Dimensional Digital Services

July / 2024

Report

Study on Noise Mapping and Noise Zone

at

Mysuru Airport, Mysuru

Submitted to

MYSURU AIRPORT
MYSURU,
KARNATAKA 571311

Submitted by

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Mysuru Airport, Mysuru

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Study on Noise Mapping and Noise Zone as per DGCA guidelines for the year 2024
at

Mysuru Airport

Doc. No.:110

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Prepared by:

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DISCLAMER

Note this report is a study on '**noise** mapping and noise zone study at Mysuru Airport' conducted in accordance with DGCA CAR Section 10, Series A Part I, 18th DEC, 2014 and to provide an initial overview of noise exposure within and outside the airport.

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List of Abbreviations

AAI	Airport Authority of India
ADS B	Automatic Dependent Surveillance–Broadcast
ATC	Air Traffic Control
CAEP	Committee on Aviation Environmental Protection
CPCB	Central Pollution Control Board
DGCA	Directorate General of Civil Aviation
GPS	Global Positioning System
ICAO	International Civil Aviation Organisation
INM	Integrated Noise Model
AEDT	Aviation Environmental Design Tool
MOEF	Ministry of Environment and Forests
KSPCB	Karnataka State Pollution Control Board
NABET	National Accreditation Board for Education and Training
NMS	Noise Monitoring Systems
NMTs	Noise Monitoring Terminals
SLM	Sound Level Meter
IRS	Indian Remote Sensing Satellite
NRSC	National Remote Sensing Centre

1. Introduction

This report is prepared by Dimensional Digital Services Pvt. Ltd in response to a tender published by Mysuru Airport to carry out Noise mapping and noise zoning study as per the requirement of The Environment (Protection) Amendment Rules, 2018.

Mysuru Airport situated 12KM from city railway station. Presently, Mysuru Airport is having two schedule flights connecting Mysuru to Hyderabad and Chennai. Moreover, M/s OFAA & M/s NCC having base at Mysuru Airport providing CPL, PPL pilot training and Cadet familiarization training respectively. M/s OFAA is having 08 C172 and 01 TU type of aircraft and operating dawn to dusk at Mysuru Airport

The annual flight movements at Mysuru Airport is around 19738 for the year 2022. The Mysuru airport comes under 'Other Airport' category as per GSR 568 €. As per GSR 568 €, Airports having Aircraft movements more than 15,000 and Less than 50,000 annually, are categorised as 'Other Airport'.

The study was conducted in consultation with Mysuru airport Air Navigation Service Provider (ATC department) as per the requirements of Environment (Protection) Amendment Rules, 2018. The Minutes of the Meeting is provided in Annexure 4. The Minutes of the Meeting is provided in Annexure 4.

1.1. Objective of study

Noise mapping and declaration of Airport Noise Zone at Mysuru Airport as per the requirements of Environment (Protection) Amendment Rules-2018.

1.2. Scope of work

The scope of work of the noise study at Mysuru Airport, includes the following

1. A detailed scientific study of noise caused by aircraft operations and associated activities within the premises of the airport.
2. Noise monitoring, assessment and mapping
    a. Collection of baseline information.
    b. Noise monitoring during operation times and also at the villages located within a 10km radius from the airport.
    c. Develop land use mapping of airport and its surrounding.
    d. Noise modelling of airport as well as at surrounding land-use using the noise prediction model.

e. Development of noise maps and declaration of Airport Noise Zone using standard Noise modelling software.

f. Conduct noise impact assessment using the noise maps.

g. Study Boundary Noise due to aircraft operations

h. Study of Lmax and its locations at Mysuru Airport

1.3. Methodology of Study

The Noise mapping and Noise zone study was carried out at Mysuru Airport, as per requirement of the Environment (Protection) Amendment Rules, 2018.

Noise maps and noise zone were developed by using the Aviation Environmental Design Tool (AEDT). AEDT is the standard software developed by The Federal Aviation Administration (FAA) US, AEDT is a integrated software to estimate the environmental consequences of aviation actions, such as airport noise, fuel consumption, and air pollutant emissions.

The basic input data for noise modelling is flight operation data. The flight operations of one year (from 1st Jan 2023 to 31st Dec. 2023) were obtained from Mysuru airport.

The flight data covers the details of each flight that was operated at airport including: runway usage, flight registration no, Airline operator, Call sign information, date, time, route etc. All the flight details were processed to check any missing or errors in the flight data.

Noise maps for Lday and Lnight were developed using the flight data. In order to validate the Noise contours, noise monitoring campaign was conducted at Mysuru airport for a period of one week (from 21st March 2024 to 27th March 2024). During noise monitoring at Mysuru airport, flight tracks were also monitored using Automatic Dependent Surveillance–Broadcast (ADS-B) station.

This report is in two parts:

1) Noise mapping study at Mysuru Airport
2) Noise zone study at Mysuru Airport

Part-1: Noise Mapping Study at Mysuru Airport

2. Noise modelling

Noise modelling and mapping was developed using the actual air traffic data of the year 2023, flight tracks and geographical information of airport, airport master plan. Noise maps were developed for the following noise indices: L_{day}, L_{night}, on 5 dBA intervals starting from 55 dBA to 75 dBA for L_{day} metrics and from 45 dBA to 75 dBA for L_{night} metrics.

2.1. Noise Metrics

L_{day} Means the average sound level, in decibels, from 0600-2200hrs

L_{night} Means the average sound level, in decibels, from 2200-0600hrs

The following noise contours have been determined (table 2-1):

Table 2-1: Noise metrics.

Metric	Level dB(A)
L_{day}	55dB to 75dB
L_{night}	45dB to 75dB

2.2. Airport data

For the calculations the following airport related input data has been used, mainly based on the information provided in the Aeronautical Information Publication (AIP) and Automatic Dependent Surveillance – Broadcast (ADS-B) data.

<u>Runways</u>

Mysuru Airport has one runway in use, the details are given in table 2.2

Table 2-2: Runway details.

Runway	Header	Runway end/ Runway threshold	Lat	Lon	Elevation[ft]
09-27	09	THR:	121352.63N	0763840.36E	THR: 2397
		END:	121354.64N	0763937.89E	TDZ: 2397
	27	THR:	121354.64N	0763937.89E	THR: 2341
		END:	121352.63N	0763840.36E	TDZ: 2354

The meteorological conditions that have been used for performance calculations in AEDT are the average meteorological data for the last 10 years.

2.3. Traffic data

Following internationally accepted conventions, noise maps are to be derived for a representative day of the year. Since the flight plan provided by Mysuru airport, provides the actual aircraft types used in the year 2023, the typical fleet composition can easily be derived by dividing the total number of operations of each aircraft type by the total number of days. Tables 2-3 and 2-4 provide the fleet composition of this representative day for the year 2023 divided by 365.

Table 2-3: Fleet composition and percentage of operations for each time period.

Class	Aircraft Models	% Day	% Evening	% Night
Medium-range (single aisle)	A320 family, B737 family, etc.	0	0	0
Long-range wide bodies (2 eng)	A330, B777, etc.	0	0	0
Long-range wide bodies (4 eng)	A340, B747, etc.	0	0	0
Turboprops	ATR72, etc.	22%	71%	71%
Other	General aviation, helicopters, etc.	78%	29%	29%
	Total	100%	100%	100%

Table 2-4: Fleet composition and percentage of operations for the time period of the total number of operations.

Class	Aircraft Models	% Day	% Evening	% Night	% Total
Medium-range (single aisle)	A320 family, B737 family, etc.	0	0	0	0
Long-range wide bodies (2 eng)	A330, B777, etc.	0	0	0	0
Long-range wide bodies (4 eng)	A340, B747, etc.	0	0	0	0
Turboprops	ATR72, etc.	18%	14%	0.0%	32%
Other	General aviation, helicopters, etc.	62%	6%	0%	68%
	Total	80%	20%	0%	100%

Flight profiles

The aircraft operational conditions were determined based on the Standard flight procedures, provided in the AEDT aircraft performance database.

Track distribution

Based on the flight plan data the distribution among the runways (see Table 2-5, Table 2-6) of all operations has been derived for the representative day.

Table 2-5: Distribution among the runways.

Runway	A	D	Total
09	4.11	3.16	7.27
27	4.76	5.60	10.36
Total	8.87	8.76	17.62
Per hour	0.37	0.36	0.73

Table 2-6 Distribution among the runways, %

Runway	A	D	Total
09	46%	36%	41%
27	54%	64%	59%
Total	100%	100%	100%

Based on the destination and cardinal, the distribution among the tracks of each aircraft type (incl. stage-length) has been derived for the representative day.

This combination of the actual runway usage and distribution among the tracks will thus allow for the determination of a single noise map for the combined result of the various runway use configurations. This is normal practice in airport noise mapping, since it provides the noise exposure in a single map, taking into account the actual use (in terms of relative importance of each runway) of the airport.

2.4. Noise Monitoring

Noise monitoring was conducted at Mysuru Airport as per the 'Requirement and Procedure for monitoring ambient noise levels due to aircraft' by CPCB.

