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# The Study Report
# Entitled
# Noise Mapping and Declaration of Airport Noise Zones at Birsi Airport, Gondia,

भारतीय विमानपत्तन प्राधिकरण
AIRPORTS AUTHORITY OF INDIA

## Birsi Airport, Gondia,

Submitted in partial fulfilment of the requirements

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## SUMMARY

Aircraft noise has been recognized as a serious issue that affects the urban regions. Due to urbanization and industrialization, transportation in urban areas has increased. Air traffic density in India and the world at large is growing fast and posing challenging problems. The problems encountered can be parameterized as flight delay, workload of air traffic controllers and noise levels in and around aerodromes. Prediction and quantification of these parameters aid in developing strategies for efficient air traffic management. Noise prediction maps can be used to identify the impact of noise pollution. The objective of the study is to develop noise maps and declaration of the noise zone of Birsi Airport, Gondia,

Noise monitoring and mapping study has been done for Birsi Airport, Gondia. The noise maps are developed using a computer simulation model software, which was used to develop noise prediction contour maps as per DGCA guidelines. Data required to create noise maps, namely the number of flights, pattern of flights, schedule of flights, aircraft types & details, runway information, and meteorological data, were collected from Birsi Airport, Gondia Authority.

The results of the noise monitoring study depicted that the daytime & nighttime noise levels were within the prescribed limit of MOEF&CC, G.S.R 568 (E) dated 18th June 2018. Birsi Airport is located in Maharashtra, India, approximately 17 km northeast of Gondia city centre, near Zilmili village. The airport hosts the National Flying Training Institute (NFTI), which conducts general aviation and pilot training. To assess the noise impact of proposed aircraft operations, noise mapping was conducted using a noise modelling technique. A base map of an area of 8 km x 8 km area encompasses the project site, along with noise monitoring locations and identified sensitive receptors. As per G.S.R. 751 (E), issued by the Ministry of Civil Aviation (Height Restrictions for Safeguarding of Aircraft Operations) Rules, 2015 published on 30th September 2015 the Airport Noise Zone has been declared within a 4 km radius of the airport.


Keywords: Aircraft Noise; Airport Noise Zone; ECAC 4th Edition Model; Equivalent Noise Level; Noise Mapping

**For Unistar Environment And**

**Research Labs Pvt. Ltd.**

**(Authorized Signatory)**

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# ABBREVIATIONS

| | |
|---|---|
| CAR | Civil Aviation Requirements |
| CCZM | Colour-Coded Zoning Map |
| CPCB | Central Pollution Control Board |
| CDA | Continuous Descent Approach |
| CCO | Continuous Climb Operations |
| dB | Decibel |
| dB(A) | Decibel in “A” weighting network |
| DGCA | Directorate General of Civil Aviation |
| DNL | Day Night Average/ Equivalent Sound Level |
| ECAC | European Civil Aviation Conference |
| INM | Integrated Noise Model |
| ICAO | The International Civil Aviation Organization |
| IATA | International Air Transport Association |
| LAEQ | A-weighted equivalent noise level in dB(A) |
| LAEQD | A-weighted equivalent daytime noise level in dB(A) |
| LAEQN | A-weighted equivalent daytime noise level in dB(A) |
| Ldn | Day Night Average/ Equivalent Sound Level |
| LAMAX | Maximum A-weighted Noise level in dB(A) |
| MoCA | Ministry of Civil Aviation |
| MOEF & CC | Ministry of Environment, Forests and Climate Change |
| NMT | Noise Monitoring Terminal |
| SLM | Sound Level Meter |
| TDOA | Time Difference of Arrival |

# CHAPTER-1

# INTRODUCTION

## 1.1 GENERAL

Sound is characterized as minute variations in air pressure relative to standard atmospheric pressure. Human auditory perception typically ranges from approximately 20 microPascals (µPa) to over 20 million µPa. Unwanted sound is commonly referred to as noise, which is often considered objectionable due to its disturbing or annoying nature. The objectionable characteristics of sound are influenced by both its pitch and loudness. Pitch, determined by the frequency of vibrations, affects how loud a sound is perceived by humans, with higher frequencies generally sounding louder. Loudness is defined by the intensity of sound waves in conjunction with the ear's reception characteristics. The three parameters that define noise include:

**(i) Level:** The level of sound is the magnitude of air pressure change above and below atmospheric pressure and is expressed in decibels (dB). Typical sounds fall within a range between 0 dB (the approximate lower limit of human hearing) and 120 dB (the highest sound level experienced in the environment). A 3 dB change in sound level is perceived as a barely noticeable change in outdoors and a 10 dB change in sound level is perceived as a doubling (or halving) of loudness.

**(ii) Frequency:** The frequency (pitch or tone) of sound is the rate of air pressure change and is expressed in cycles per second, or Hertz (Hz). Human ears can detect a wide range of frequencies from around 20 Hz to 20,000 Hz; however, human hearing is not as sensitive at high and low frequencies, and the A-weighting system, which measures what humans hear in a meaningful way by reducing the sound levels of higher and lower frequency sounds, is used to provide a measure in A-weighted decibels dB(A) that correlates with human response to noise. The A-weighted sound level has been widely adopted by acousticians as the most appropriate descriptor for environmental noise.

**(iii) Time Pattern:** Because environmental noise is constantly changing, it is common to condense this information into a single number, called the "equivalent" noise level (Leq). The Leq represents the changing noise level over a period, 1 hour, or 24 hours, in noise assessments. For aviation noise assessments, the Day-Night Noise Level (DNL or Ldn) is commonly used, incorporating a 10 dB penalty for nighttime noise to reflect its greater disturbance.

Loud noise can negatively impact humans, interfering with sleep, and communication, and even causing physiological problems. Noise-induced hearing loss (NIHL) is a significant concern, particularly from occupational noise exposure. Unlike continuous noise sources like road traffic, aircraft noise is intermittent, with significant noise during takeoff (mainly from engines) and landing (aerodynamic noise). Ideally, airports should be located away from human habitation, but urban development often occurs near airports. Consequently, people living near airports or under flight paths experience high noise levels, especially at night. Gondia Airport, commonly known as Birsi Airport, is located in Maharashtra, India, approximately 17 km northeast of Gondia city, near Zilmili village. The airport hosts the National Flying Training Institute (NFTI), which conducts general aviation and pilot training. To assess the noise impact of proposed aircraft operations, noise mapping was conducted using a noise modelling technique. A base map of the project site, along with noise monitoring locations and identified sensitive receptors within an 8 km x 8 km area, is shown in **Figure 3.5**.

## 1.2 NOISE MAPS AND PREDICTION

With the increasing number of flights and the continuous development of technology, aircraft noise has become a serious problem in terms of environmental protection. It is, therefore, necessary to conduct regular assessments to identify urban areas where there are high noise levels that exceed allowable noise limits. These assessments can be performed through on-site measurements or through predictions, using specially designed software. Noise mapping software are a professional tool, widely used by many experts from different backgrounds and with great experience in various applications, data, and software.

The manner of using the software is very important because it can affect the quality of the results in the noise mapping process. When it comes to the proper interpretation of the noise generated by aircraft, data processing software is very useful. Normally, all the software is based either on acoustic measurements or predictions, taking into account in case of aircraft noise, various aspects like aircraft type, schedule, altitude, flight path, etc. These two ways of analyzing noise can also go together by introducing data about the analyzed area and data concerning the measured noise. The noise map that can be generated after introducing all these parameters can provide later an overview of the analyzed area.

Noise maps are developed by a specialized computer simulation model that calculates the noise level in specific areas, showing how noise propagates from the considered sources. This software can also consider elements that affect the dispersion of noise like buildings, the shape of the land, and the capacity of an area to absorb noise or to reflect noise. They also take into account the obstacles in the area, which can be: barriers, the shape and the acoustical characteristics of the terrain, meteorological conditions, and more.

There are number of computer simulation models (software) available to map and model sound. These types of software support basic environment noise mapping tracing polygon on top of a bitmap are a general way of mapping the area. The process is easy for a small area, but it can be time-consuming to do this on a large scale.

The modelling process can be simplified to use readily available data and large areas can be mapped as easily and efficiently as the computing power available. Noise modelling can be done using various software available such as INM, LimA, Cadna/A, and SoundPLAN. These noise software models can provide fast and precise noise impact assessment.

The noise maps created by the software show an overview of the explored area from the acoustic perspective. The noise maps highlight the areas in which noise levels are higher than the maximum allowable limits and provide simulations and animations showing clearly how noise propagates from a mobile noise source.

The propagation models and software are very useful to analyze the current situation of external noise. The software creates a noise map, which shows the complete information on the distribution of noise in a given area. Noise can be a combination of point sources and line sources. Thus, the development of noise maps based on measurements requires a large number of measurement data, propagation models, and software.

# CHAPTER-2

# OBJECTIVES

## 2.1 GENERAL

According to the scope of work, it is observed that a large number of people can be exposed to aircraft noise at different locations around the Birsi Airport, Gondia. This chapter deals with the problem statement and objectives of the entire study.

## 2.2 PROBLEM STATEMENT

The noise produced by aircraft during operations around airports represents a serious social, ecological, technical and economic problem. The ability to assess and predict noise exposure accurately is an increasingly important factor in the design and implementation of airport improvements. Aircraft are complex noise sources. The number and intensity of noise sources vary with the type of aircraft and, in particular, with the type of engines incorporated in their power plants. Relationships between the acoustic characteristics of the main noise sources and the flight mode parameters (or engine mode parameters) must be known for the best evaluation of noise levels under the flight path for any type of aircraft at any stage of its flight. Therefore, aircraft noise modelling has been carried out to study the propagation of noise from aircraft movement along with field measurements. The noise maps can be developed using a computer simulation model.

## 2.3 OBJECTIVES

The objectives of this study are outlined below:

1. Noise monitoring study on and around Birsi Airport, Gondia.
2. Declaration of airport noise zones.
3. To develop noise contour maps using a computer simulation model for Birsi Airport, Gondia.

# CHAPTER-3

# METHODOLOGY

## 3.1 GENERAL

This chapter deals with methodology, instruments and software used for the study, site selection criteria, noise monitoring time, noise parameters, noise standards, and study area profile. Noise mapping and declaration of airport noise zones for the airport has to be carried out by the latest DGCA Aviation Environment Circular 01 of 2024.

## 3.2 METHODOLOGY

The methodology used for performing work is represented in **Figure 3.1**. A noise survey was carried out and analyzed on and around Birsi airport, Gondia premises. This analysis included noise monitoring on selected locations, aircraft type & aircraft traffic volume, airport details, passenger statistics, and urban land use study. Noise monitoring was carried out continuously for 24 hours for one month as per the tender requirement guideline. Integration of the exhaustive data was done using a computer simulation model, to develop noise maps.

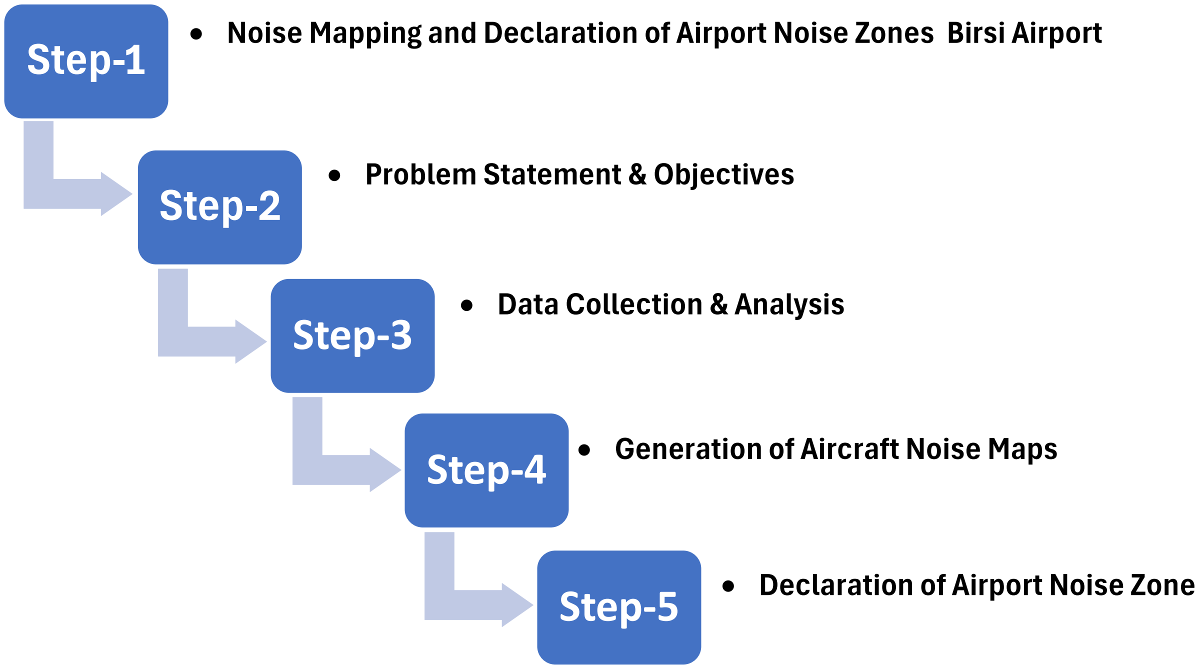



**Figure 3.1: Flow Diagram of Methodology**

### 3.2.1 SITE SELECTION CRITERIA

The site was selected to minimize disturbances from other sources for proper event detection. The minimum A-weighted maximum sound pressure level from aircraft movements was at least 15 dB above the background noise level.

### 3.2.2 NOISE MONITORING

Noise monitoring shall be carried out continuously for 24 hours a day, 365 days a year in permanent stations. In temporary stations, noise shall be monitored continuously for one month, as per tender requirements. The microphone height shall be at least 4 m, preferably 10 m, above the ground level.

### 3.2.3 TYPE OF MONITORING STATIONS

Monitoring stations should be permanent for all runway approaches. Mobile monitoring can be either mobile vans mounted or portable noise monitoring terminals that can be used as temporary stations.

### 3.2.4 NUMBER OF MONITORING STATIONS

At least two permanent stations shall be installed per runway. The permanent monitoring stations shall be located on both sides of the runway, at the nearest residential area/silence zone and as far as possible under the flight paths of the aircraft. In addition, temporary stations shall be used for specific monitoring activity under the flight paths, where noise levels are expected to be higher.

### 3.2.5 MONITORING TIME

Daytime monitoring has been carried out from 6.00 am to 10.00 pm and night-time from 10.00 pm to 6.00 am.

