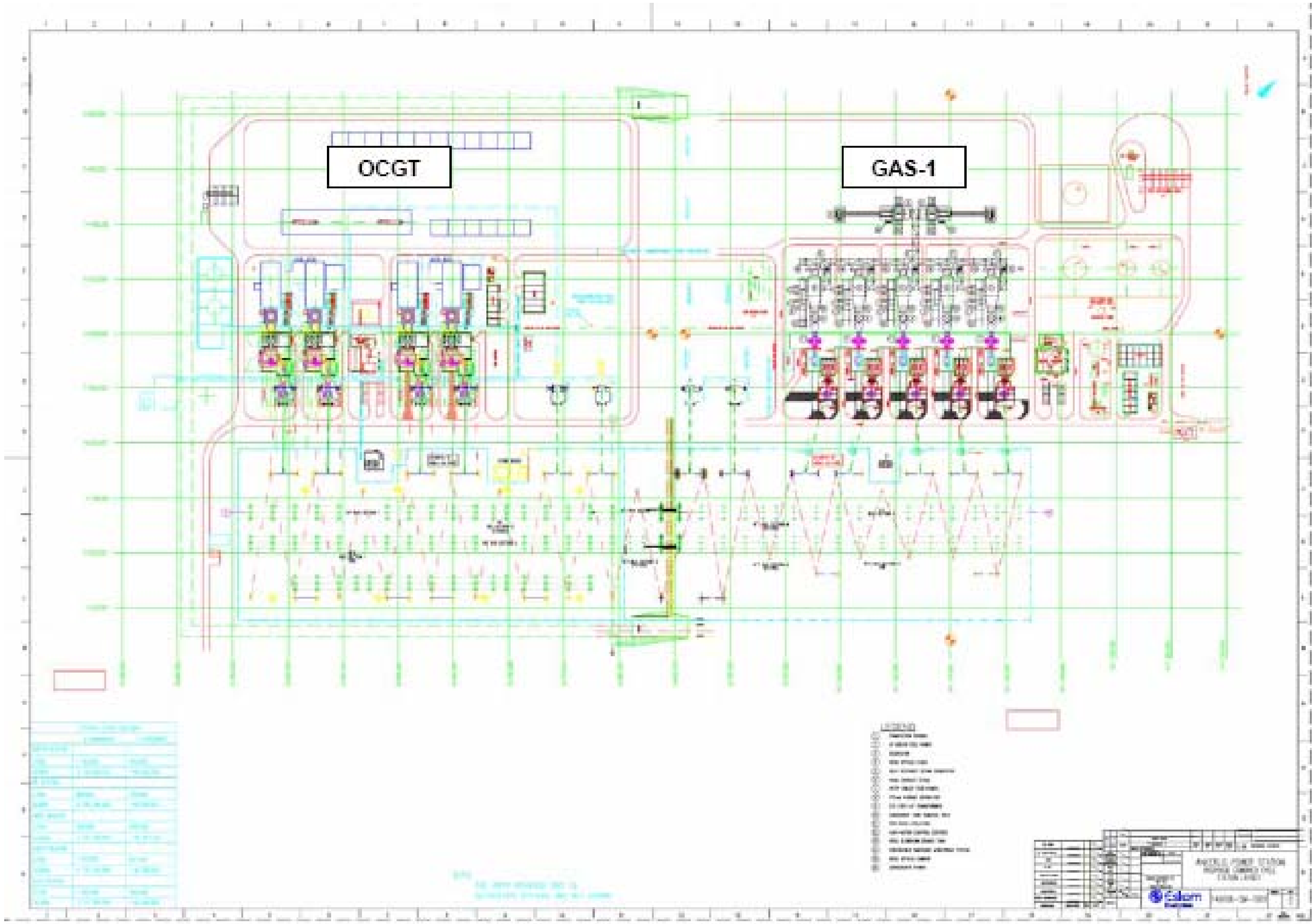

Figure 1. Eskom Atlantis OCGT & GAS-1 Facilities.

Table 1-1
Summary of Preliminary Acoustical Design Requirements for the Eskom Atlantis Project.

Equipment	Qty	Noise Source Components	Major Equipment Packages				
			Standard Equipment Package Specification	**Intermediate Mitigation Specification**	**Anticipated Mitigation**	**Substantial Mitigation Specification**	**Anticipated Mitigation**
CTG Pkg (SGT5-2000E) Indoor	9	Turbine compartment, generator compartment, load compartment, ventilation fans, fin fan cooler, lube oil cooler, cooling water pumps and all other auxiliary equipment /modules included in the CTG scope-of-supply.	85 dBA @ 1 m (b) 63 dBA @ 122 m (a)	85 dBA @ 1 m (b) 63 dBA @ 122 m (a)	N/A	85 dBA @ 1 m (b) 63 dBA @ 122 m (a)	N/A[rb1]
HRSG	9	HRSG package including transition, boiler, stack, and stack exit	85 dBA @ 1 m (b) 67 dBA @ 122 m (a)	62 dBA @ 122 m (a)	• Increase in Boiler Casing Thickness • Stack Exit Silencer	56 dBA @ 122 m (a)	• Increase in Boiler Casing Thickness • Stack Exit Silencer • Transition barrier
GSUT	9	Transformer with fans at max cooling	85 dBA per IEEE C57.12.90	85 dBA per IEEE C57.12.90	N/A	85 dBA per IEEE C57.12.90	N/A
AUX XFMR	9	Transformer with fans at max cooling	80 dBA per IEEE C57.12.90	80 dBA per IEEE C57.12.90	N/A	80 dBA per IEEE C57.12.90	N/A
BFP	9	Low Pressure Pump and motor assembly	90 dBA @ 1 m (b)	85 dBA @ 1 m (b)	• Pump/motor assembly upgrade	65 dBA @ 1 m (b)	• Place BFP indoors high STC enclosure
	9	High Pressure Pump and motor assembly	90 dBA @ 1 m (b)	85 dBA @ 1 m (b)	• Pump/motor assembly upgrade	65 dBA @ 1 m (b)	• Place BFP indoors high STC enclosure

Table 1-1
Summary of Preliminary Acoustical Design Requirements for the Eskom Atlantis Project.

Equipment	Qty	Noise Source Components	Major Equipment Packages				
			Standard Equipment Package Specification	**Intermediate Mitigation Specification**	**Anticipated Mitigation**	**Substantial Mitigation Specification**	**Anticipated Mitigation**
STG Pkg	4	Turbine sections, generator compartment, piping, and all other auxiliary equipment included in the STG scope-of-supply.	85 dBA @ 1 m (b) 68 dBA @ 122 m (a)	60 dBA @ 122 m (a)	• Place STG inside enclosure	45 dBA @ 122 m (a)	• Place STG indoors high STC enclosure
Air Cooled Condenser	4	Fan, motor, gearbox, water splash.	85 dBA @ 1 m (b) 63 dBA @ 122 m (a)	50 dBA @ 122 m (a)	• Low noise fans	45 dBA @ 122 m (a)	• Low noise fans • inlet and exit silencers • larger footprint
CCCW Coolers	4	Fan and motor assembly.	85 dBA @ 1m (b)	75 dBA @ 1m (b)	• Low noise fans	65 dBA @ 1m (b)	• Low noise fans • inlet and exit silencers • larger footprint

NOTES
(a) The maximum sound pressure level in any direction from the equipment envelope at the distance specified. The equipment envelope is defined as the contour that completely encompasses all equipment components at a distance of one meter from the equipment face or enclosure.
(b) Average sound pressure level along the equipment envelope.