The Noise monitoring instrument meets the requirements for a Class 1 Instrument, as specified in IEC 61672-1 (2002) Class 1. The Noise Monitoring Station (NMS) consists of a weatherproof microphone, a data storage and analysis device, and an information transmission system – GSM (Global System for Mobile Communications).

The Sound Level Meter was installed in flat terrain having no excessive sound absorption characteristics such as thick, matted or tall grasses, shrubs, or wooded areas. There were no obstructions influencing the sound field from the aircraft.

The location of the NMSs placed at Mysuru airport are shown in figure 2-1.

Figure 2-1: Location of Noise Monitoring Stations.

Both the noise monitoring stations are located within the airport boundary. The noise instrument was placed at a height of 4m from ground level. The following photographs highlight the position and setup of the noise monitoring locations (Figure 2-2).

Noise monitoring at 09 end.	Noise monitoring at 27 end.

Figure 2-2: Photographs of Noise Monitoring Stations at Mysuru Airport.

3 Noise mapping

One of the main objectives of the present study is to derive noise maps for the current noise situation at Mysuru airport. In this section, the input data, methodology and results of the noise maps are described.

It should be noted that, the noise maps provided do not take into account any existing background noise.

3.1 Input data

The following are the input data used to calculate the noise contours:

- Existing tracks for the runways
- Forecast for Traffic
- Fleet mix
- Distribution of flights

3.2 Methodology

The noise maps were developed for the noise indices: L_{day}, & L_{night}, on 5dBA intervals starting from 55 dBA to 75 dBA and for L_{night} it start from 45dBA.

Noise mapping was carried out using the flight data of 2023 (flight data from 1st Jan 2023 to 31st Dec 2023). The flight data was processed and filtered out invalid events. The flight data was used as input data in the AEDT noise model that is developed by FAA. AEDT is the international standard software used for air and noise modelling of aircrafts. Using this software L_{day}, & L_{night} on 5 dBA intervals were developed.

Along with the flight data, flight tracks, GIS maps of airport and master plan of airport were also used as an input data for noise mapping. The flight tracks were obtained using the ADS-B station installed at the airport during measurement period.

The flight tracks of the Varanasi airport is shown in figure 3-1 and 3-2.

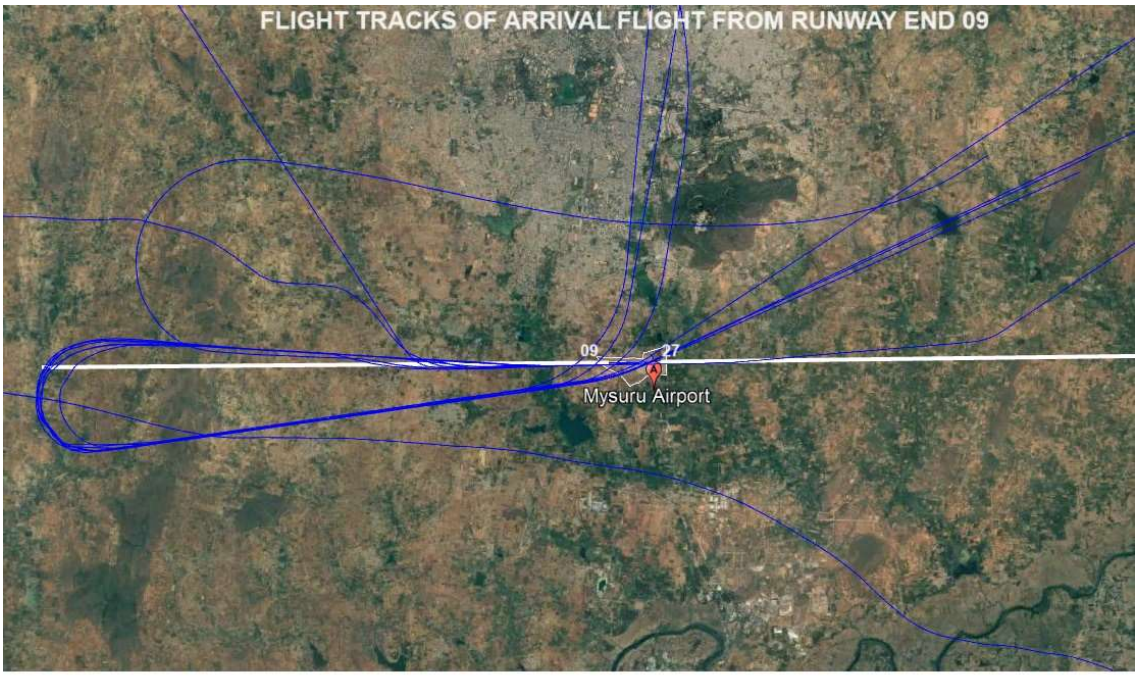


Figure 3-1: Showing the Arrivals from Runway end 09.

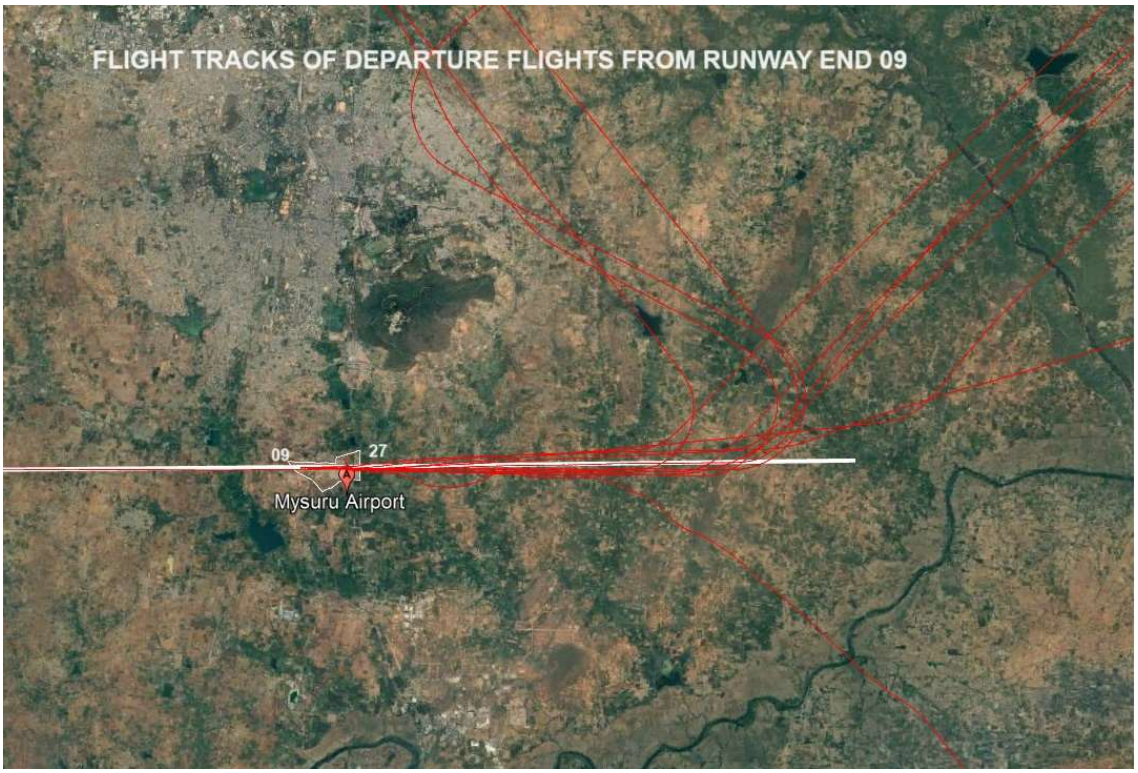


Figure 3-2: Showing the Departure from Runway end 27.

It is observed that both the arrival and departure flight paths from both ends of the runway (09 and 27) confirm that the flights are operating within the approach and take-off climb funnel described in the GSR 751 (E).

3.3 Results

In the following section, the noise contours are provided for the metrics defined above and for the required range of aircraft noise levels. These contours are validated with the noise monitoring data.

Figure 3-3 presents the noise contours for the L_{day} metric. This map only takes into account the operations occurring between 06:00h to 22:00h.

Figure 3-3: Noise Contour: L_{day} (55,60,...,75).

Figure 3-4 gives the noise contours for the L_{night} metric. This map only takes into account the operations occurring between 22h and 06h. However, these contours are provided also for lower noise levels (down to 45 dBA), which corresponds to larger distances away from the airport.

Figure 3-4: Noise Contour: L_{night} (45,50,...,75).

3.4 Validation of predicted noise levels with measurement results

In order to assess the validity of the noise mapping process, measurements were made with noise monitoring stations at 2 points near the airport. These measurements also included the deployment of an ADS-B receiver, which provided information on the actual flight tracks of the operations detected during the measurement period. The data were processed with the noise monitoring system to obtain the various noise metrics for which the noise maps have been determined. The following table 3-1 gives both datasets for measured and predicted noise levels respectively.