### 3.2.6 MONITORING PARAMETERS

During noise survey, various noise indices such as LAeq, Lmax, Lmin, L10, L50, L90, LDay, Lnight, have been recorded.

### 3.2.7 METEOROLOGICAL MEASUREMENT

Meteorological parameters such as wind speed, wind direction, relative humidity, air temperature and occurrence of rain were recorded.

### 3.2.8 AIRPORT NOISE NOTIFICATION DATED 18TH JUNE 2018

Standards for noise levels are given in MOEF&CC, G.S.R. 568(E) dated 18th June 2018 for Ambient Air Quality Standards with respect to Noise in Airport Noise Zone and it is given in Table 3.1.

<table>
<tr><th>Sr.No.</th><th>Industry</th><th>Parameters</th><th colspan="2">Standards</th></tr>
<tr><td rowspan="2">1</td><td>2</td><td>3</td><td colspan="2">4</td></tr>
<tr><td colspan="4">Ambient Air Quality Standards with respect to Noise in Airport Noise Zone</td></tr>
<tr><td rowspan="4">"112</td><td rowspan="4">Airports</td><td rowspan="2">Type of Airports</td><td colspan="2">Limits in dB (A) Leq*</td></tr>
<tr><td>Day Time</td><td>Night Time</td></tr>
<tr><td>Busy Airports</td><td>70</td><td>65</td></tr>
<tr><td>All other Airports excluding the proposed airports</td><td>65</td><td>60</td></tr>
</table>

Based on the 2023–24 Traffic, Flight Tracks, and Corridors data, Birsi Airport is classified as a non-busy airport. Noise monitoring data (as detailed in Chapter 4) showed that levels at the airport and surrounding residential areas were within the prescribed limits. At Approach Funnel Area–04, Lday and Lnight were 50.8 dB(A) and 45.1 dB(A), respectively; at Approach Funnel Area–22, 56.7 dB(A) and 46.2 dB(A); and in the Residential Scatter Area, 47.5 dB(A) and 43.1 dB(A). All values were below the permissible limits of 65 dB(A) (daytime) and 60 dB(A) (nighttime), confirming that ambient noise levels in and around Birsi Airport comply with the prescribed standards.

## 3.3 INSTRUMENTS AND SOFTWARE

The instruments and software used for the study were a class-1 noise monitoring terminal & sound level meter with its kits for measuring noise, and a computer simulation model for developing noise maps. Following is the list of equipment/instruments and software used for noise mapping:

### 3.3.1 SPOT NOISE MONITORING TERMINAL

Spot Noise Monitoring Terminal was used for noise data collection from premises of airport, which is shown in Figure 3.2. The Spot Noise Monitoring Terminal is an acoustic measurement instrument from Slovenia with the main features of a conventional and integrating-averaging sound level meter and analyzer with storage. It is available with a cloud-based server available in India.

Spot Noise Monitoring Terminal (NMT) has features like A-C-Z weighted noise level, equivalent continuous level (Leq), peak pressure levels, real-time analyzer by octave bands –31.5 Hz to 8 kHz, minimum and maximum noise level values, and statistical distribution of the measured values: Lmax, Lmin, Lday, Lnight, LApeak, L10, L50, L90, and LAeq.

### 3.3.2 BEDROCK AM100 CLASS 1 SOUND LEVEL METER

The Bedrock AM100 is most advanced class 1 / type 1 acoustic measuring instrument, which is shown in **Figure 3.3**. The BEDROCK AM100 SLM is an acoustic measurement instrument from the Netherlands with the main features of a conventional and integrating-averaging sound level meter and analyzer with storage.

## 3.3.3 PHOTOGRAPHS OF NOISE MONITORING STATIONS

**Figure 3.2: Spot Noise Monitoring Terminal**


**Birsi Airport, Gondia Approach Funnel Area-04**


**Birsi Airport, Gondia Approach Funnel Area-22**

**Figure 3.3: Bedrock Am100 Class 1 Sound Level Meter**


**Airport Colony, Gondia**


**Birsi Village, Gondia**


**Zilmili Village,Gondia**


**Paraswada Village, Gondia**

### 3.3.4 COMPUTER SIMULATION MODEL

In this study, a specialized software suite, developed by professionals in noise pollution engineering, was utilized to simulate various noise scenarios. The software, designed specifically for noise modelling, offers comprehensive capabilities, including the modelling of aircraft noise. With more than 10 calculation standards integrated into the platform, it effectively meets the needs of noise control engineers and environmental consultants.

The software was employed in this case to develop detailed noise maps. Notably, it includes a dedicated single-document application tailored for aircraft noise, allowing standard noise cases to be processed quickly, efficiently, and cost-effectively. This feature significantly enhances the accuracy and usability of the tool in managing complex noise scenarios

### 3.3.5 RADAR TRACKING SYSTEM

Flightradar24 was used to avail the flight-related data. It is a global flight tracking service that provides you with real-time information about thousands of aircraft around the world. It has the largest ADS-B network in the world with over 40,000 connected receivers. Flightradar24's business account was subscribed to collect the radar tracking data.

## 3.4 STUDY AREA PROFILE

Gondia Airport (IATA: GDB, ICAO: VAGD), also known as Birsi Airport, is a domestic airport serving the city of Gondia in Maharashtra, India. It is located at Zilmili near Birsi village, 17 km (11 mi) northeast of the city centre. It is also home to the National Flying Training Institute (NFTI), where purposes of general aviation and pilot training are conducted. Other nearby airports to Gondia Airport (GDB) include Nagpur (NAG) (124.8 km), Raipur (RPR) (163.2 km) and Jabalpur (JLR) (192.2 km).

**Figure 3.4: Birsi Airport, Gondia**

The airstrip was built by the British in 1940 during World War II as an air force base of the Royal Indian Air Force., After independence, it was initially run by the Public Works Department, and then it was taken over by the state-owned Maharashtra Industrial Development Corporation (MIDC) from August 1998 to December 2005, after which it has been operated by the Airports Authority of India (AAI). The AAI extended the runway at the airport to 7,500 feet to handle larger aircraft such as the Airbus A320 and Boeing 737 in 2013.

In March 2022, the low-cost regional airline, FlyBig, commenced regular and direct flight services to Indore and Hyderabad under the government's UDAN Scheme for improving regional connectivity and accessibility to remote regions through air from major regions of India. However, the airline indefinitely suspended operations in August 2022 for unspecified reasons after operating only for five months. Since then, the airport has remained inoperative, until in October 2023, India's largest airline, IndiGo, announced it would restart commercial operations in the airport by starting new flights to Hyderabad on 1 December 2023.

The airport has a single runway, oriented 04/22, measuring 2,290 m (7,510 ft) in length and 45 metres in width, with a parallel taxiway connecting to it, measuring 1,697 m (5,568 ft) in length. The main apron measures 100 m × 150 m. The airport is equipped with a non-directional beacon (NDB), DVOR, Distance Measuring Equipment (DME) and Instrument Landing System (ILS) to support the nighttime landing of aircraft.

**Table 3.2: Statistics of Passengers**

| Year | Total |
|---|---|
| 2022-23 | 10,707 |
| 2023-24 | 8,077 |

**Table 3.3: Noise Monitoring Locations**

| Sr.No. | Coordinates | Locations Code | Location | Location Category |
|---|---|---|---|---|
| 1 | 21°32'01.0"N 80°17'53.0"E | NMT-1_S07 | Birsi Airport, Gondia Approach Funnel Area-04 | Airport Premises |
| 2 | 21°31'00.0"N 80°16'47.0"E | NMT-1_S08 | Birsi Airport, Gondia Approach Funnel Area-22 | Airport Premises |
| 3 | 21°31'00.3"N 80°16'17.9"E | SMT-1 | Airport Colony, Gondia | Resident |
| 4 | 21°30'55.0"N 80°17'01.4"E | SMT-2 | Birsi Village, Gondia | Resident |
| 5 | 21°32'03.1"N 80°18'33.7"E | SMT-3 | Zilmili Village,Gondia | Resident |
| 6 | 21°32'24.5"N 80°17'18.5"E | SMT-4 | Paraswada Village, Gondia | Resident |

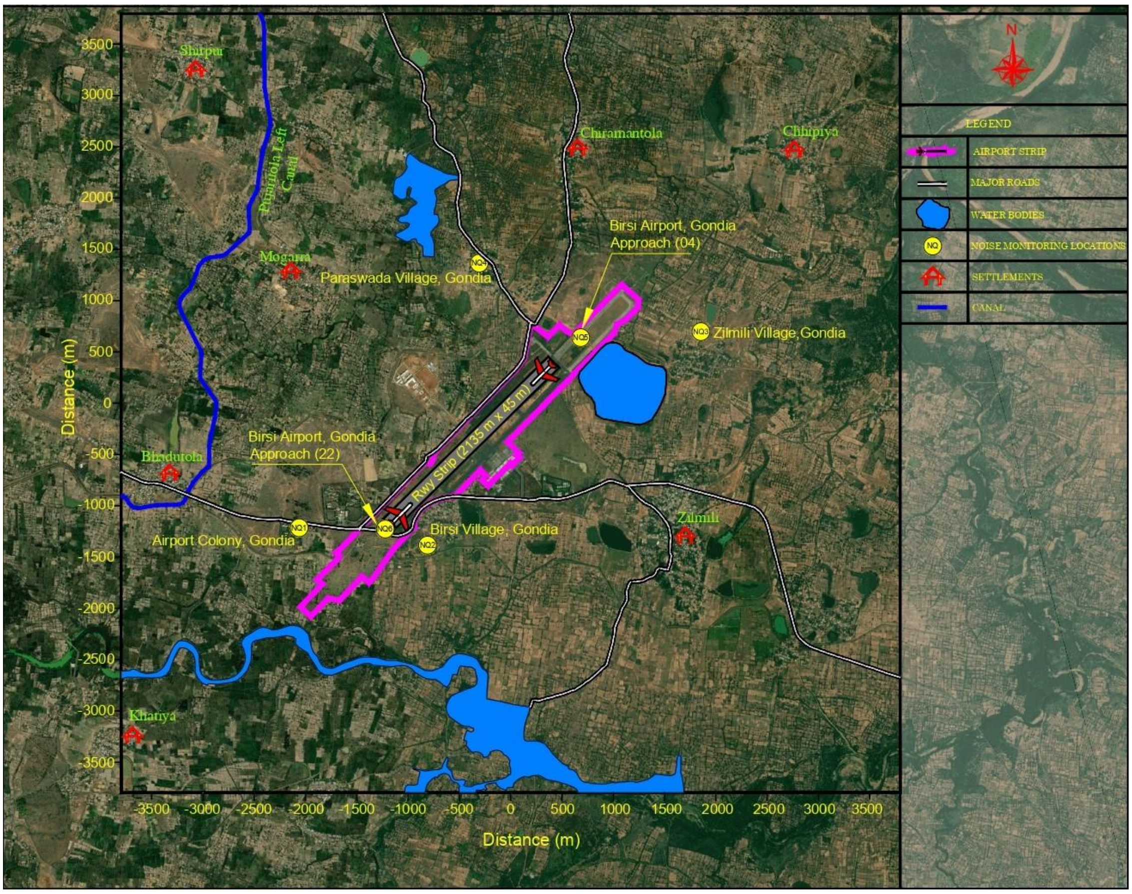



**Figure 3.5: Map of Birsi Airport, Gondia with Monitoring Locations**

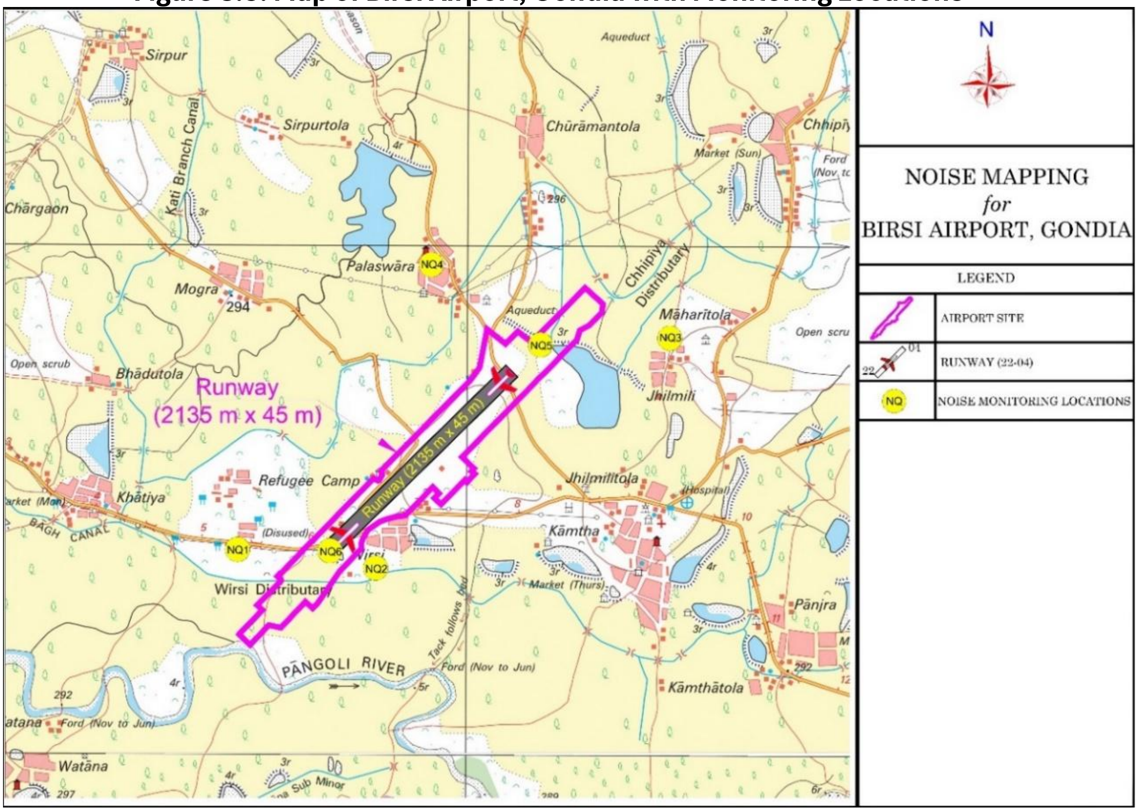



**Fig. 3.5** shows the Birsi Airport, Gondia map with monitoring locations. A total of six locations were selected as per MoEF&CC, G.S.R. 568(E) dated 18th June 2018. These six locations include diversified activities of residence and village. Different types of land-use patterns have been seen along these locations. All locations are laid under the Gondia City.

