3. GENERAL INFORMATION

3.1 CALCULATION OF NOISE LEVELS

The aircraft noise contours around East London Airport were calculated with the latest available version (i.e. 6.1) of the Integrated Noise Model (INM), maintained and distributed by the Federal Aviation Administration (FAA). The INM incorporates a database of performance related noise emission levels for a large variety of aircraft types, obtained from ICAO certification data. The model uses this data to mathematically estimate the noise level at a given point on the ground caused by an aircraft under specific operating conditions. The various factors that influence the propagation of sound energy, i.e. the directionality of noise emissions, distance of the aircraft from the point and meteorological conditions prevalent at the airport and the associated airspace are included in the calculation.

The document governing aircraft noise around airports in South Africa is SABS 0117. It was substantially revised and is soon to be published as SANS 10117/SABS 0117 *'Calculation and prediction of aircraft noise around airports for land use purposes'*. The revised document now directly refers to the INM for the calculation of aircraft noise.

3.2 PARAMETERS THAT DETERMINE AIRCRAFT NOISE

The calculation of aircraft noise is a very complex procedure and involves a large number parameters. The noise caused by an individual takeoff or landing operation is mainly determined by the following parameters:

• The flight track of arriving and departing aircraft.
• The flight profile (height, configuration and power settings) of arriving and departing aircraft.
• The type of aircraft in terms of its aerodynamic characteristics.
• The weight of the aircraft (in the case of departures, quantified by the distance to
destination).
• The manufacturer and type of the engines.
• The certified noise level of the aircraft.
• The time of arrival and departure.
• The wind direction and aircraft landing and departure routes.
• The meteorological conditions at the airport.

These properties are taken into consideration by the INM. There are a number of other localised effects, which may influence noise levels, but are not considered by the INM. These include:

• The screening effect of buildings and other constructions.
• The effect of topography on sound propagation.
• The contribution of other noise sources, e.g. road traffic and industry.

3.3 QUANTIFYING AIRCRAFT NOISE

Noise in general, and aircraft in particular, has many dimensions that may influence the reaction of people. These reactions relate to the amplitude or ‘loudness’ of the noise, the sensitivity of the ear to different frequencies, the frequency of occurrence of noise intrusions, the time of day and overall number of those intrusions.

However, for land planning purposes it has become international practice to express aircraft noise in terms of an integrated, or energy-averaged, noise level over a period of 24 hours. It is thus very important to ensure that this noise level is determined for the typical operational conditions at the airport.

The old South African noise metric was the Noisiness Index (NI) and in effect was an equivalent A-weighted noise level determined over a period of 24 hours, with penalties for flights occurring during the evening and night. The NI has now been withdrawn and is replaced with the internationally widely used Day-Night-Level

(DNL). In order to effectively integrate with other noise related documents, the DNL is called the Equivalent Continuous Day/Night Rating Level (L_{Rdn}) in the Southern African context. ‘Day’ is defined as being from 06:00 to 22:00, and ‘Night’ from 22:00 to 06:00. A penalty of 10 dB is applied to flights during the night.

3.4 THE SOUTH AFRICAN NOISE REGULATORY FRAMEWORK

Environmental protection is the subject of the Environmental Conservation Act, 1989 (Act 73 of 1989). Restrictions on land use and development in the vicinity of an airport with respect to aircraft noise are controlled by Schedule 1, which refers to the Code of Practice SABS 0117, i.e. to the succeeding SANS 10117/SABS 0117.

In this document the following recommendations concerning the maximum yearly L_{Rdn} to which a particular type of district should be exposed are made:

- L_{Rdn} = 55 dBA: Residential developments should not be allowed to fall inside the 55 dBA contour, i.e. the yearly noise level should not exceed 55 dBA. This includes other noise sensitive developments such as hospitals, educational facilities, conference facilities and places of worship.
- L_{Rdn} = 60 dBA: Commercial districts including retail shopping, offices, consulting rooms.
- L_{Rdn} = 65 dBA: Commercial/Industrial districts, i.e. central business districts, motor trade, warehousing, etc. Also agriculture (livestock and breeding) and cemeteries.
- L_{Rdn} = 70 dBA: Industrial activities, i.e. manufacturing, assembly, repairing, packaging, bus depots, builders yards, etc.
- L_{Rdn} = 75 dBA: Agricultural land tenure without livestock, picnic facilities, open spaces (vacant land).
- L_{Rdn} = 80 dBA: Forbidden area, i.e. no development of land to be permitted.

The current Noise Regulations applicable in the Eastern Cape, published under the Environment Conservation Act, also refer to SABS 0117. According to these, a local authority may proclaim a controlled zone in an area where the NI equals or exceeds 65. In effect this means that no residential development should take place inside the NI 65 contour, unless it can be proven that additional effective sound isolation measures have been applied to buildings.

There is no direct conversion factor between NI and L_{Rdn} (DNL), although both are determined by the same acoustic principles. However, it can be accepted that NI 65 is considerably higher than L_{Rdn} = 55 dBA. Therefore, the new limits for development are considerably more stringent than the old Noise Regulations. It should also be noted that new noise regulations are to be published soon which will refer directly to the new SABS documentation, thereby enforcing the more stringent limits.