Table 3-1: Comparison of measured and calculated noise levels.

Location	Position		L_{day} in dB (A)		
Runway end	Latitude	Longitude	Meas	Model	Δ
09	12.232521 N	76.644423 E	58.3	57.9	0.4
27	12.22832 N	76.662093 E	57.2	59.1	1.9

As can be seen from this table, the average difference between prediction and measurements is in the order of at most 1.9 dB(A), which is considered as an acceptable result. From the variation in the difference for the various metrics of each single point it can be concluded that there does not appear to exist a significant bias in noise maps. The noise maps is also shown on topographical maps which is given in Annexure 1.

Part-2: Noise Zone Study at Mysuru Airport

4 Noise Zone study

As per the Environment Protection Amendment Rules of 2018, the noise zone study was carried out at Mysuru airport during month of March -May 2024. The noise zone study includes the L_{max} levels study, the boundary noise determination and development of noise zone.

For the purpose of establishment of noise zones, the noise contours for a future scenario are to be determined, representative for the maximum capacity of the airport. In this manner, the airport "reserves" space for growth.

4.1 Input data

The following are the input data used to calculate the noise zone contours:

- Existing tracks for the runways
- Forecast for Traffic
- Fleet mix
- Distribution of flights

The fleet mix is based on the 2023 flight plans data.

For the future fleet the same fleet mix share of all aircraft types is maintained, except for the A320 family, for which a 20%/80% ratio is assumed for Classic and Neo versions respectively.

The number of movements is based on the maximum capacity presented in table 4-1. The maximum capacity corresponds to a total of 1,05,188 movements per year, which is the amount used in this study.

Table 4-1 : Hourly Runway Traffic Handling Capacity

Operational Mode	Runway	
	RWY 09	RWY 27
Max Number of Arrival and Departure	12	12
Max Number of Arrival Only	6	6
Max Number of Departure Only	6	6

At present an 80%/20% distribution between Day and Evening operations is found and almost 0% at Night time. For the future scenario this same distribution is maintained.

With respect to runway operation, due to no information about real runway usage, currently an 41%/59% East / West share was assumed. For the future scenario this same distribution is assumed. Combining the above, the following table 4-2 can be compiled as a description for the future scenario.

Table 4-2: Future scenario traffic distribution.

Runway	A	D	Total
9	67.8	53.7	121.5
27	76.4	90.1	166.5
Total	144.1	143.9	288.0
per hour	6	6	12

Considering that noise contours are quite close to the runway ends and do not cover the turn point, it is assumed that the tracks are straight ahead the longitudinal axes of the runway.

4.2 Methodology

The noise contours for the future scenario are calculated with the AEDT 3e model, using the input data as described in the former section.

As per definition provided by DGCA, the noise zones are determined based on the following noise contours:

Metric	Contour (dB)
L_{day}	55
L_{night}	50

4.3 Noise zones

Based on the noise zoning results from studies performed at various Indian airports, DGCA concluded that the L_{day} 55 and L_{night} 50 noise contours shall be used as the airport noise zones for day and night period respectively. Figures 4.1-4.2 present these contours for Mysuru airport. The combined map of L_{day} and L_{night} zone is shown in figure 4-3.

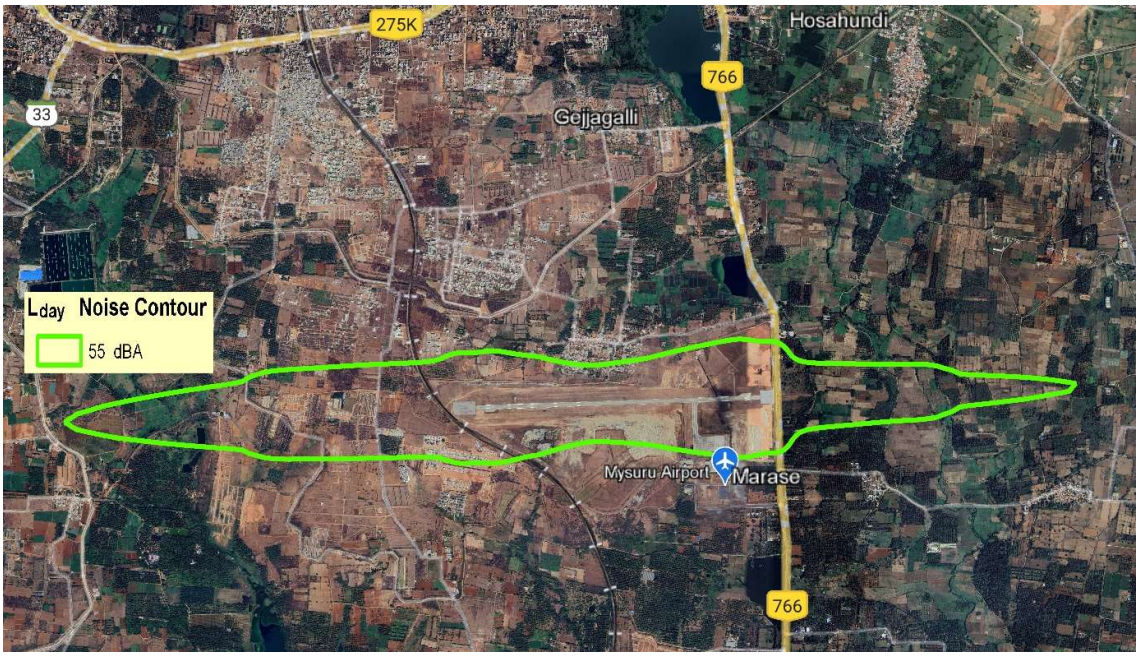


Figure 4-1: Airport noise zone for day time (based on L_{day} 55 noise contour).

Figure 4-2: Airport noise zone for night time (based on L_{night} 50 noise contour).

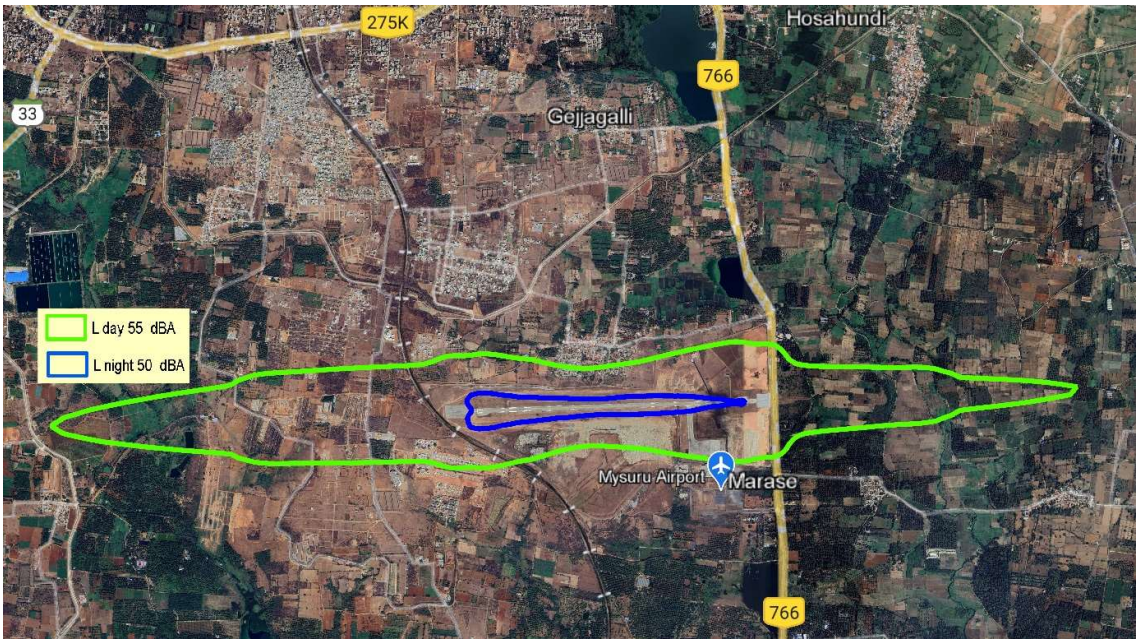


Figure 4-3: Airport noise zone for day and night time (based on L_{day} 55 and L_{night} 50 noise contours).

The noise zone maps is also shown on topographical maps which is given in Annexure 2.

5 L_{max} of Airport

In accordance with Environment Protection Amendment Rules, June 2018 the maximum noise levels should be determined at specific points. Usually this would be done based on the measurements performed with a noise monitoring system. At Mysuru airport such system is not yet installed and thus the maximum noise levels will have to be determined based on the predictions with the noise model. For this, 2 locations are defined in the nearest villages on both sides of the extended center-line of the runway.

5.1 Input data

In order to determine the L_{max} at two locations, the actual flight data of 2023 was analysed long with the following information:

- Lmax of individual aircraft operations measured at the various noise monitoring locations.
- Information on operation (Aircraft type, runway/track used, distance to microphone, etc).
- Flight Data for the years 2023.