# CHAPTER-4

# DATA COLLECTION AND ANALYSIS

## 4.1 GENERAL

This chapter deals with data collection work of noise surveys, meteorological data, flight schedules, and aircraft-related data. The detailed observation of data collection is incorporated here. Noise data were collected as per MoEF&CC notification G.S.R.568(E), CPCB guideline, and DGCA Aviation Environment Circular 01 of 2024.for aircraft noise monitoring and mapping.

Noise monitoring was done at six different locations that were under the flight path. Residential, buildings are located under the flight path and these buildings are of a minimum of 3 storeys and a maximum of 13 storeys. Noise measurements were carried out from 28th June 2024 to 27th July 2024. Field measurements have been taken by using Spot Noise Monitoring Terminal and Bedrock Class-1 Sound Level Meter for a 24-hour duration. Monitoring was divided into two parts as per CPCB guidelines, for daytime 6.00 am to 10.00 pm and night time 10.00 pm to 6.00 am. The noise monitoring terminal & sound level meter are calibrated before each measurement using a calibrator. The sound level meter is mounted at a height of 4 m above the floor level as per the CPCB guideline.

Noise levels (LAeq) and other noise indices (L10, L50, L90, Lmax, Lmin, Lday, Lnight and LApeak) are stored in the automatic sound level meter and the Indian cloud-based server automatically generates a complete data sheet of all necessary noise data and statistics in a user-friendly way.

## 4.2 NOISE MONITORING SURVEY

Noise monitoring was conducted between 28th June 2024 to 27th July 2024 in airport premises and between 28th June 2024 to 27th July 2024 around Birsi Airport, Gondia. Monitoring has been done at 6 locations which are laid under the flight path with aircraft traffic volume, meteorological data, and radar tracking data.

Noise monitoring was done on both sides of the runway, at the nearest residential/silent zone and as far as possible under the flight path of the aircraft using the Spot Noise Monitoring Terminal. Other temporary four stations were installed under the flight path where noise levels are expected to be high This instrument was set for A-weighting continuous 24 hours and all the readings were taken as per CPCB protocol. Noise descriptors like Lmax, Lmin, Lday, Lnight, LApeak, L10, L50, L90, and LAeq, were assessed and are given in Tables 4.1 to 4.3 for all locations. Representative noise analysis reports are given in **Annexure I.**

**Table 4.1: NMT-1_S07_Airport Premises Noise Level Readings (Approach Funnel Area-04)**

| Date | LAEQ | LMAX | LMIN | LAPeak | L10 | L50 | L90 | L Day | L night |
|---|---|---|---|---|---|---|---|---|---|
| 28-06-2024 | 51.6 | 72.8 | 38.4 | 110.3 | 49.0 | 44.7 | 42.1 | 57.0 | 44.0 |
| 29-06-2024 | 51.9 | 79.5 | 38.4 | 137.7 | 49.0 | 45.3 | 42.2 | 55.2 | 47.8 |
| 30-06-2024 | 52.7 | 72.1 | 38.4 | 105.3 | 49.2 | 44.3 | 40.9 | 57.7 | 49.4 |
| 01-07-2024 | 51.4 | 92.4 | 37.2 | 108.7 | 48.6 | 44.0 | 40.9 | 54.1 | 46.6 |
| 02-07-2024 | 50.9 | 89.6 | 36.5 | 112.4 | 48.6 | 45.2 | 42.5 | 58.4 | 44.7 |
| 03-07-2024 | 52.4 | 84.6 | 34.0 | 91.6 | 51.0 | 46.1 | 42.4 | 58.5 | 43.7 |
| 04-07-2024 | 49.9 | 90.3 | 30.7 | 102.4 | 50.1 | 44.6 | 41.1 | 53.0 | 44.9 |
| 05-07-2024 | 48.6 | 80.5 | 29.8 | 100.9 | 50.1 | 44.3 | 40.8 | 49.8 | 48.0 |
| 06-07-2024 | 48.5 | 81.3 | 28.5 | 108.3 | 49.7 | 44.3 | 40.4 | 50.5 | 44.9 |
| 07-07-2024 | 47.3 | 88.5 | 28.1 | 102.3 | 46.4 | 42.5 | 39.5 | 49.1 | 43.6 |
| 08-07-2024 | 45.1 | 84.4 | 29.9 | 104.5 | 46.5 | 42.8 | 40.8 | 51.3 | 43.6 |
| 09-07-2024 | 48.0 | 79.9 | 25.0 | 104.6 | 45.7 | 40.9 | 38.1 | 50.3 | 46.9 |
| 10-07-2024 | 47.4 | 88.5 | 25.9 | 101.4 | 44.4 | 40.4 | 37.8 | 49.2 | 49.6 |
| 11-07-2024 | 47.1 | 88.8 | 29.0 | 102.3 | 46.2 | 41.6 | 38.6 | 50.4 | 44.1 |
| 12-07-2024 | 46.6 | 88.9 | 28.2 | 105.6 | 47.1 | 41.0 | 37.9 | 51.7 | 44.7 |
| 13-07-2024 | 43.3 | 92.2 | 28.4 | 102.4 | 48.5 | 43.6 | 40.4 | 49.8 | 49.7 |
| 14-07-2024 | 44.6 | 85.8 | 26.3 | 104.8 | 43.4 | 40.0 | 37.3 | 44.7 | 46.8 |
| 15-07-2024 | 46.3 | 85.7 | 25.9 | 107.9 | 45.1 | 40.3 | 37.3 | 51.0 | 45.2 |
| 16-07-2024 | 49.3 | 92.6 | 27.0 | 106.3 | 48.9 | 43.5 | 39.7 | 49.0 | 46.2 |
| 17-07-2024 | 46.5 | 82.8 | 26.4 | 107.3 | 47.4 | 41.3 | 37.1 | 51.4 | 48.9 |
| 18-07-2024 | 49.3 | 82.6 | 27.4 | 109.3 | 47.6 | 41.1 | 36.8 | 49.2 | 45.1 |
| 19-07-2024 | 47.2 | 99.7 | 30.0 | 134.0 | 47.3 | 42.3 | 38.2 | 49.8 | 54.9 |
| 20-07-2024 | 48.3 | 92.8 | 31.3 | 134.0 | 50.5 | 45.0 | 41.6 | 52.8 | 44.4 |
| 21-07-2024 | 50.1 | 94.4 | 28.0 | 122.9 | 47.2 | 41.9 | 38.9 | 49.2 | 54.4 |
| 22-07-2024 | 49.6 | 93.7 | 28.7 | 124.2 | 48.4 | 42.6 | 39.5 | 53.2 | 43.4 |
| 23-07-2024 | 48.6 | 89.3 | 34.5 | 102.1 | 49.0 | 44.4 | 41.7 | 50.8 | 43.4 |
| 24-07-2024 | 50.3 | 87.2 | 32.4 | 104.0 | 48.4 | 43.6 | 40.6 | 53.2 | 48.3 |
| 25-07-2024 | 50.7 | 71.6 | 31.2 | 102.4 | 48.2 | 42.4 | 39.3 | 53.0 | 43.3 |
| 26-07-2024 | 50.9 | 78.4 | 29.3 | 110.4 | 48.9 | 43.0 | 40.0 | 53.6 | 43.7 |
| 27-07-2024 | 49.4 | 82.7 | 32.4 | 106.8 | 49.0 | 43.1 | 40.1 | 53.7 | 43.9 |

**Table 4.2: NMT-2_S08_Airport Premises Noise Level Readings (Approach Funnel Area-22)**

| Date | LAEQ | LMAX | LMIN | LAPeak | L10 | L50 | L90 | L Day | L night |
|---|---|---|---|---|---|---|---|---|---|
| 28-06-2024 | 51.3 | 93.4 | 33.3 | 107.6 | 48.7 | 44.4 | 41.8 | 56.7 | 43.7 |
| 29-06-2024 | 51.6 | 80.9 | 31.1 | 107.6 | 48.7 | 45.0 | 41.9 | 54.9 | 47.5 |
| 30-06-2024 | 52.4 | 86.4 | 32.4 | 108.3 | 48.9 | 44.1 | 40.6 | 57.4 | 49.1 |
| 01-07-2024 | 51.1 | 85.4 | 34.5 | 109.5 | 48.3 | 43.7 | 40.6 | 53.8 | 46.3 |
| 02-07-2024 | 50.6 | 96.2 | 37.0 | 110.7 | 48.3 | 44.9 | 42.2 | 58.1 | 44.4 |
| 03-07-2024 | 50.4 | 82.6 | 29.8 | 109.5 | 48.4 | 42.6 | 39.5 | 53.2 | 43.4 |
| 04-07-2024 | 50.5 | 81.6 | 31.6 | 108.4 | 49.2 | 44.7 | 41.1 | 54.0 | 42.4 |
| 05-07-2024 | 50.8 | 81.2 | 31.5 | 108.4 | 48.7 | 43.9 | 40.4 | 57.4 | 49.9 |
| 06-07-2024 | 49.6 | 82.0 | 30.4 | 108.4 | 47.4 | 43.1 | 40.4 | 54.2 | 45.8 |
| 07-07-2024 | 50.4 | 86.2 | 30.3 | 108.4 | 45.9 | 41.9 | 39.4 | 54.1 | 44.5 |
| 08-07-2024 | 51.4 | 84.2 | 28.2 | 109.2 | 49.2 | 42.7 | 39.7 | 57.1 | 44.1 |
| 09-07-2024 | 51.6 | 80.9 | 30.1 | 109.7 | 48.3 | 42.4 | 39.5 | 58.0 | 46.7 |
| 10-07-2024 | 50.5 | 84.5 | 28.0 | 109.7 | 47.2 | 42.5 | 39.5 | 54.9 | 48.5 |
| 11-07-2024 | 50.5 | 81.6 | 30.8 | 107.9 | 48.1 | 43.0 | 40.2 | 52.6 | 34.1 |
| 12-07-2024 | 50.4 | 81.6 | 28.6 | 102.1 | 46.4 | 41.3 | 38.5 | 57.1 | 44.1 |
| 13-07-2024 | 51.5 | 83.7 | 30.0 | 114.3 | 47.8 | 43.0 | 40.0 | 57.6 | 44.9 |
| 14-07-2024 | 51.6 | 84.5 | 27.9 | 134.2 | 46.6 | 42.5 | 39.9 | 58.1 | 47.5 |
| 15-07-2024 | 51.3 | 94.0 | 29.2 | 134.2 | 47.4 | 42.7 | 39.8 | 58.9 | 45.2 |
| 16-07-2024 | 54.5 | 84.3 | 29.3 | 134.2 | 49.8 | 44.3 | 39.8 | 58.4 | 43.8 |
| 17-07-2024 | 52.1 | 83.5 | 29.4 | 134.2 | 47.2 | 40.7 | 37.4 | 58.6 | 52.4 |
| 18-07-2024 | 53.7 | 84.3 | 32.1 | 135.0 | 49.1 | 42.0 | 37.7 | 59.0 | 47.5 |
| 19-07-2024 | 52.2 | 84.6 | 32.2 | 135.0 | 47.6 | 41.0 | 37.2 | 59.0 | 48.4 |
| 20-07-2024 | 54.4 | 104.6 | 31.5 | 134.8 | 50.9 | 44.9 | 41.4 | 58.0 | 46.5 |
| 21-07-2024 | 50.2 | 89.3 | 31.8 | 134.8 | 47.1 | 42.4 | 39.6 | 58.3 | 50.2 |
| 22-07-2024 | 52.8 | 93.2 | 30.0 | 134.8 | 47.7 | 43.3 | 40.5 | 57.9 | 46.3 |
| 23-07-2024 | 52.4 | 83.8 | 34.9 | 134.8 | 50.1 | 46.2 | 43.4 | 56.9 | 49.9 |
| 24-07-2024 | 52.9 | 85.7 | 35.3 | 134.8 | 49.3 | 44.5 | 41.2 | 56.0 | 51.9 |
| 25-07-2024 | 50.7 | 84.7 | 33.7 | 134.8 | 47.4 | 42.1 | 38.9 | 57.2 | 47.7 |
| 26-07-2024 | 49.8 | 85.5 | 32.9 | 134.8 | 46.5 | 41.8 | 38.7 | 57.6 | 45.3 |
| 27-07-2024 | 49.7 | 89.5 | 33.3 | 134.8 | 47.2 | 42.8 | 39.0 | 55.8 | 45.4 |

**Table 4.3: Residential Scatter Area Noise Level Readings**

| Date | Location | LAEQ | LMAX | LMIN | LAPeak | L10 | L50 | L90 | Lday | Lnight |
|---|---|---|---|---|---|---|---|---|---|---|
| 27-06-2024 | Birsi Village, Gondia | 50.8 | 104.5 | 34.9 | 110.3 | 68.3 | 46.8 | 40.6 | 50.8 | 48.6 |
| 25-06-2024 | Airport Colony, Gondia | 46.2 | 91.1 | 29.5 | 105.6 | 52.1 | 46.3 | 40.5 | 46.2 | 41.6 |
| 29-06-2024 | Zilmili Village,Gondia | 45.7 | 103.8 | 31.4 | 115.4 | 54.3 | 44.6 | 38.1 | 45.0 | 40.8 |
| 04-07-2024 | Paraswada Village, Gondia | 49.3 | 94.8 | 32.5 | 106.8 | 60.6 | 47.6 | 41.0 | 47.8 | 41.2 |