5.2 Methodology for the definition of Lmax

- Analyse Lmax single event data for each proposed location
- Filter out non-valid events
- Determine maximum noise level at each location
- Define limit on Lmax for each location

For every month of 2023 all aircraft noise events were identified and the Lmax level of each event was determined. This procedure is used for all points outside the expected band, for both Departures and Approaches. At this stage it is important to distinguish between Departure and Approach, because the noise characteristics in both flight phases are very different. The Lmax noise levels were determined by the noise modelling software AEDT. However, these Lmax limits are temporary and shall be revised once permanent noise monitoring stations are installed at the both ends of the runway.

5.3 Lmax of Mysuru airport

When establishing the limits for L_{max}, several considerations should be made:

- Should be sufficiently high to allow for the vast majority of operations to comply with.
- Should be sufficiently low to avoid the (unnecessary) noisiest operations.

- What to do with those events that exceed the limit.

In order to avoid an arbitrary definition of the L_{max} level, it is proposed to set the limit at each location such that the 10 highest noise events detected in the period 2023 should be considered excessive. Table 5-1 presents the results of this exercise. The Lmax values are derived using the AEDT noise model considering the type of flights, flight tracks, flight plan and geographical location of settlement areas.

Table 5-1: Maximum calculated noise levels at the nearest residential areas.

	Lmax in dB	Coordinates	
City / Village	**AEDT**	**Latitude**	**Longitude**
Kalalavadi	101.1	12.231042	76.637545
Marase	90.2	12.227428	76.667664

The figure 5-1, shows the location of Lmax points outside the airport at both end of runway. These points are temporary located at the nearest residential areas, however, the Lmax location points will change after installation of permanent noise monitoring stations in future.

Figure 5-1: Location of villages with L_{max} values.

With these limits only few operations would have been in excess, whereas they will safeguard the currently existing noise climate at both locations. It is suggested to send a letter to those airlines operators that exceed the limit, indicating the measured L_{max} level. The main purpose of this would be to raise awareness among the operators to fly quietly. At a later stage the limits may be reconsidered downwards, in order to enforce even quieter flights, and it shall be a part of the Noise Action Plan.

6 Boundary Noise Study

As per the Environment Protection Amendment Rules, June 2018, the noise at the boundary of the airport premises needs to be determined. The boundary noise levels are determined by means of calculation by using AEDT 3e noise model.

6.1 Input data

The following are the input data used to model boundary noise.

- Coordinates of the points at the boundary
- Noise and track data from calculations and measurements
- Flight Plan for 2023
- All data for full year 2023

6.2 Methodology s

The following methodology was adopted to determine boundary noise:

1. Analyse available data
2. Establish noise model for full year 2023
3. Acquire land use information
4. Determine noise levels of airport operations at airport boundary
5. Background noise from nearby residential areas close to the boundary are excluded
6. Determine average noise level over all positions of airport boundary at an interval of 150m
7. Noise levels at boundary was determined using AEDT modelling software consider the flight operation of 2023.

The details of the boundary along with the points for noise level calculation are given in figure 6-1. Total receptor points are 49 at an interval of 150m.

Figure 6-1: Definition of points on boundary, every 150m.

6.3 Results

Boundary noise of L_{day} noise levels were calculated using the model. The L_{day} noise details are shown in figure 6-2. The boundary noise of L_{night} were not calculated because there are no night operations.

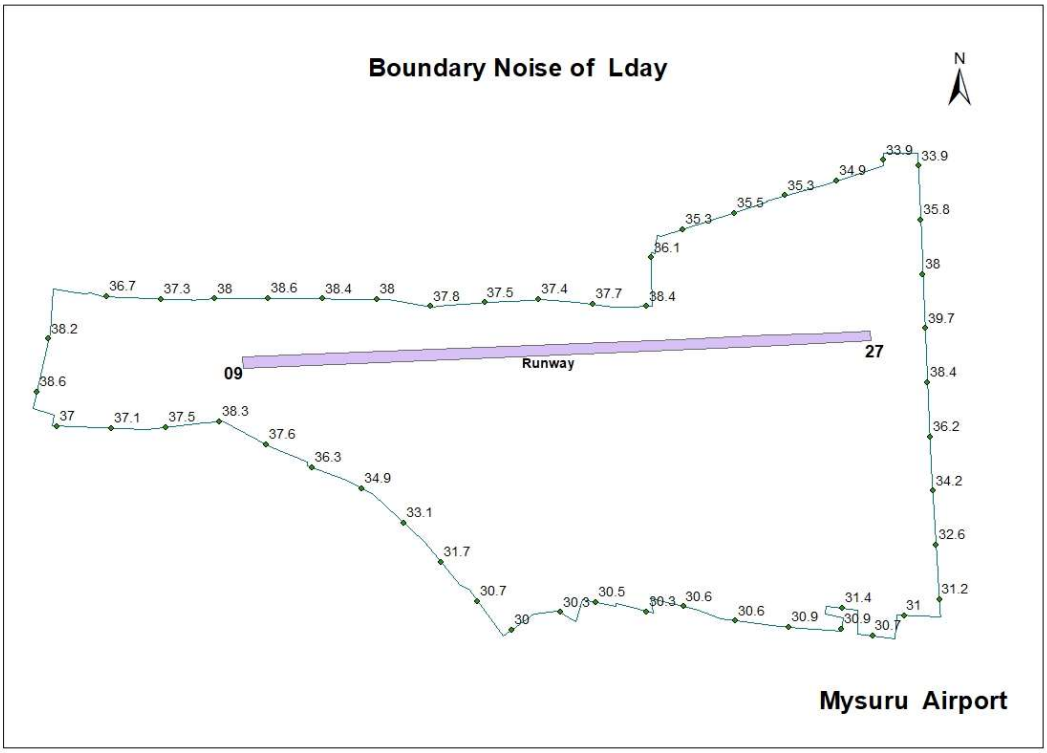


Figure 6-2: L_{day} levels at boundary points.

L_{day} noise levels were calculated using the model. The L_{day} noise details are shown in table 6-1.

Table 6-1: Points of the Airport boundary.

Name	Latitude, deg	Longitude, deg	L_{day} in dB
1	12.2329	76.6411	36.7
2	12.2329	76.6425	37.3
3	12.2329	76.6438	38.0
4	12.2329	76.6452	38.6
5	12.2329	76.6466	38.4
6	12.2328	76.648	38.0
7	12.2327	76.6493	37.8
8	12.2327	76.6507	37.5
9	12.2328	76.6521	37.4
10	12.2327	76.6535	37.7
11	12.2326	76.6548	38.4
12	12.2338	76.655	36.1
13	12.2345	76.6558	35.3
14	12.2349	76.6571	35.5
15	12.2354	76.6584	35.3
16	12.2357	76.6597	34.9
17	12.2362	76.6609	33.9
18	12.2361	76.6618	33.9
19	12.2347	76.6618	35.8
20	12.2334	76.6619	38.0
21	12.232	76.6619	39.7
22	12.2307	76.662	38.4
23	12.2293	76.662	36.2
24	12.228	76.6621	34.2
25	12.2266	76.6622	32.6
26	12.2253	76.6622	31.2
27	12.2249	76.6613	31.0
28	12.2243	76.6605	30.7
29	12.225	76.6598	31.4
30	12.2245	76.6597	30.9
31	12.2246	76.6584	30.9
32	12.2247	76.657	30.6
33	12.2251	76.6557	30.6
34	12.225	76.6548	30.3
35	12.2252	76.6535	30.5
36	12.225	76.6526	30.3
37	12.2246	76.6514	30.0
38	12.2253	76.6505	30.7
39	12.2263	76.6496	31.7
40	12.2272	76.6486	33.1
41	12.2281	76.6476	34.9

Name	Latitude, deg	Longitude, deg	$L_{day\ in\ dB}$
42	12.2286	76.6463	36.3
43	12.2292	76.6451	37.6
44	12.2298	76.644	38.3
45	12.2297	76.6426	37.5
46	12.2297	76.6412	37.1
47	12.2297	76.6398	37.0
48	12.2306	76.6393	38.6
49	12.2319	76.6396	38.2

Based on the above-described study, the following Boundary noise levels (Table 6-2) were found for Mysuru airport:

Table 6-2: Boundary noise levels dB

	L_{day}
Boundary	35.9
Limit	75
Margin	39.1

Considering the applicable limits of Industrial zone as per Noise Pollution (Control and Regulation) Rules 2000, 75 dB are noise limits for Day period respectively. Boundary noise was compared with these noise limits and found that the boundary noise level is far (39 dB(A)) below the limit.

7 Conclusion

A Noise mapping and noise zone study has been performed to get a first indication of the current noise situation at Mysuru Airport. The study was carried out for a period of 3 months from March to May 2024. Flight tracks were measured using ADS B system. Based on the analysis of the data gathered, the following conclusions can be derived:

1. Noise monitoring was undertaken by the Standard Class 1 type with 1/3 Octave band noise instrument and flight track monitoring system. The monitored results were validated with noise monitoring data. A comprehensive database of both noise levels and flight tracks was obtained.

2. Noise maps were developed using the flight operation data of 2023 and Noise modelling software AEDT.

3. Noise zone was developed based on the maximum capacity of runway using the AEDT software. Noise zones were developed for L_{day} and L_{night} indices with the noise contour of 55 dB and 50 dB respectively.

4. The Airport Noise Zone area for Mysuru Airport have been developed on the basis of existing GSR 751 (E), issued by the Ministry of Civil Aviation (Height Restrictions for Safeguarding of Aircraft Operations) Rules, 2015 published on 30th September, 2015 as amended from time to time on Height Restriction for Safeguarding of Aircraft Operation considering all approach and departure funnels and Instrument Flight Procedures (i.e.Instrument Approach Procedures, Standard Instrument Departure & Standard Terminal Arrival Route) in consultation with airports Air Navigation Service Provider as per the Master Plan of the Airport

5. After obtaining approval from DGCA, the Noise zone shall be displayed on the website of respective Airport Operators.

6. State / Union Territory Development Authorities should take into consideration of Airport Operations requirements in the airport noise zone area for the land use planning around the airport.

7. The Development Authorities/Regional Planning Department shall specify provisions for inclusion of sound resistance in new buildings, facilities and projects of residential, institutional, hospital and commercial facilities in the design, construction and materials selections for improving indoor environment under existing building codes and bye laws for any building constructions coming under airport noise zones.

7.1 Mitigations measures

The following are some of the recommended mitigation measures proposed:

- Minimum usage of reverse thrust after landing.
- Use of quitter aircrafts such as A320 NEO will significantly help in reducing noise impact.
- Use of Continuous Descent Approach during non-peak hours. It is found that the reduction in noise levels due to steeper arrivals are generally not noticeable for anyone living in the vicinity of airport.
- Avoid intersection take-off: The intersection take-off can result in an increase in noise exposure because the aircraft is lower along the departure path, resulting in an increase in noise levels at the vicinity of the villages. Therefore, it is advised to avoid intersection take-offs.
- Restrict night time flight operations as much as possible to reduce aircraft noise levels associated with aircraft operations during night-time hours.

7.2 Action plan

Based on the results of this noise study, Mysuru airport management is recommended to perform a more detailed follow-up study which should at least address the following:

- Once the airport crosses 50,000 movements per year, the airport shall install a permanent noise monitoring and flight track system, with stations located in the most noise-sensitive areas.
- The possibility to implement noise mitigation measure stated in this report.
- A periodic schedule for observing noise related issues and implementing a reporting mechanism.
- The evaluation of the noise reductions by optimised take-off procedures for the most relevant aircraft types (such as A320, B737-800, A330, B777, B747-400)..

Annexure 1

Noise maps of Mysuru Airport

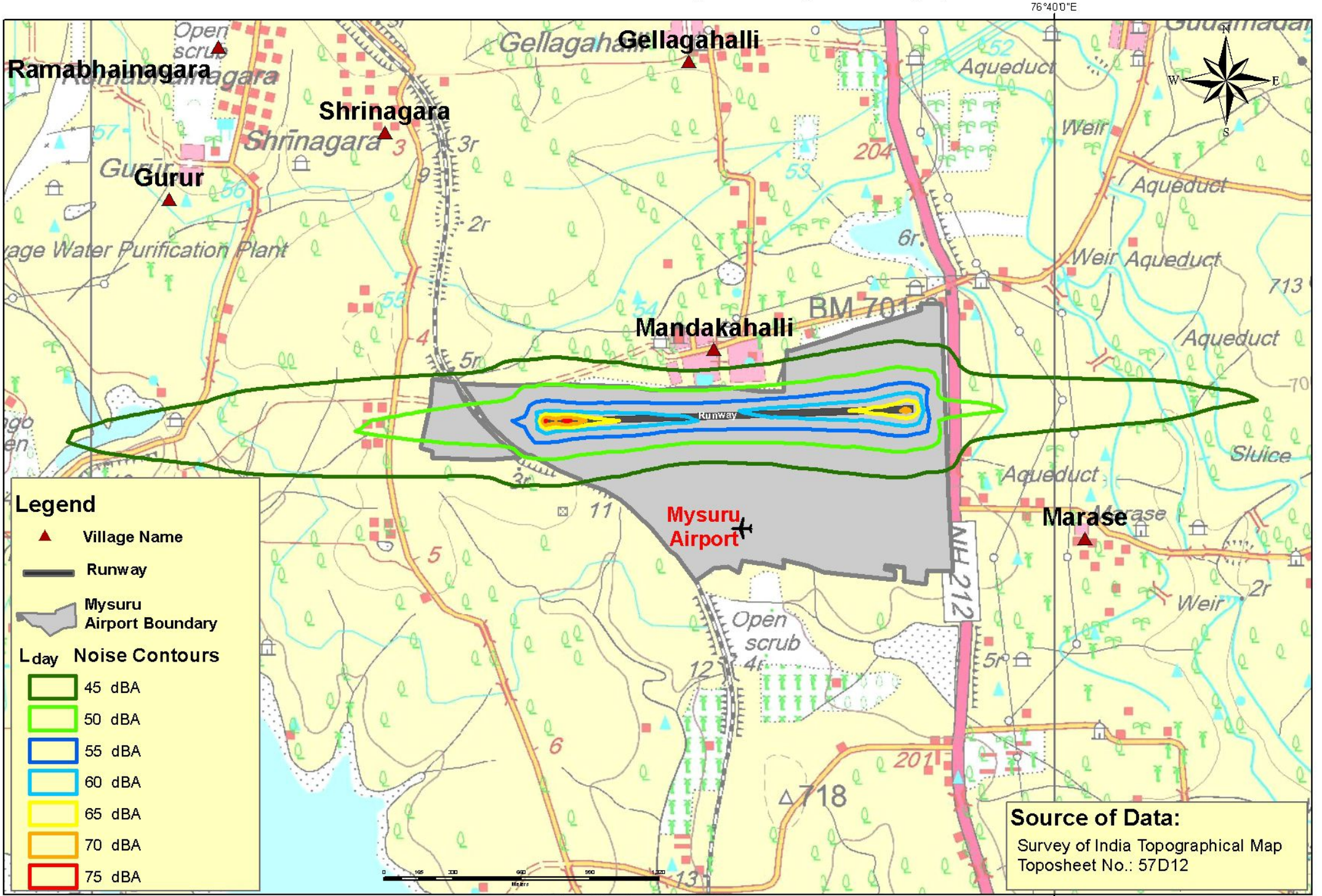
(Developed using 2023 flight data)

Noise maps

The following noise contours are provided. These maps have been determined applying the methodology described in report.

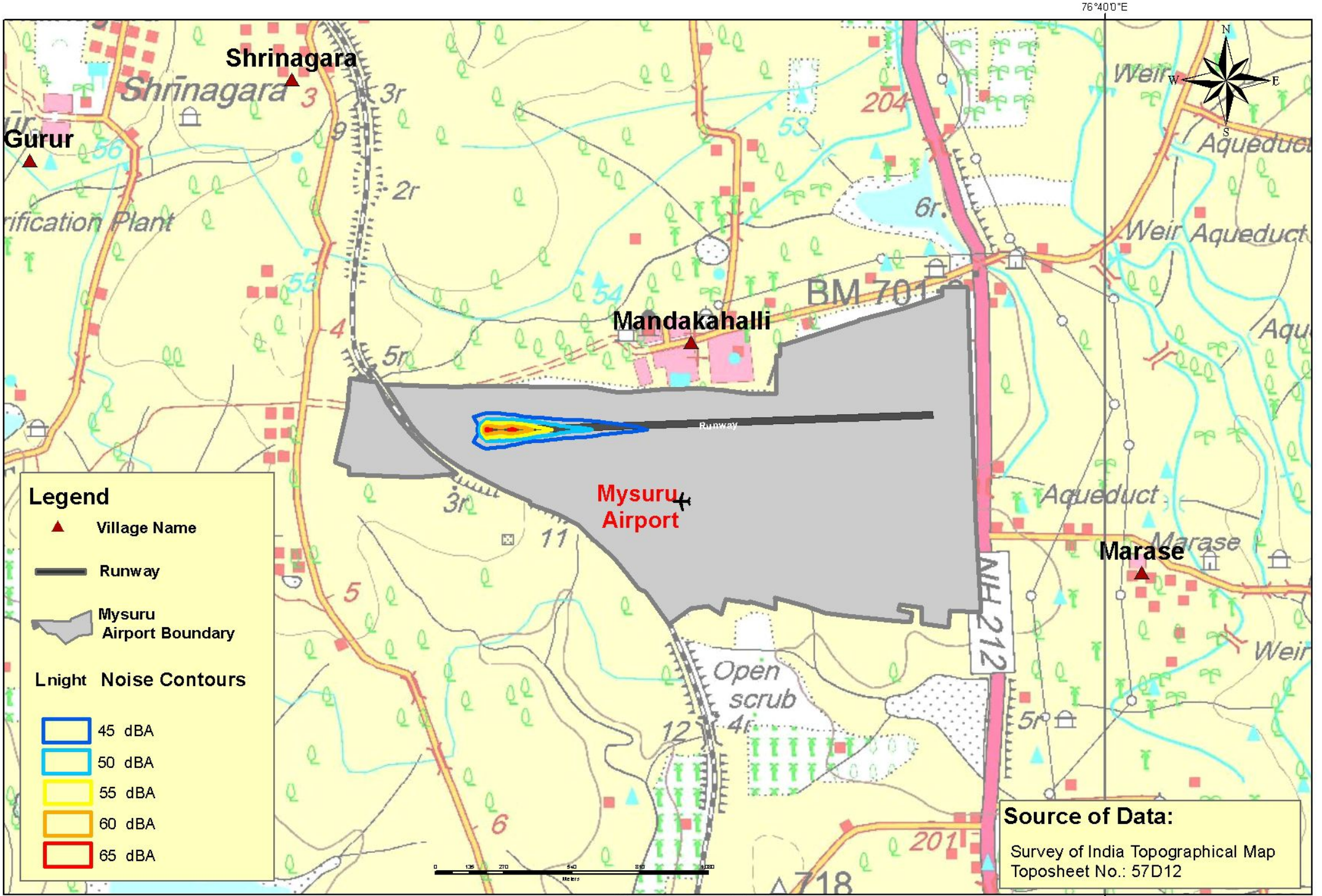
Metric	Level dB(A)
L_{day}	55dB to 75dBb with 5 dB Interval
L_{night}	45dB to 75dB with 5 dB Interval