**Figure 4.1: Daytime and Night-time NMT-1 Noise Indices**

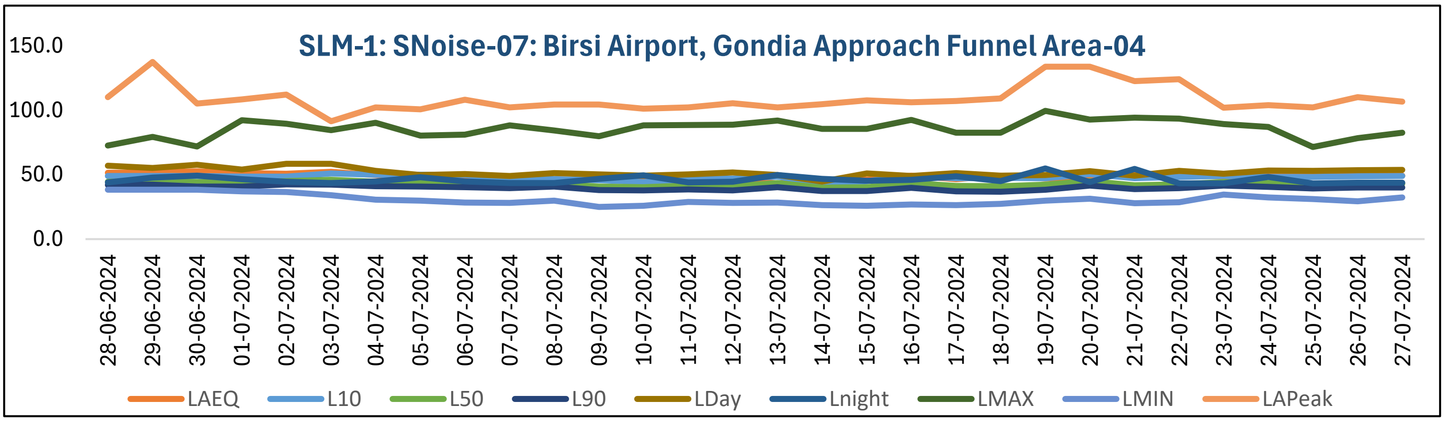



**Figure 4.2: Daytime and Night-time NMT-2 Noise Indices**

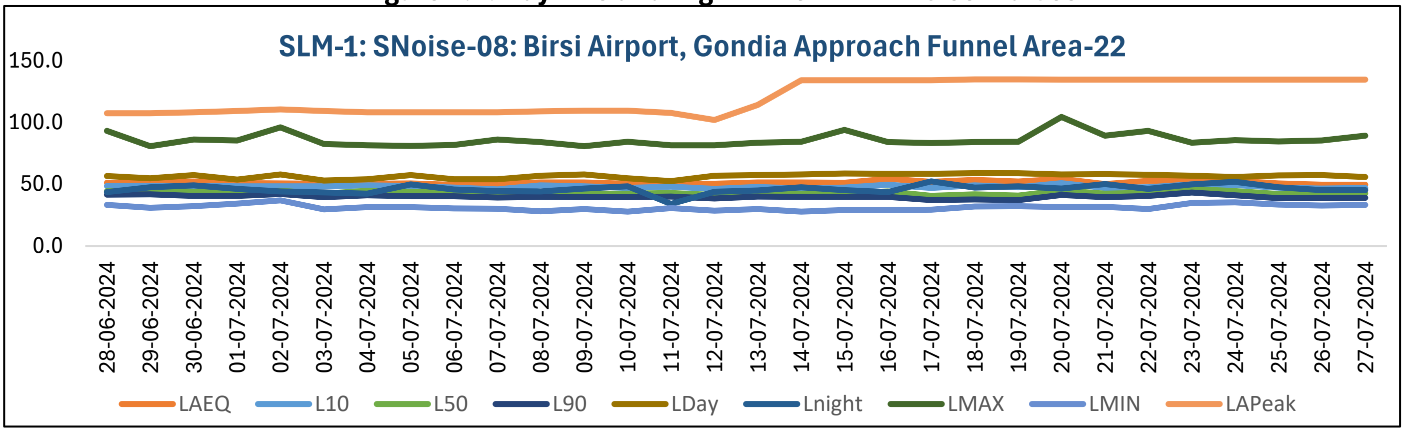



**Figure 4.3: Daytime and Night-time Residential Scatter Area Noise Level**

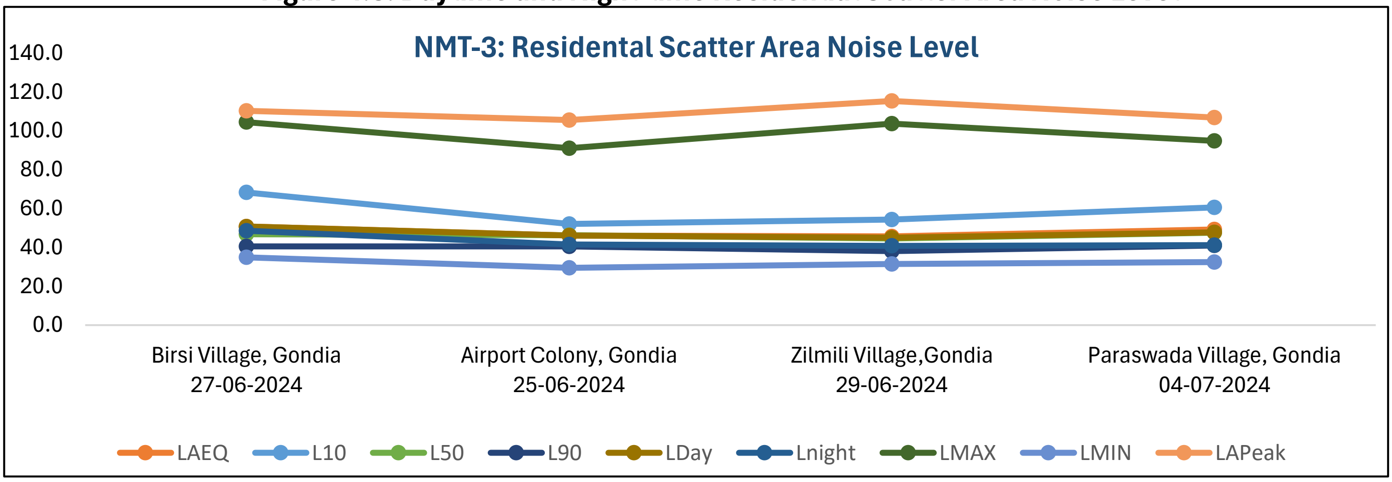


Fig. 4.1 to 4.3 depicts the daytime and night-time noise indices viz. Lmax, Lmin, Lday, Lnight, LApeak, L10, L50, L90, and LAeq of different locations. It shows that the highest Lmax observed was 104.8 dB(A) at the NMT-2 location. The day & night time Lmax observed in all locations was very high. A-weighted sound levels vary with time. For example, as an aircraft approaches, the sound level increases then falls and blends into the background as the aircraft recedes into the distance (though even the background varies as birds chirp or the wind blows or a vehicle passes by). This variation in sound level over time often makes it convenient to describe a particular noise "event" by its maximum sound level, abbreviated as Lmax.

All recorded hourly LAeq values were near to the prescribed limits by MoEF&CC G.S.R. 568(E) during both day and night time. This indicates that the noise levels are significantly near to the prescribed limit even during night time, thereby causing annoyance and sleep disorders among the human habitation.

## 4.3 AIRPORT NOISE MAPPING DETAILED SURVEY

Gondia Airport, commonly known as Birsi Airport, is located in Maharashtra, India, approximately 17 km northeast of Gondia city centre, near Zilmili village. The airport hosts the National Flying Training Institute (NFTI), which conducts general aviation and pilot training. To assess the noise impact of proposed aircraft operations, noise mapping was conducted using a noise modelling technique. A base map of the project site, along with noise monitoring locations and identified sensitive receptors within an 8 km x 8 km noise impact zone.

### 4.3.1 AIRPORT/RUNWAY DATA

1. IATA: GDB
2. ICAO: VAGD
3. Location: Zilmili, Gondia district, Maharashtra, India
4. Opened: 1940; 84 years ago
5. Co-ordinates: 21.522°N 80.010°E
6. Elevation: 987 ft / 301 m
7. Runway:

| Direction | Geometry | | Surface |
|---|---|---|---|
| | Length (m) | Width (m) | |
| 04/22 | 2135 | 45 | Asphalt |

### 4.3.2 FLIGHT SCHEDULE

The detailed flight schedule, including aircraft type, was collected from the Airport Authority of India, Gondia, and verified with radar tracking data. Popular flight routes from Gondia Airport (GDB) include Gondia (GDB) ⇒ Hyderabad (HYD). The National Flying Training Institute operates flights on the Gondia (GDB) ⇒ Gondia (GDB) route for training purposes, making it the only domestic flight route involving Hyderabad. Additionally, Birsi Airport has non-scheduled flight connectivity with other domestic and international destinations. Below are the tables for domestic departures, domestic arrivals, international departures, and National Flying Training Institute arrivals and departures.

**Table 4.4 Schedule Domestic Arrival**

| AIRLINE | FLIGHT # | ORIGINATES | OPERATES | Aircraft Type |
|---|---|---|---|---|
| IndiGo | 6E7696 | Hyderabad [HYD] | Daily | ATR72 |

**Table 4.5 Schedule Domestic Departure**

| AIRLINE | FLIGHT # | DESTINATION | OPERATES | Aircraft Type |
|---|---|---|---|---|
| IndiGo | 6E7697 | Hyderabad [HYD] | Daily | ATR72 |

**Table 4.6 Schedule National Flying Training Institute Arrival and Departure**

| AIRLINE | FLIGHT # | ORIGINATES/ DESTINATION | OPERATES | Aircraft Type |
|---|---|---|---|---|
| NFTI | -- | Gondia [GDB] | Daily/Random | DA40 |
| NFTI | -- | Gondia [GDB] | Daily/Random | DA42 |
| NFTI | -- | Gondia [GDB] | Daily/Random | DIAMOND DA42 |
| NFTI | -- | Gondia [GDB] | Daily/Random | P2008JC |

### 4.4 TRAFFIC, FLIGHT TRACKS AND CORRIDORS

The Flightradar24 platform was used to collect real-time flight details. It shows real-time aircraft flight tracking information on a map. It is a global flight tracker that shows live air traffic from around the world. It combines data from several data sources, including ADS-B, MLAT, satellite, and radar data. This positional data is aggregated with schedule and flight status data to create the flight tracking experience. The primary technology that Flightradar24 uses to receive flight information is called automatic dependent surveillance-broadcast (ADS-B). ADS-B technology is the long-term air traffic management replacement for radar technologies, especially in areas with limited radar coverage, such as remote areas and oceanic airspace. Aircraft broadcast a series of data points at regular intervals, including data on their position, altitude, speed, and much more. These signals are received by our network of ADS-B ground receivers, the largest such independent network in the world.

Flightradar24 also have the facility to calculate positions of non-ADS-B equipped aircraft with the help of Multilateration (MLAT), by using a method known as Time Difference of Arrival (TDOA). By measuring the time it takes to receive the signal from an aircraft with an older Mode S transponder, it’s possible to calculate the position of these aircraft.

**Figure 4.4** Flight tracks arrival and Departure. Flight tracks are specific to a runway. The tracks consist of the track name, the landing/take-off direction, a glide path and a detailed description of the flight path. The traffic data (how many planes for day/night) are also associated with the flight track. Flight tracks are usually followed up to a 10-kilometre influence radius. Aircraft do not follow a road or railway line; they are determined by air traffic control personnel who advise pilots to turn to a specific heading and fly in a certain direction for a specified time.

The exact time and turn radius are at the pilot’s discretion and therefore the flight tracks can be described as corridors rather than lines. Flight operations and weather conditions also add to the variability. Around the airport, there are mandatory reporting points, usually associated with a radio beacon that aircraft tend to fly over. For the calculation, the standards determine how the flight corridor is represented by individual line sources.

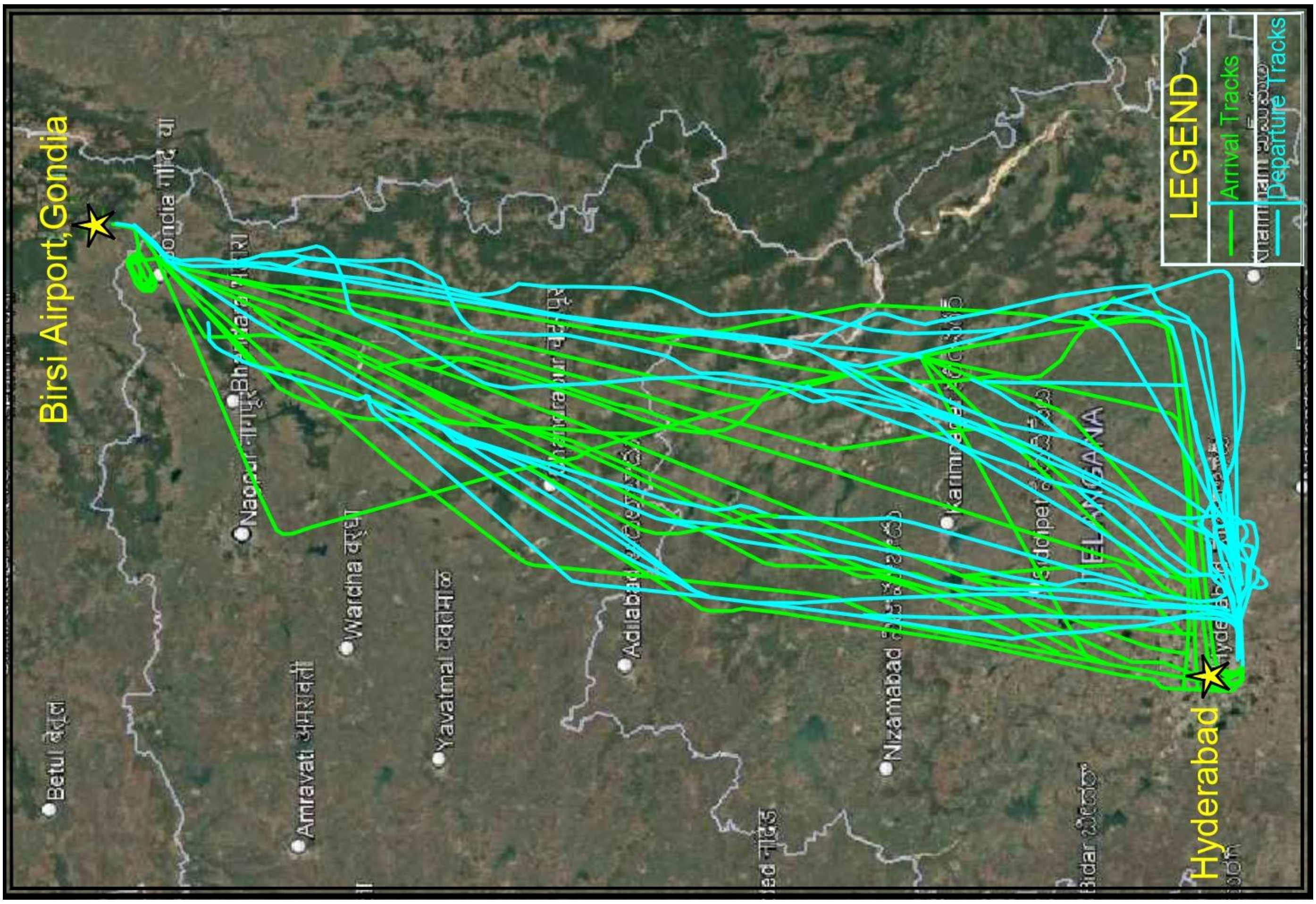



**Figure 4.4 Flight tracks arrival and Departure.**

Based on the Traffic, Flight Tracks and Corridors data for the year 2023–24, Birsi Airport has been classified as a non-busy airport. Accordingly, for such airports, excluding proposed airports, the prescribed ambient air quality standards with respect to noise in the airport noise zone are 65 dB(A) Leq for daytime (06:00–22:00 hrs) and 60 dB(A) Leq for nighttime (22:00–06:00 hrs).

| Sr.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 |
| | | **All other Airports excluding the proposed airports** | **65** | **60** |

The measured noise levels at various monitoring locations around Birsi Airport indicate compliance with the prescribed standards for non-busy airports. All observed values were below the permissible limits of 65 dB(A) during daytime and 60 dB(A) during nighttime. This demonstrates that the ambient noise levels in and around Birsi Airport are well within the regulatory standards, with no exceedance of noise limits observed during the monitoring period.

| Location | Measured Value | | Prescribed Limit as per non-busy airports | | Compliance Status |
|---|---|---|---|---|---|
| | Lday dB(A) | Lnight dB(A) | Lday dB(A) | Lnight dB(A) | |
| Airport Premises – Approach Funnel Area-04 | 50.8 | 45.1 | **65** | **60** | Within Limit |
| Airport Premises – Approach Funnel Area-22 | 56.7 | 46.2 | **65** | **60** | Within Limit |
| Residential Scatter Area | 47.5 | 43.1 | **65** | **60** | Within Limit |

## 4.5 METEOROLOGICAL DATA

Noise propagation is affected by meteorological parameters like wind velocity & direction, temperature, air pressure, and humidity were collected from the Indian Meteorological Department. This meteorological data also becomes one of the input parameters for the software. Table 4.7 depicts data such as temperature, humidity, air pressure, and Headwind of Birsi Airport, Gondia City in June and July- 2024.