Noise Contour Map of L_{day} in dB (A)



A3 Scale: 1:15,000

Noise Contour Map of L_{night} in dB (A)



A3 Scale: 1:13,000

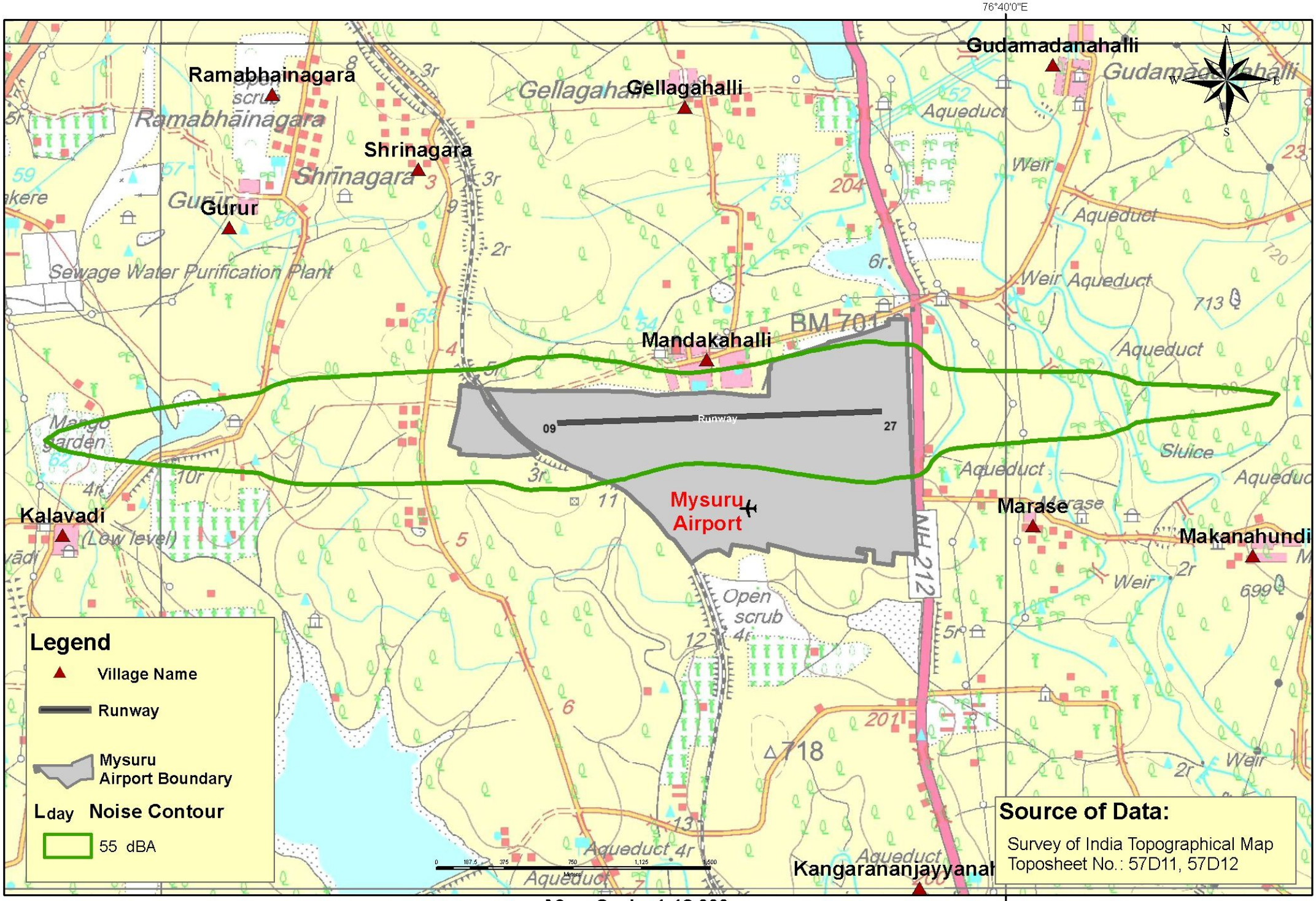
Annexure 2

Noise Zone maps of Mysuru Airport

Noise Zone maps

The following noise zone contours are provided. These maps have been determined applying the methodology described in report.

L_{day} 55 dBA Contour for Noise Zone



Annexure 3

Environment (Protection) Amendment Rules, 2018

रजिस्ट्री सं० डी० एल०-33004/99 REGD. NO. D. L.-33004/99

भारत का राजपत्र
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अधिसूचना

नई दिल्ली, 18 जून, 2018

सा.का.नि. 568(अ)—केन्द्रीय सरकार पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 6 और धारा 25 में प्रदत्त शक्तियों का उपयोग करते हुए पर्यावरण (संरक्षण) नियमावली, 1986 में और संशोधन करने के लिए एतद्द्वारा निम्नलिखित नियम बनाती है, अर्थात्:-

1. (1) इन नियमों का संक्षिप्त नाम पर्यावरण (संरक्षण) संशोधन नियम, 2018 है।

(2) ये राजपत्र में प्रकाशन की तारीख को प्रवृत्त होंगे।

2. पर्यावरण (संरक्षण) नियम, 1986 में, अनुसूची-I में क्रम सं.111 और उससे संबंधित प्रविष्टियों के बाद निम्नलिखित क्रम संख्या और प्रविष्टियां अंत:स्थापित की जाएंगी, अर्थात् :-

क्रम सं.	उद्योग	प्राचल	मानदंड	
1	2	3	4	
		विमानपत्तन ध्वनि परिक्षेत्र में ध्वनि के संबंध में परिवेशी वायु गुणवत्ता मानक		
"112	विमानपत्तन	विमानपत्तनों के प्रकार	db (A) Leq* में सीमाएं	
			दिन का समय	रात्रि का समय
		व्यस्त विमानपत्तन	70	65
		प्रस्तावित विमानपत्तनों से इतर सभी अन्य विमानपत्तन	65	60

परिभाषाएं:

(क) *dB (A) Leq माप A पर डेसीबल में ध्वनि स्तर में भारित औसत में लगे समय को सूचित करता है, जो मानवीय श्रवण से संबंधित है। भारित औसत के लिए समय सीमा के लिए दिन में 6.00 प्रात: से 10.00 बजे रात्रि तक और रात्रि समय में 10.00 बजे रात्रि से 6.00 बजे प्रात: तक की समय सीमा पर विचार किया जाता है।

(ख) db (A) Leq "A" से ध्वनि के मापन में भारिता बारम्बारता और मानव श्रवण की बारम्बारता प्रतिक्रिया विशेषताओं के प्रति समनुरूपता को सूचित करता है। (मानव श्रवण सीमा 20 Hz से 20 KHz तक है)

(ग) "डेसीबल" वह इकाई है जिसमें ध्वनि मापित की जाती है।

(घ) Leq : B यह एक विनिर्दिष्ट समय सीमा में ध्वनि स्तर का ऊर्जा औसत है।

(ड.) व्यस्त विमानपत्तन- विमानपत्तनों पर ध्वनि प्रबंधन के प्रयोजनार्थ एक व्यस्त विमान पत्तन को "उस नागर विमानपत्तन, जहां हल्के यानों के केवल प्रशिक्षण प्रयोजनार्थ संचालन को छोड़कर, 50,000 प्रति वर्ष यानीय संचालन (विमान के उड़ान भरने अथवा उसे उतारने की क्रिया) से अधिक हो, के रूप में पारिभाषित किया जाएगा।