**Table 4.7: Meteorological Data**

| Humidity (%) | Air pressure (mmHg) | Headwind (km/hr) | Temperature ($^{O}$C) |
|---|---|---|---|
| 82.17 | 759.97 | 14.8 | 27.6 |

# CHAPTER-5

# NOISE MAPS AND PREDICTION

## 5.1 GENERAL

This chapter highlights the noise mapping concept and the noise mapping of the study area. Noise maps were developed for Birsi Airport, Gondia, using a computer simulation model

## 5.2 CONCEPT OF NOISE MAPPING

A noise map is a map of an area, which is coloured according to the noise levels in the area. Sometimes, the noise levels may be shown by contour lines, which show the boundaries between different noise levels in that area. The noise levels over an area will vary all the time. For example, noise levels may rise as the aircraft approaches, and reduce again after it has passed. This would cause a short-term variation in noise level. In the longer term, wind, weather and season all affect noise levels. This means that it is not possible to say with confidence what the noise level will be at any particular point at any instant in time, but where the noise sources are well-defined, such as road or rail traffic, or aircraft, then it is possible to say with some confidence what the long-term average noise level will be.

It may be thought that the best way of doing this is by measurement. A long-term average must be measured over a long period (24 hours). Secondly, to obtain complete coverage of an area, measurements would have to be made on private property, where access might be difficult, and thirdly, measurements cannot distinguish the different sources of noise, so they would not be able to give information on how much noise was being made by each of the sources in an area. For these and other reasons, noise mapping is usually done by calculation based on a computerized noise model of an area, although measurements may be appropriate in some cases.

A further benefit of having a noise map is that it can be used to assess the effects of transportation and other plans. Thus, the effect of a proposed new airport/existing airport can be assessed and suitable noise mitigation can be designed to minimize its impact. This is particularly important in noise action planning, where a cost-benefit analysis of various options can be tested before a decision is made.

## 5.3 NOISE MAPS AND PREDICTION MODEL

The predicted noise levels from the proposed aircraft operations were modelled using the Integrated Noise Model (INM) software. This model is widely used for evaluating aircraft noise impacts near airports. The study utilized input parameters such as atmospheric temperature, pressure, and average headwind speed to compute noise levels for each operation. The noise level in the surrounding community was evaluated based on the characteristics of the noise source, time of occurrence, and location relative to receptors.

Predicted noise levels at six monitoring locations (NQ1-NQ6) for four standard noise metrics (LAEQ, LAEQD, LAEQN, and LAMAX) were compared with the measured value under two flight operation scenarios and are detailed in **Tables 5.1 and 5.4**, with graphical representations in **Figure 5** depicts the predicted and observed noise levels at the six monitoring locations, showing marginal deviations that may be attributed to the study period and other influencing factors.

For developing an aircraft noise model, it is essential to associate noise levels with the generation, propagation and reception of aircraft noise. Every model needs three significant features such as the noise source, the path of propagation and the receiver. The noise source data consist of the aircraft type, aircraft engine type, flight path. The propagation path includes the perpendicular distance of the receiver from the source, the average height of propagation above the ground surface, the ground surface characteristics, the angle of view of the source from the receptor and the reflecting surface near the source. The data considered for the receptor are the location, height and angle of view of the receptor and the reflecting surfaces near to receptor.

The time required to generate a single aircraft noise map depends upon the data inventory; however, for this study, it ranged from 8 to 14 hours. The results of noise mapping shall be validated using actual measurements of aircraft noise around the airport, preferably at the points chosen during the modelling.

**Table 5.1: LAEQ Measured Value and Predicted Values**

| Locations | Measured Value | Predicted Values (Scenario-1) | Predicted Values (Scenario-2) |
|---|---|---|---|
| | LAEQ | LAEQ | LAEQ |
| Birsi Airport, Gondia Approach Funnel Area-04 | 48.8 | 42.2 | 59.6 |
| Birsi Airport, Gondia Approach Funnel Area-22 | 51.4 | 61.2 | 49.8 |
| Birsi Village, Gondia | 50.8 | 52.8 | 59.9 |
| Airport Colony, Gondia | 46.2 | 50.3 | 50.7 |
| Zilmili Village,Gondia | 45.7 | 44.1 | 47.7 |
| Paraswada Village, Gondia | 49.3 | 49.2 | 45.7 |

**Table 5.2: LAEQ Day time Measured Value and Predicted Values**

| Locations | Measured Value | Predicted Values (Scenario-1) | Predicted Values (Scenario-2) |
|---|---|---|---|
| | LAEQD | LAEQD | LAEQD |
| Birsi Airport, Gondia Approach Funnel Area-04 | 52.0 | 41.8 | 59.5 |
| Birsi Airport, Gondia Approach Funnel Area-22 | 56.7 | 61.1 | 49.4 |
| Birsi Village, Gondia | 50.8 | 52.5 | 59.9 |
| Airport Colony, Gondia | 46.2 | 50 | 50.7 |
| Zilmili Village,Gondia | 45.0 | 43.7 | 47.7 |
| Paraswada Village, Gondia | 47.8 | 48.8 | 45.7 |

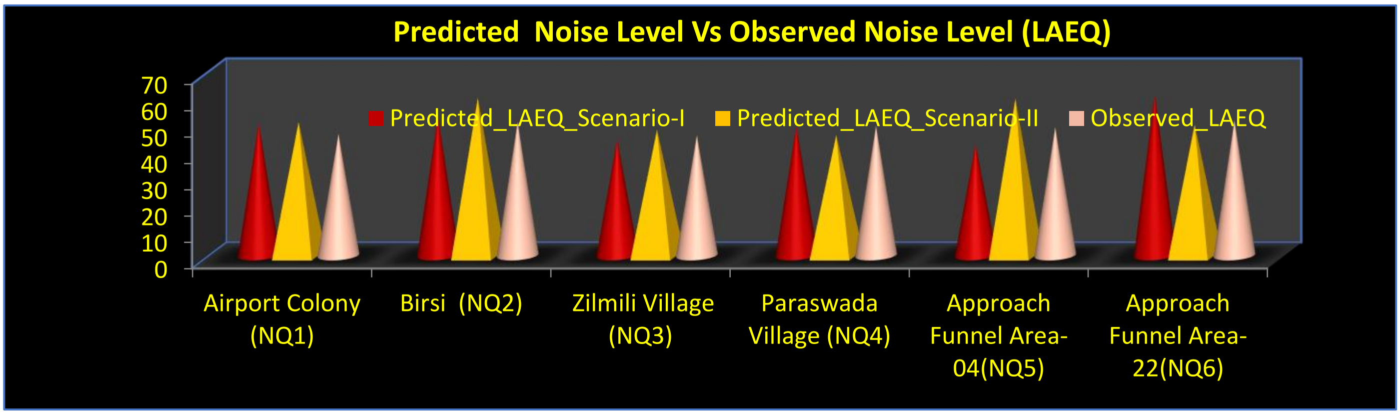
**Table 5.3: LAEQ Night-time Measured Value and Predicted Values**

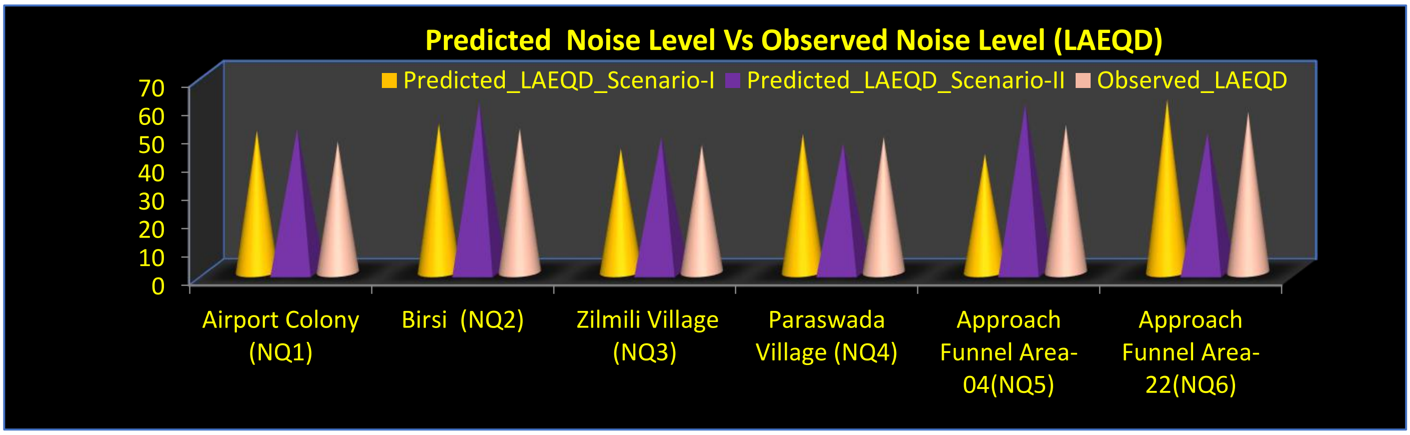
| Locations | Measured Value | Predicted Values (Scenario-1) | Predicted Values (Scenario-2) |
|---|---|---|---|
| | LAEQN | LAEQN | LAEQN |
| Birsi Airport, Gondia Approach Funnel Area-04 | 46.3 | 42.7 | 59.7 |
| Birsi Airport, Gondia Approach Funnel Area-22 | 46.2 | 61.2 | 50.3 |
| Birsi Village, Gondia | 48.6 | 53.4 | 59.6 |
| Airport Colony, Gondia | 41.6 | 50.9 | 50.3 |
| Zilmili Village,Gondia | 40.8 | 44.6 | 47.3 |
| Paraswada Village, Gondia | 41.2 | 49.7 | 45.3 |

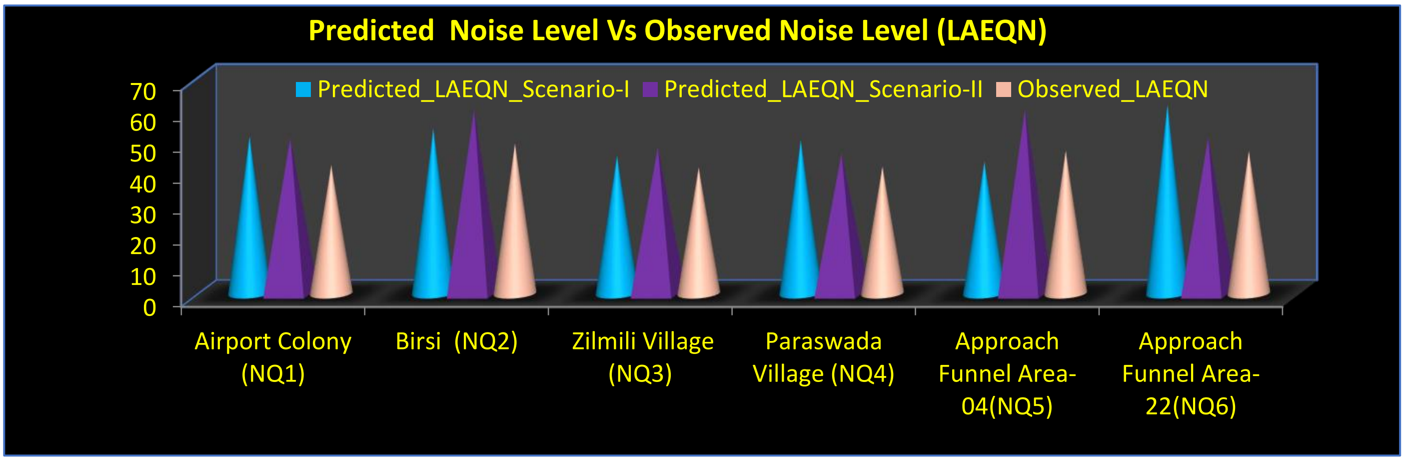
**Table 5.4: LAMAX Measured Value and Predicted Values**

| Locations | Measured Value | Predicted Values (Scenario-1) | Predicted Values (Scenario-2) |
|---|---|---|---|
| | LAMAX | LAMAX | LAMAX |
| Birsi Airport, Gondia Approach Funnel Area-04 | 85.8 | 71.8 | 95.9 |
| Birsi Airport, Gondia Approach Funnel Area-22 | 86.1 | 99.9 | 75.6 |
| Birsi Village, Gondia | 104.5 | 77 | 81.7 |
| Airport Colony, Gondia | 91.1 | 73.4 | 73.4 |
| Zilmili Village,Gondia | 103.8 | 66.5 | 69.9 |
| Paraswada Village, Gondia | 94.8 | 70.2 | 66.5 |

Tables 5.0 depict the noise values of prediction and measurement. The maps of the model (e.g. Figure 6.1 & 6.2) describe the noise levels in the form of contours. Noise contours highlight existing or potential areas of significant aircraft noise exposure (as prescribed by MoEF&CC notification, G.S.R. 568 (E)). They are a series of lines superimposed on a map of the airport's environs. These lines represent various levels of average exposure. Noise contours are used to assess the relative aircraft noise exposure levels of different runway and or flight corridor alternatives.