(च) उड़ान भरना- उड़ान भरने की शक्ति के प्रयोग से उड़ान भरने की अंतिम उच्च सीमा तक की अवस्था

(छ) जमीन पर उतरना –लैंडिग फ्लेयर की शुरुआत से उड़ान का एक चरण, जब तक कि जमीन पर उतरने के लिए विमान, धावन पथ (रनवे) पर रुक नहीं जाता जब अथवा टच-एण्ड-गो लैंडिग के मामले में उड़ान भरने के लिए शक्ति प्रयुक्त की जाती है।

(ज) Lmax – यह db (A) में विमान की अधिकतम ध्वनि स्तर के लिए इकाई है, जो संबंधित विमानपत्तनों के लिए नागर विमानन महानिदेशालय द्वारा अधिसूचित ध्वनि मानकों के अनुसार अनुवीक्षण अवस्थान पर विमानों के लिए अधिकतम अथवा उच्चतम ध्वनि मान है।

(झ) अन्य विमानपत्तन- ऐसा विमानपत्तन, जहां 15000 से अधिक किंतु 50000 से कम वार्षिक यानीय संचालन हो रहे हैं।

(ञ) प्रस्तावित विमानपत्तन-ऐसा विमानपत्तन जो अभी प्रचालनात्मक नहीं है किंतु निर्माणाधीन है।

टिप्पणी :

(i) दिन का समय 6.00 प्रात: से 10.00 बजे रात्रि तक और रात्रि समय 10.00 बजे रात्रि से 6.00 बजे प्रात: तक अभिप्रेत है।

(ii) उपरोक्त विनिर्दिष्ट सीमाओं की 10 dB (A) Leq की सहनीय सीमा होगी।

(iii) निर्धारित सीमा में सभी धावन पथों (रनवे) से रक्षा विमान और विमान के उतरने और उड़ान भरने के दौरान ध्वनि और विमान इंजन/ग्रांउड रनअप्स, इस प्रयोजनार्थ विमानपत्तन संचालक द्वारा अभिनिर्धारित की गई हेलीपैड अवस्थानों को शामिल नहीं किया गया है।

(iv) तथापि, यानीय ध्वनि के लिए Lmax के रूप में सीमा, इस अधिसूचना के पैरा 1 में यथा उल्लिखित विमानपत्तनों द्वारा संस्थापित यानीय ध्वनि अनुवीक्षण अवस्थानों पर नागर विमानन महानिदेशालय के अनुमोदन से विमानपत्तन संचालकों द्वारा अधिसूचित की जाएगी।

(v) उपरोक्त विनिर्दिष्ट ध्वनि सीमाएं, निम्नलिखित मौजूदा परिक्षेत्रों की ध्वनि सीमाओं के संबंध में परिवेशी वायु गुणवत्ता को प्रतिस्थापित और अधिक्रांत करेगी;

(क) शांत;

(ख) आवासीय; और

(ग) वाणिज्यिक क्षेत्रों;

(vi) जैसा कि विमानपत्तन ध्वनि परिक्षेत्रों के अंतर्गत सीधे तौर पर आ रहे क्षेत्रों में ध्वनि प्रदूषण (विनियमन और नियंत्रण) नियम, 2000 में विनिर्दिष्ट किया गया है।

(vii) विमानपत्तनों की समूची चारदीवारी के भीतर ध्वनि मानक, औद्योगिक क्षेत्रों के लिए लागू किए गए अनुसार होंगे अर्थात् ध्वनि (विनियम और नियंत्रण) नियम, 2000 के अनुसार दिन के समय 75 dB (A) Leq होंगे और रात्रि के समय 70 db (A) Leq होंगे और विमानपत्तन की चारदीवारी पर भिन्न-भिन्न बिंदुओं पर मापित किया जाएगा और तब उसका औसत निकाला जाएगा।

(viii) यह अधिसूचना उस नागर विमानपत्तन पर लागू नहीं होगी जहां वार्षिक यानीय संचालन 15,000 से कम है।

1 (1) नए प्रस्तावित विमानपत्तनों को छोड़कर, विमानपत्तनों के लिए:

dB (A) Leq जैसा उल्लेख किया गया है, "विमानपत्तन ध्वनि परिक्षेत्र" में लागू के अतिरिक्त, dB (A) में Lmax मान को केवल 50,000 से अधिक वार्षिक यानीय संचालन कर रहे विमानपत्तनों के लिए नागर विमानन महानिदेशालय के अनुमोदन से विमानपत्तन संचालकों द्वारा प्रकाशित किया जाएगा। इन Lmax मानों का एयरलाईन्स द्वारा अनुपालन किया जाएगा और इन विमानपत्तन के संचालकों द्वारा अनुवीक्षण किया जाएगा। नागर विमानन महानिदेशालय के सूचित किया जाएगा है। भविष्य में जब भी आवश्यकता होगी, इन Lmax मान की समीक्षा की जाएगी।

(2) प्रस्तावित विमानपत्तनों के लिए (अभी संचालन किया जाना है):

(i) किसी भी नए/नवनिर्मित विमानपत्तनों के लिए ध्वनि मोडलिंग, विमानपत्तन संचालकों द्वारा की जाएगी और पर्यावरण प्रभाव मूल्यांकन अधिसूचना, 2006 के तहत पर्यावरणीय स्वीकृति प्राप्त करते समय पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय को परिणाम प्रस्तुत किए जाएंगे।

(ii) विमानपत्तन संचालक पैरा 4 में विनिर्दिष्ट किए अनुसार विमानपत्तन ध्वनि परिक्षेत्र भी विकसित करेंगे और विमानपत्तन के आस-पास आवश्यक भूमि उपयोग आयोजना के लिए उसे आवास और शहरी कार्य मंत्रालय और संबंधित राज्य विकास प्राधिकरण के साथ साझा करेंगे।

(iii) संबंधित राज्य/संघ शासित प्रदेश विकास प्राधिकरण किसी ध्वनि न्यूनीकरण उपाय के बिना विमानपत्तन ध्वनि परिक्षेत्र में आ रहे नए आवासीय, संस्थागत और वाणिज्यिक सुविधाओं और अन्य ध्वनि संवेदनशील क्षेत्र को अनुमति नहीं देंगे।

2. जैसा कि ऊपर विनिर्दिष्ट किया गया है विमानपत्तन ध्वनि परिक्षेत्र में लागू ध्वनि स्तरों का अनुपालन विमानपत्तन संचालकों द्वारा किया जाएगा और नागर विमानन महानिदेशालय द्वारा उसका पर्यवेक्षण किया जाना है।

3. विमानपत्तन प्रचालक, विमानपत्तन-ध्वनि मानकों के अनुपालन हेतु ध्वनि प्रबंधन योजनातैयार करेंगे।

4. **विमानपत्तन ध्वनि परिक्षेत्र:**

(1) प्रत्येक विमानपत्तन के लिए, विमानपत्तन ध्वनि परिक्षेत्र को विमानपत्तन के मास्टर प्लान के अनुसार विमानपत्तनों के एयर नेविगेशन सेवा प्रदाता के साथ परामर्श करके सभी प्रवेश और प्रस्थान फनलों और उपकरण उड़ान प्रक्रियाओं (अर्थात् उपकरण प्रवेश प्रक्रिया, मानक उपकरण प्रस्थान एवं मानक टर्मिनल आगमन मार्ग) पर विचार करते हुए विमान संचालन की सुरक्षा के लिए ऊंचाई प्रतिबंध पर समय-समय पर यथा-संशोधित, 30 सितम्बर, 2015 को प्रकाशित नागर विमानन मंत्रालय (विमान प्रचालनों की सुरक्षा के लिए ऊंचाई प्रतिबंध) नियम, 2015 द्वारा जारी मौजूदा सा.का.नि. 751 (अ) के आधार पर संबंधित विमानपत्तन प्रचालक द्वारा दिन और रात की अवधि के लिए ध्वनि रूप-रेखा के रूप में परिभाषित किया जाएगा। इसे नागर विमानन महानिदेशालय द्वारा अनुमोदित किया जाएगा और संबंधित विमानपत्तन प्रचालकों की वेबसाइट पर प्रदर्शित किया जाएगा। यह कार्य अंतिम अधिसूचना जारी करने की तारीख से दो साल के भीतर पूरा किया जाएगा।

(2) राज्य/संघ शासित प्रदेश विकास प्राधिकरणों को विमानपत्तन के आस-पास भूमि उपयोग योजना के लिए विमानपत्तन ध्वनि परिक्षेत्र में विमानपत्तन प्रचालनअपेक्षाओं पर विचार करना चाहिए।

5. **विमानपत्तन ध्वनि मैपिंग:**

सभी विमानपत्तनों के लिएध्वनि मैपिंग का कार्यविमानपत्तन के मास्टर प्लान के अनुसार, विमानपत्तन भावी विमान संचलन और यातायात अनुमानों पर विचार करते हुए विमानपत्तन के प्रचालकों द्वारा नागर विमानन महानिदेशक की अपेक्षाओं में निर्दिष्ट आवश्यकताओं के अनुसार किया जाना चाहिए। यह जानकारी विमानपत्तनों के प्रमुख स्थानों के साथ-साथ संबंधित विमानपत्तन प्रचालक और राज्य/संघ शासित प्रदेश विकास प्राधिकरण की वेबसाइट में प्रदर्शित की जाएगी।