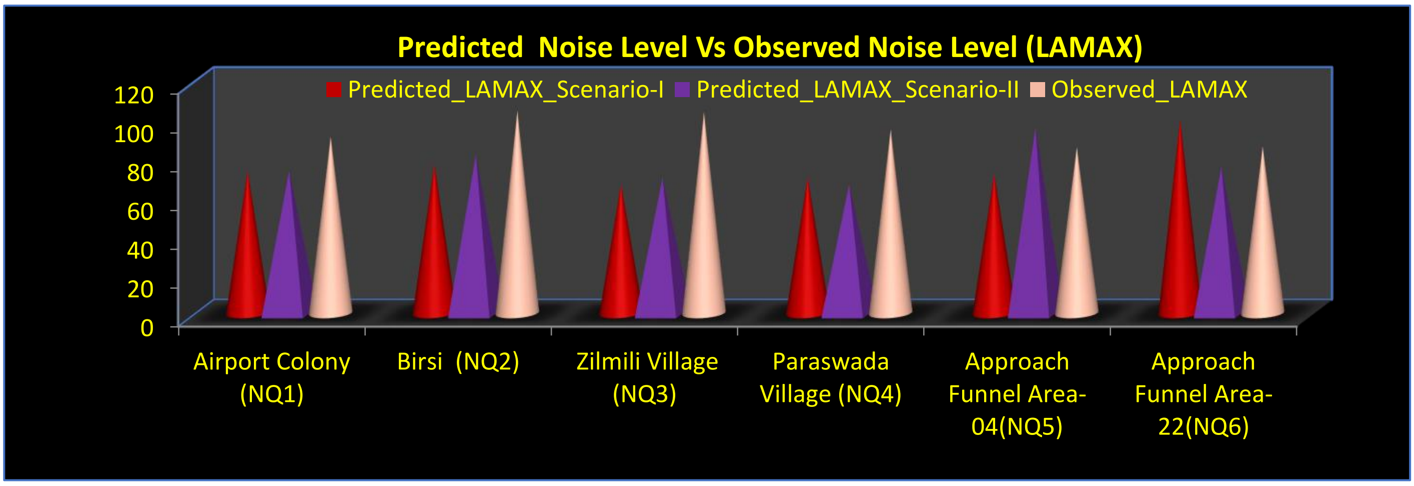




**Figure 5: Predicted Vs Observed Noise Level Metrics**

### 5.3.1 VALIDATION OF NOISE PREDICTIONS

To ensure the accuracy of the noise prediction model for Birsi Airport, validation was conducted by comparing measured noise levels with predicted noise levels at key monitoring locations. The validation points were based on actual field measurements taken from six locations around the airport, including Birsi Village, Airport Colony, and Zilmili Village. Metrics such as LAeq (A-weighted equivalent noise levels) and LAMAX (maximum noise levels) for both daytime and nighttime were compared against the predicted values generated by the noise mapping software.

The results demonstrate a close alignment between the measured and predicted values, confirming the reliability of the prediction model in identifying noise impacts around the airport. However, minor discrepancies were observed, which could be attributed to variations in real-time conditions such as flight patterns, meteorological changes, or local environmental factors. These deviations emphasize the importance of continuous noise monitoring to refine predictions and ensure ongoing accuracy. Regular updates to the model, incorporating real-time noise data, will enhance the robustness of noise management strategies.

This validation process plays a crucial role in confirming that the noise contours and proposed mitigation measures are appropriately tailored to the noise impact zone, ensuring that Birsi Airport adheres to the prescribed noise standards.

# CHAPTER-6

# DECLARATION OF NOISE ZONE

## 6.1 GENERAL

The purpose of aircraft noise modelling is to generate the noise contour maps for an existing or planned airport or to show the variations in contours for different operations/plans / future aircraft /noise abatement restrictions and so on. Parallel to the graphical representation of the noise contours, it is possible to get details of the noise zone in the form of noise maps. Aircraft noise contour maps can be used to calculate the total areas, residential populations affected, numbers of schools and hospitals, or other potentially noise-sensitive locations, geographically located within defined aircraft noise contour bands.

## 6.2 DECLARATION OF NOISE ZONE

The Airport Noise Zone Area for Airport is defined as noise contour for day and night periods based on 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).

International Civil Aviation Organization (ICAO) and DGCA have defined Obstacle Limitation Surfaces (OLS) in and around the airports for safe and efficient operations of the flights. Accordingly, the Ministry of Civil Aviation (MoCA) has issued a Statutory Order (S.O. 84 E) dated 14th January 2010 to protect these surfaces.

In line with the world best practices and based on the Committee recommendations, set up by MoCA for regulating the building construction around airports, MoCA (vide its letter dated 15th October 2012) has directed AAI to prepare the Colour Coded Zoning Map (CCZM) in grid form of all the civil airports, certify them and give a copy of such maps to Local/Municipal Bodies.

CCZM of all the airports has been prepared and issued to the Local Bodies. The whole of the area around the airport has been divided into geo-referenced grids of 1 minute by 1 minute (approximately 3 Square km) for easy readability and implementation. The Local, Municipal or Town Planning and Development authorities can plan their development as per the CCZM.

CZM can be used to locate and identify the home grid, where the plot/site lies. The local authorities co-relate the colour of the home grid with the colour legend, available in CCZM and check the permitted top elevation in Above Mean Sea Level (AMSL). If the colour of the home grid is red, then the applicant shall file an application to AAI through NOCAS at the AAI website for issuance of NOC. The maximum elevation that can be approved through CCZM is up to 150 m, and where the requested top elevation is above 150 m, an applicant must apply online on NOCAS. The effective utilization of an airport is considerably influenced by natural features and man-made constructions inside and outside its boundary. These may result in limitations on the distances available for takeoff and landing of aircraft. For these reasons, certain areas of the local airspace must be regarded as integral parts of the aerodrome environment. Also, there is a need to protect the airport environment so that future airport expansion plans are smoothly implemented.

## 6.3 NOISE PREDICTION & CONTOURS MAPPING

The predicted noise levels from the proposed aircraft operations were modelled using the Integrated Noise Model (INM) developed by the Federal Aviation Administration (FAA). This model is widely used for evaluating aircraft noise impacts near airports The noise level in the surrounding community was evaluated based on the characteristics of the noise source, time of occurrence, and location relative to receptors.

Day-night average Sound Levels (DNL) metric was used to assess aircraft noise exposure, with a 10 dB penalty applied to nighttime noise exposure contours were generated for DNL in 5 dB(A) increments, ranging from 40-85 dB(A), and are presented in **Figures 6.1 and 6.2** for the two different flight operation scenarios. The highest sound levels were observed near the runway and along the aircraft take-off and descent paths, with noise levels decreasing with distance from these areas. The predicted DNL noise levels are expected to comply with the residential area daytime Ambient Noise Quality Standard (ANQS) of 55 dB(A) within an average range of 0.62 km to 1.2 km, and silence zone nighttime standard of 40 dB(A) within 3.6 km to 5.5 km on either side of the runway. In addition to DNL LAMAX (maximum A-Level) noise metrics were also evaluated, with compliance ranges presented in **Figures 6.3 and 6.4**.

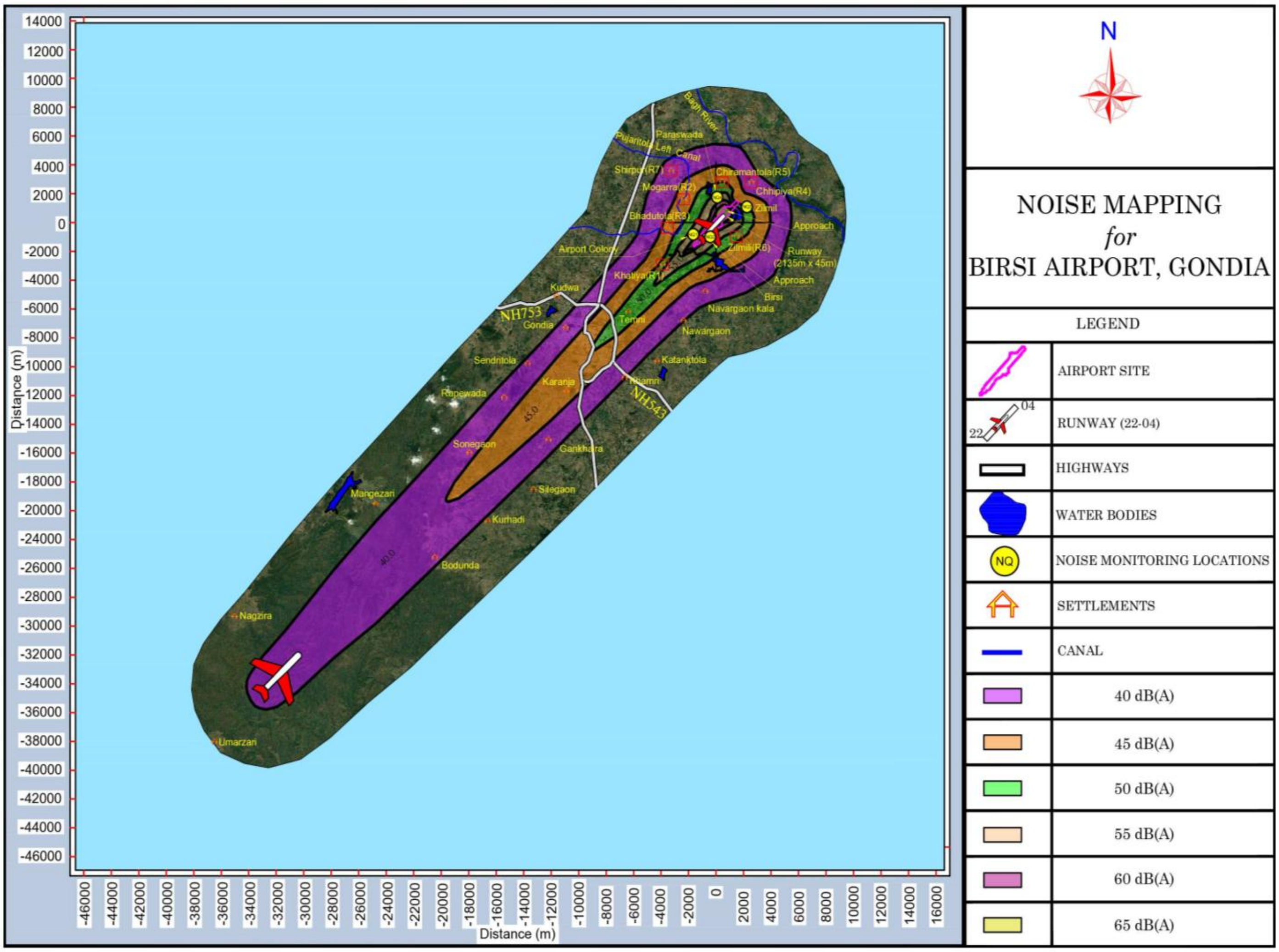
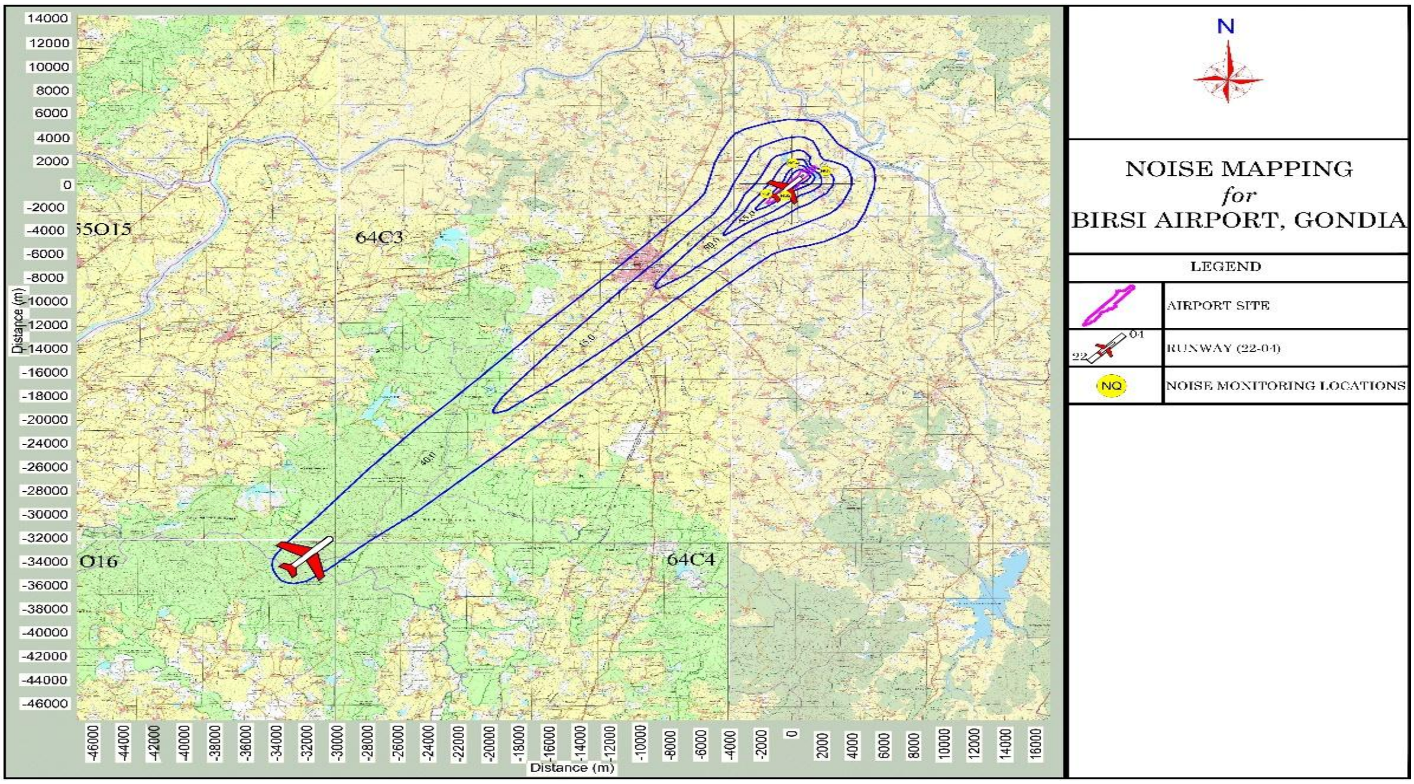



**Figure 6.1: Predicted Noise Level (DNL) Contours Map: Scenario-I Flight Operation (App-22 & Dep-04)**



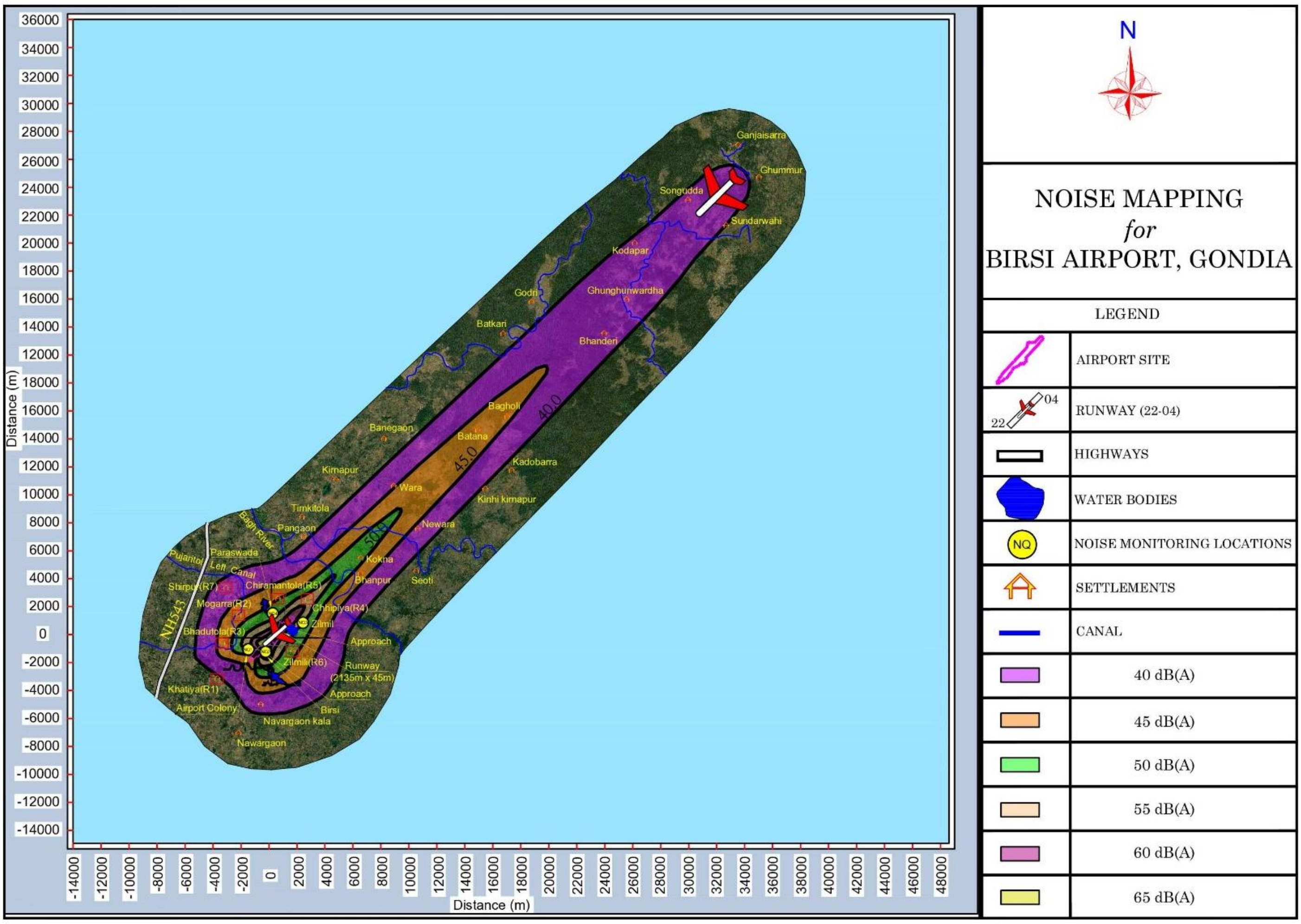
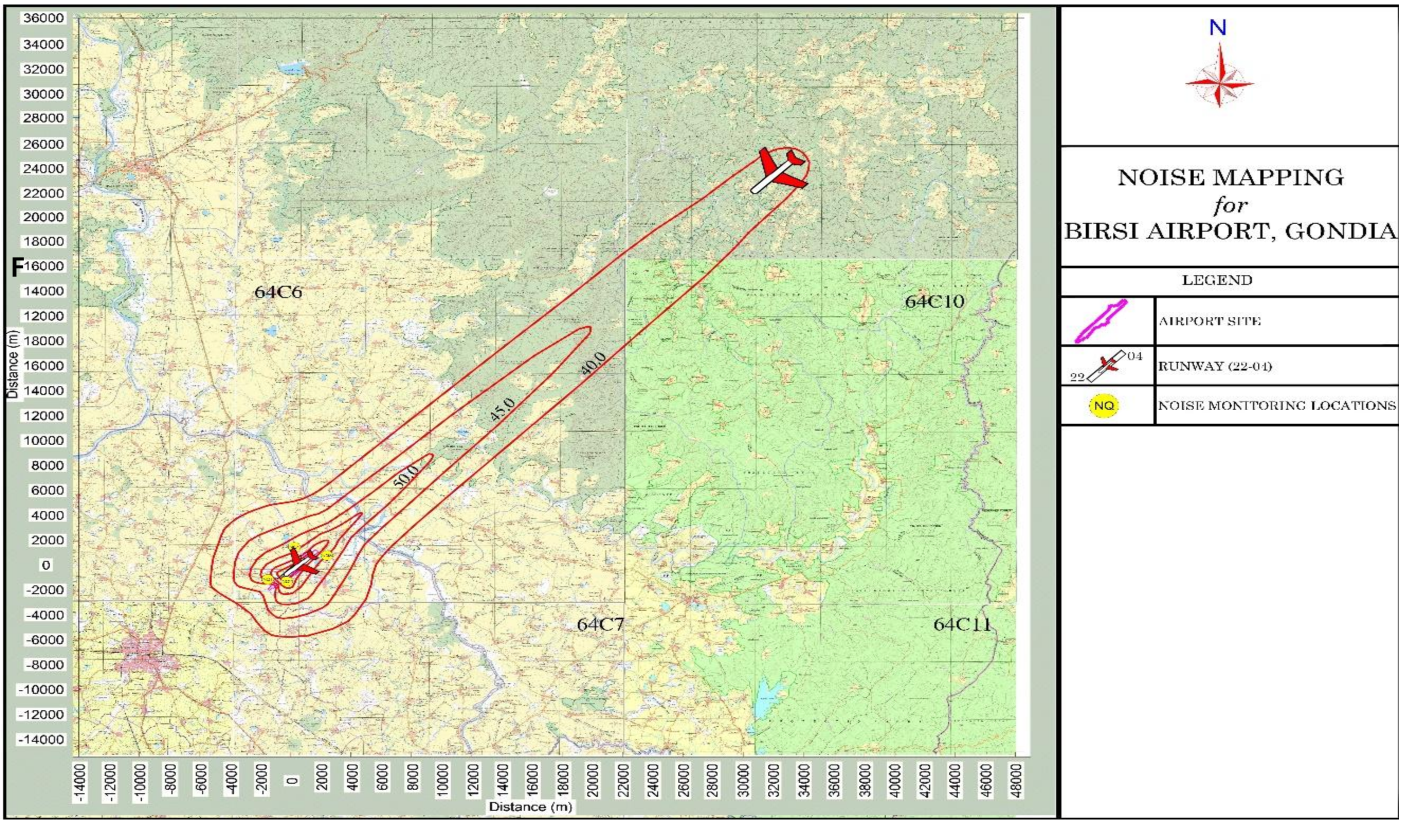



**Figure 6.2: Predicted Noise Level (DNL) Contours Map: Scenario-II Flight Operation (App-04 & Dep-22)**



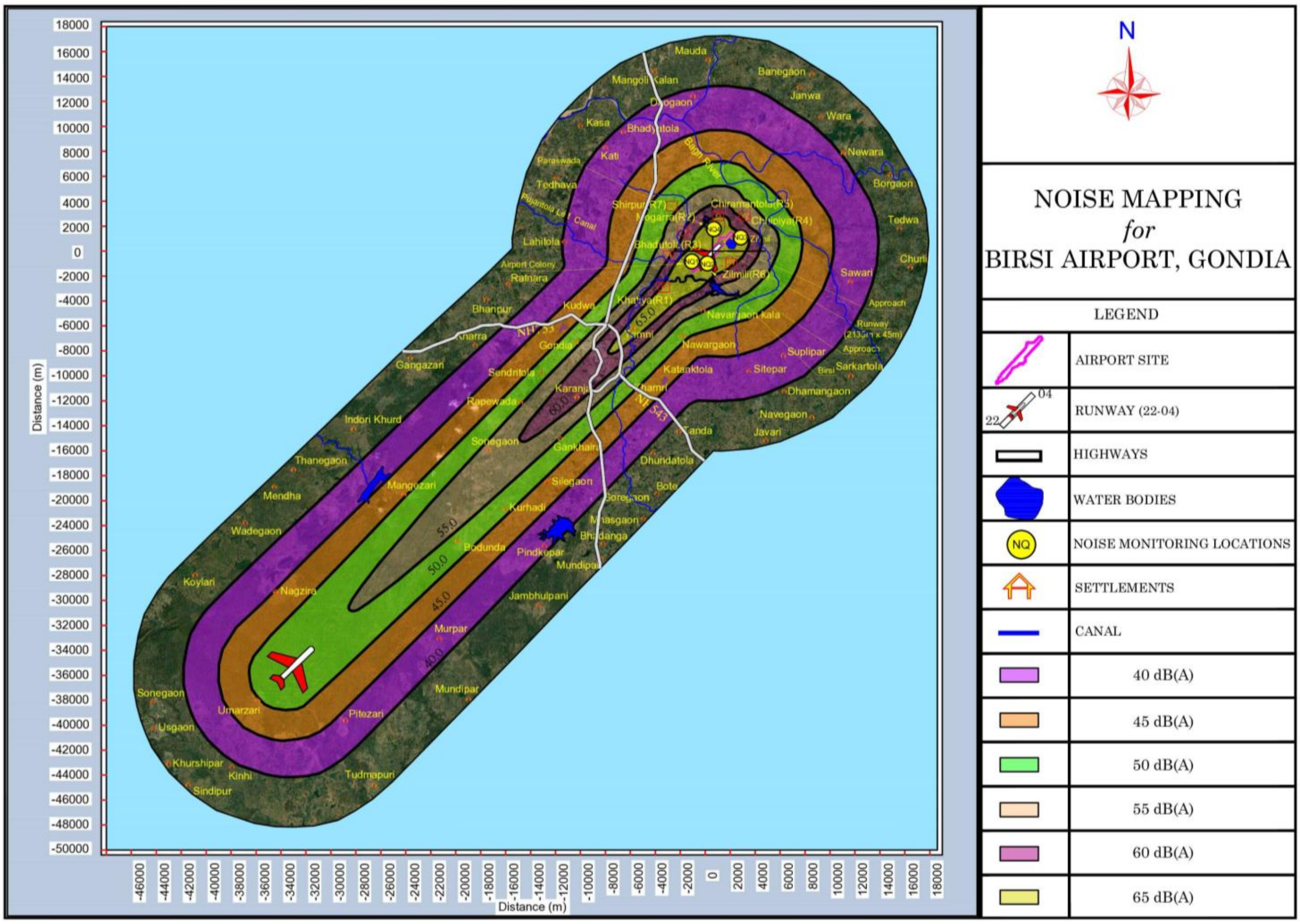
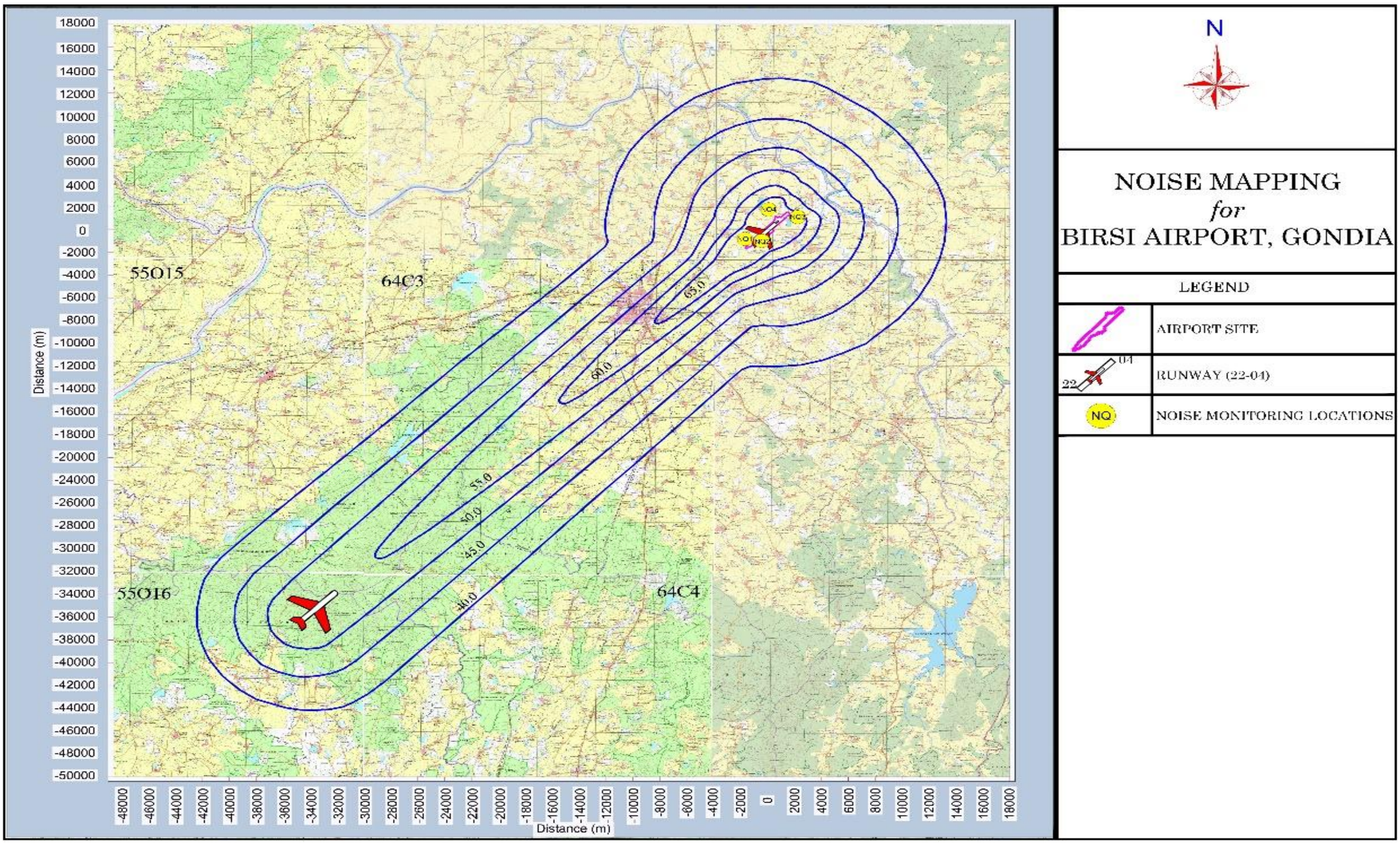