6. **प्रोटोकाल और मापन प्रक्रिया:**

पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय और केंद्रीय प्रदूषण नियंत्रण बोर्ड की वेबसाइट पर प्रदर्शित विमानपत्तन ध्वनि परिक्षेत्र के लिए निगरानी प्रोटोकाल और मापन प्रक्रिया का अनुपालन किया जाएगा।

7. विकास प्राधिकरण/क्षेत्रीय आयोजना विभाग, विमानपत्तन ध्वनि परिक्षेत्रों के अंतर्गत आने वाले किसी भी भवन निर्माण के लिए मौजूदा भवन कोडों और उप-कानूनों के तहत भीतरी वातावरण में सुधार के लिए डिज़ाइन, निर्माण और सामग्रियों के चयन में नई इमारतों, सुविधाओं और आवासीय, संस्थागत, अस्पताल और वाणिज्यिक सुविधाओं की परियोजनाओं में ध्वनि प्रतिरोध को शामिल करने के लिए प्रावधान निर्दिष्ट करेंगे।

8. सभी विमानपत्तन, एयरलाइन और प्राधिकरण अधिसूचना की तारीख से दो साल के भीतर अधिसूचना में निर्दिष्ट अपेक्षाओं का पालन करेंगे।"

[फा. सं. क्यू-15017/31/2015-सीपीडब्ल्यू]

डॉ. ए. सेंथिल वेल, वैज्ञानिक 'जी'

टिप्पण: प्रमुख नियम, भारत के राजपत्र, असाधारण, भाग-II, खंड 3, उप-खंड (i) में दिनांक 19 नवम्बर, 1986 की संख्या – का.आ 844 (अ) के द्वारा प्रकाशित किए गए थे और अंतिम संशोधन दिनांक 22 मार्च, 2018 की अधिसूचना सा.का.नि. 263 (अ) द्वारा किया गया।

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 18th June, 2018

G.S.R. 568(E).—In exercise of the powers conferred by sections 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules further to amend the Environment (Protection) Rules, 1986, namely:

1. (1) These rules may be called the Environment (Protection) Amendment Rules, 2018.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. In the Environment (Protection) Rules, 1986, in Schedule–I, after serial number 111 and the entries relating thereto, the following serial number and the entries shall be inserted, namely:-

Sl. No.	Industry	Parameters	Standards	
1	2	3	4	
		Ambient Air Quality Standards with respect to Noise in Airport Noise Zone		
"112	Airports	Type of Airports	Limits in dB (A) Leq*	
			Day Time	Night Time
		Busy Airports	70	65
		All other Airports excluding proposed airports	65	60

Definitions:

(a) *dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing. A day time from 6.00 a.m. to 10.00 p.m. and night time from 10.00 p.m. to 6.00 a.m. are considered for time weighted average.

(b) "A", in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear (The range of human hearing is 20 Hz to 20 kHz).

(c) A "decibel" is a unit in which noise is measured.

(d) Leq: It is energy mean of the noise level over a specified period.

(e) Busy Airport - For the purpose of noise management at airports, a busy airport shall be defined as "a civil airport which has more than 50,000 aircraft movements per year (a movement being a take-off or a landing)" excluding those purely for training purposes on light aircraft.

(f) Take-off – A phase of flight from the application of takeoff power to an altitude of final take-off segment.

(g) Landing – A phase of flight from the beginning of the landing flare until aircraft exits the landing runway comes to a stop on the runway, or when power is applied for takeoff in the case of a touch-and-go landing.

(h) Lmax is unit for aircraft maximum noise level in units dB(A) which is maximum or peak noise value for aircrafts at the monitoring location in accordance with the noise standards notified by the Directorate General of Civil Aviation for respective airports.

(i) Other Airports – an airport having more than 15000 but less than 50000 aircraft movement annually.

(j) Proposed Airports – airport that is not functional yet and is under development.

Note : (i) Day time shall mean from 6.00 a.m. to 10.00 p.m and night time shall mean from 10.00 p.m. to 6.00 a.m.

(ii) The above specified limits shall have a tolerance limit of 10dB (A) Leq.

(iii) The specified limit excludes defense aircraft and aircraft landing and take-off noise from all runways and aircraft engine/ground run-ups, helipad locations earmarked by Airport Operator for this purpose.

(iv) However, the limit for aircraft noise as Lmax will be notified by the airport operator with approval of the Directorate General of Civil Aviation at the aircraft noise monitoring locations installed by the airports as mentioned in paragraph 1 of this notification.

(v) The noise limits specified in above shall replace and supersede the ambient air quality in respect of noise limits of the following existing zones:

(a) Silence;

(b) Residential; and

(c) Commercial areas;

(vi) As specified in the Noise Pollution (Regulation and Control) Rules, 2000 in the areas falling directly under Airport Noise Zone.

(vii) The noise standards within the overall boundary of airports shall be applicable as Industrial Areas i.e. day time 75 dB (A) Leq and night time 70 db (A) Leq as per the Noise (Regulation and Control) Rules 2000 and shall be measured at different points of airport boundary and then averaged.

(viii) These standards will not be applicable to a civil airport which has less than 15,000 aircraft movement annually.

1(1) For Airports excluding newly proposed airports:

In addition to dB(A) Leq applicable in the 'airport noise zones' specified above, Lmax value in dB(A) shall be published by the airport operator with approval of the Directorate General of Civil Aviation only for airports having more than 50,000 annual traffic movements. These Lmax values shall be complied by airlines and to be monitored and communicated by Airport Operator to the Directorate General of Civil Aviation. These Lmax value shall be reviewed as and when there is a requirement in future.

(2) For Proposed Airports (yet to be operationalized):

(i) For any upcoming/New Airports, noise modeling shall be conducted by the airport operators and results should be submitted to the Ministry of Environment, Forest and Climate Change while seeking Environment Clearance under the Environment Impact Assessment Notification, 2006.

(ii) The airport operators should also develop airport noise zone as specified in paragraph 4 and share the same with Ministry of Housing and Urban Affairs and concerned State Development Authority for necessary land use planning around airport.

(iii) The concerned State / Union Territory Development Authorities should not allow any new residential, institutions & commercial facilities and other noise sensitive area falling in the airport noise zone area without any noise reduction measure.

2. Compliance of noise levels applicable to Airport Noise Zone as specified above shall lie with the airport operator and overseen by the Directorate General of Civil Aviation.

3. Airport operators shall prepare Noise Management Plan for compliance of the Airport Noise Standards.

4. Airport Noise Zones:

(1) The Airport Noise Zone area for each Airport shall be defined as Noise Contour for day and night period by the respective Airport Operator on the basis of existing GSR 751 (E), issued by the Ministry of Civil Aviation (Height Restrictions for Safeguarding of Aircraft Operations) Rules, 2015 published on 30th September, 2015 as amended from time to time on Height Restriction for Safeguarding of Aircraft Operation considering all approach and departure funnels and Instrument Flight Procedures (i.e. Instrument Approach Procedures, Standard Instrument Departure & Standard Terminal Arrival Route) in consultation with airports Air Navigation Service Provider as per the Master Plan of the Airport. The same shall be shall be approved by the Directorate General of Civil Aviation and displayed on the website of respective Airport Operators. This activity shall be completed within two years from the date of issuance of the final notification.

(2) State / Union Territory Development Authorities should take into consideration of Airport Operations requirements in the airport noise zone area for the land use planning around the airport.

5. Airport Noise Mapping:

Noise mapping in for all airports should be carried out as per the requirements specified in the Director General Civil Aviation's requirements by the airport operators considering future aircraft movement and traffic projections of the airport as per the Master Plan of the Airport. This information to be displayed at a prominent places at Airports as well as in the website of respective Airport Operator and State / Union Territory Development Authority.

6. Protocol and Measurements Procedure:

Monitoring protocol and measurements procedure for airport noise zone displayed on the website of the Ministry of Environment, Forest and the Climate Change and the Central Pollution Control Board shall be followed.

7. Development Authorities / Regional Planning Department shall specify provisions for inclusion of sound resistance in new buildings, facilities and projects of residential, institutional, hospital and commercial facilities in the design, construction and materials selections for improving indoor environment under existing building codes and bye laws for any building constructions coming under airport noise zones.

8. All the Airport, Airline and Authority shall comply with the requirements specified in the notification within two years from the date of notification. ”.

[F.No. Q-15017/31/2015-CPW]

Dr. A. SENTHIL VEL, Scientist ‘G’

Note : The principal rules were published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-section (i), *vide* number S.O. 844 (E), dated the 19th November, 1986 and last amended vide notification G.S.R. 263(E), dated the 22th March, 2018.

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