**Figure 6.3: Predicted Noise Level (LAMAX) Contours Map: Scenario-I Flight Operation (App-22 & Dep-04)**



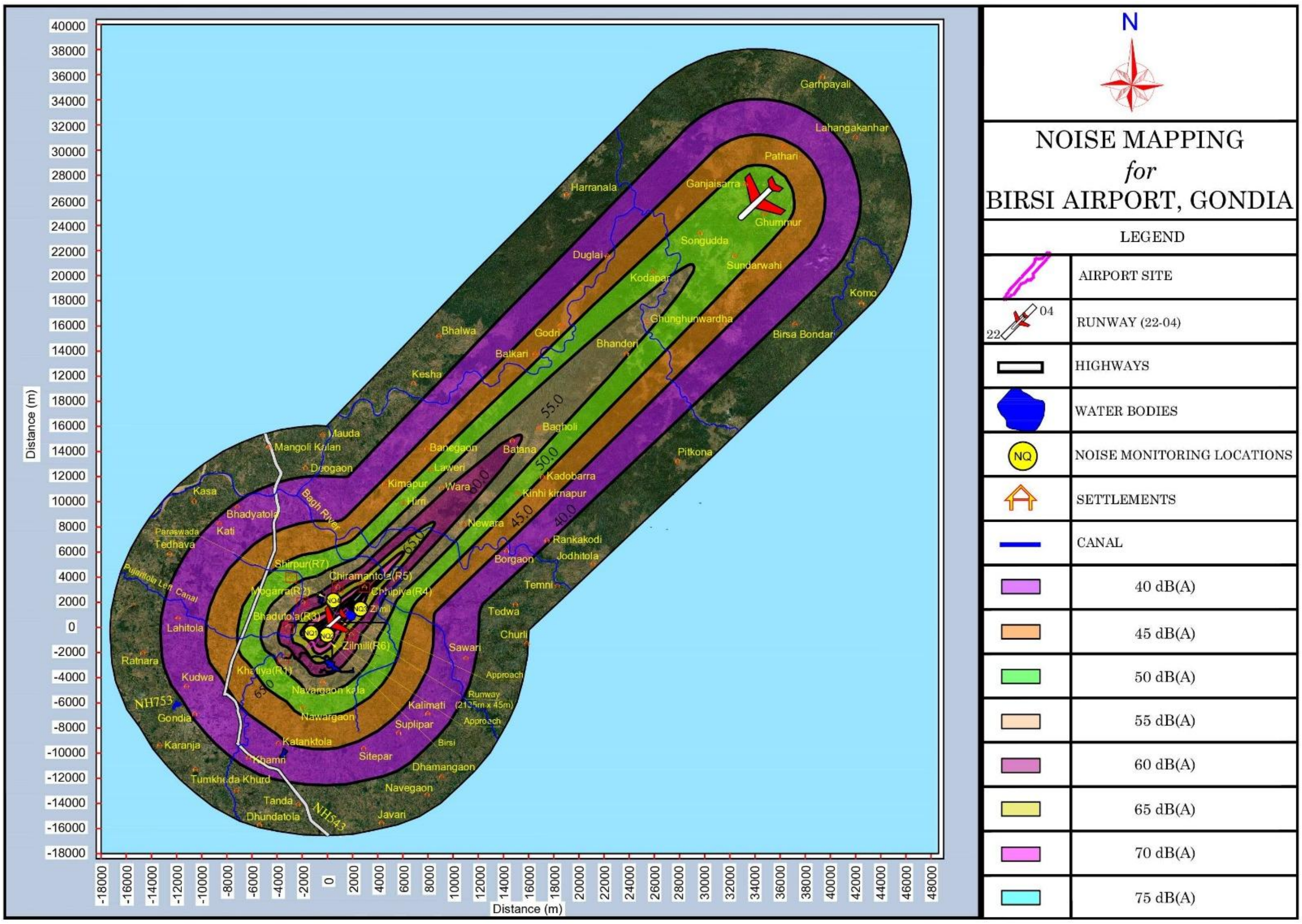
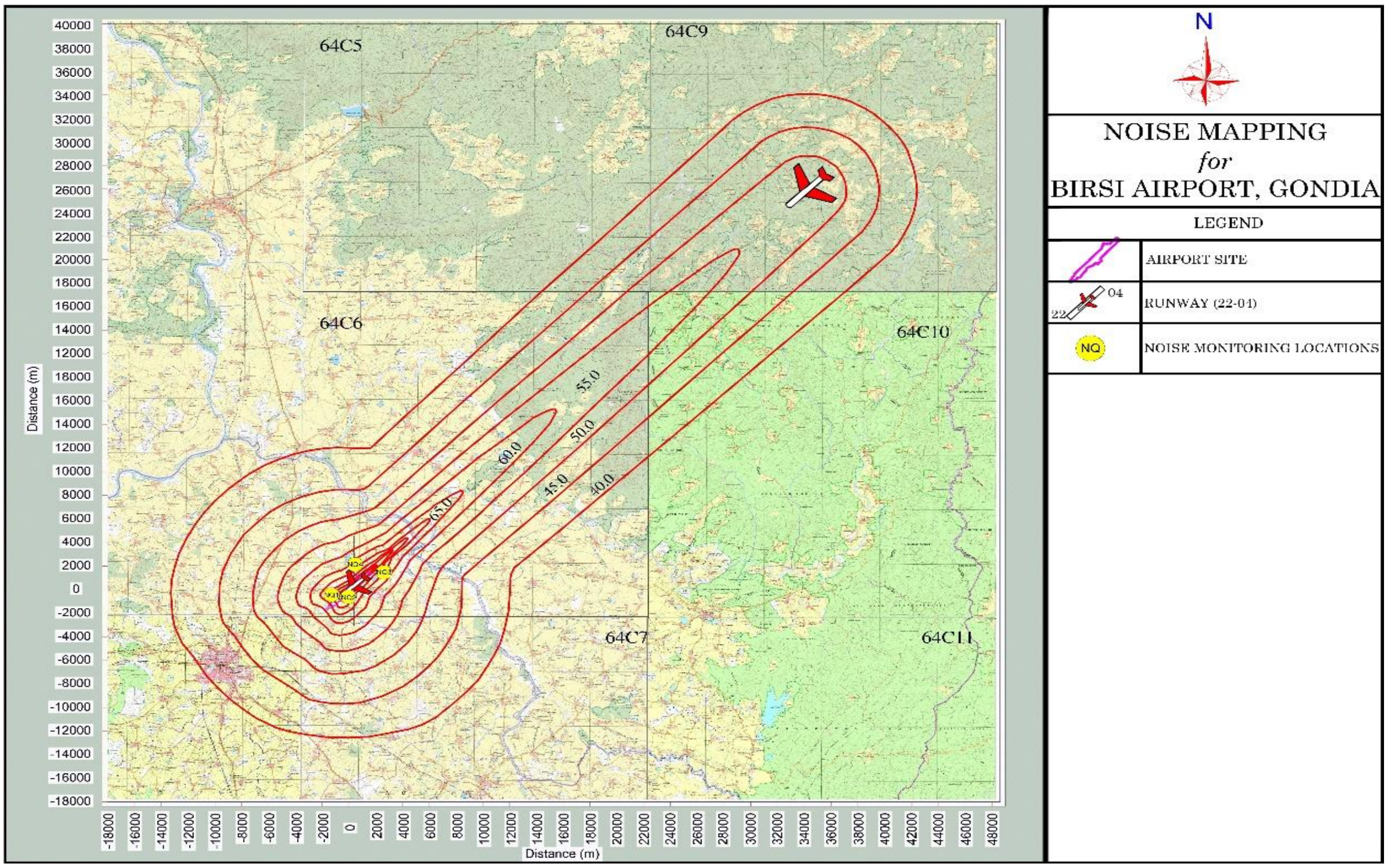



**Figure 6.4: Predicted Noise Level (LAMAX) Contours Map: Scenario-II Flight Operation (App-04 & Dep-22)**



## 6.4 AIRPORT NOISE ZONE DEMARCATIONS

Airport Noise Zones refer to areas surrounding the airport that are subject to elevated noise levels due to aircraft operations. These zones are classified based on the level of noise exposure and are divided into daytime and nighttime periods to ensure a more accurate assessment.

To demarcate the daytime (55 dBA) and nighttime (50 dBA) noise zones, a noise modeling study was conducted, assuming a conservative scenario. This scenario modeled both runway ends (Runways 04 and 22) in departure mode and used noise indices LAEQD for daytime and LAEQN for nighttime. The modeling considered 14 daytime flights (06:00 to 22:00) and 12 nighttime flights (22:00 to 06:00). The resulting noise zones for both daytime and nighttime are shown in **Figures 6.5 and 6.6,** respectively. Additionally, **Figure 6.7** presents a combined view of daytime and nighttime noise zones, with an additional nighttime contour of 45 dBA.

## 6.5 NOISE AROUND THE AIRPORT BOUNDARY

Noise levels around the project boundary are projected to range between 70-60 dBA, using the Day-Night Average Sound Level (DNL) metric, under the conservative operational scenario. The highest noise levels are expected along the Birsi Airport boundary, particularly in areas parallel to the runway, where the noise diminishes with increasing distance. The lowest noise levels, approximately 60 dBA, are expected near the runway ends, as illustrated by 2 dBA interval noise contours in **Figure 6.8**. Most of the project boundary is likely to experience noise levels between 68-70 dBA, based on conservative noise impact modelling, although actual levels could be lower than these predictions.

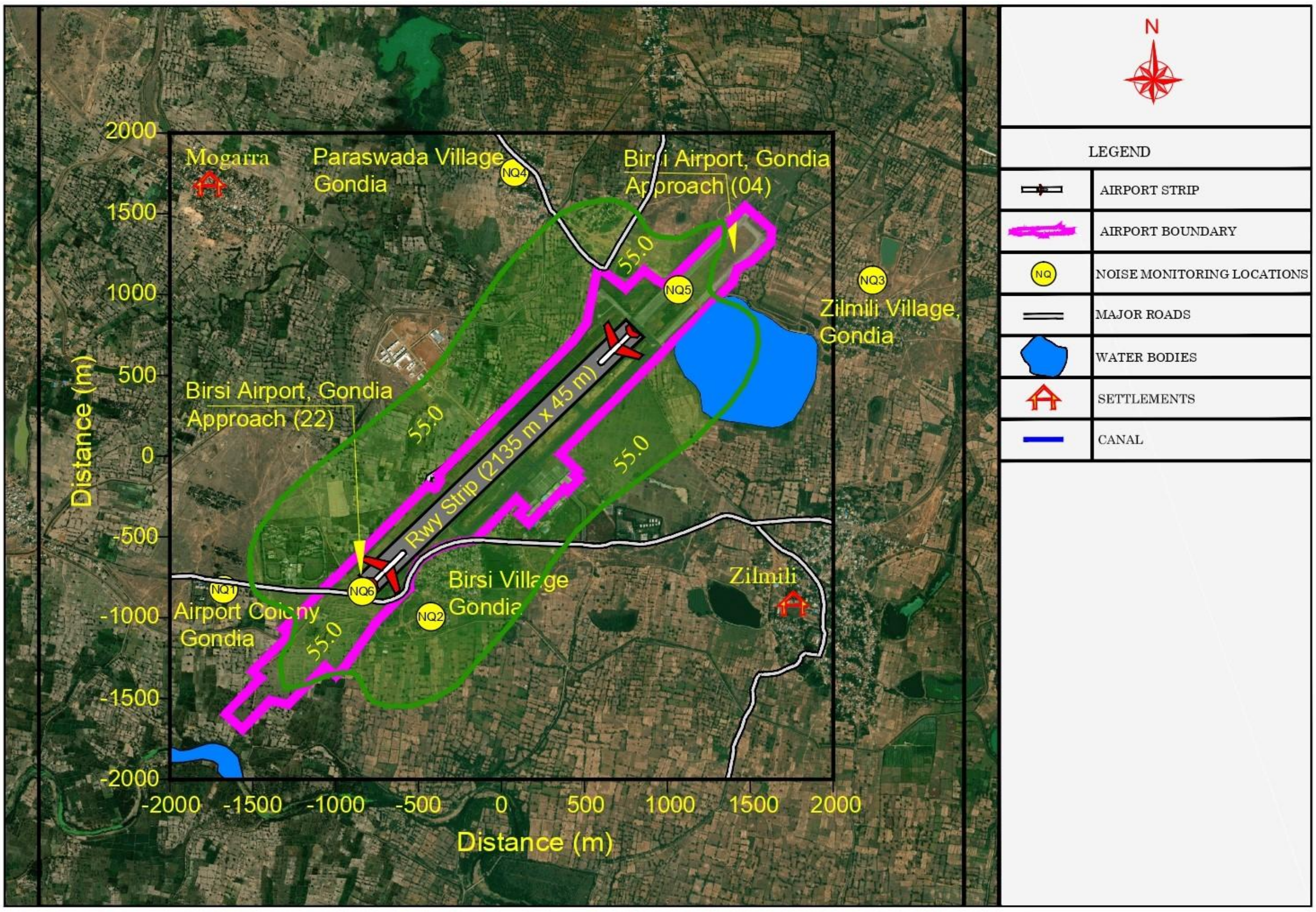
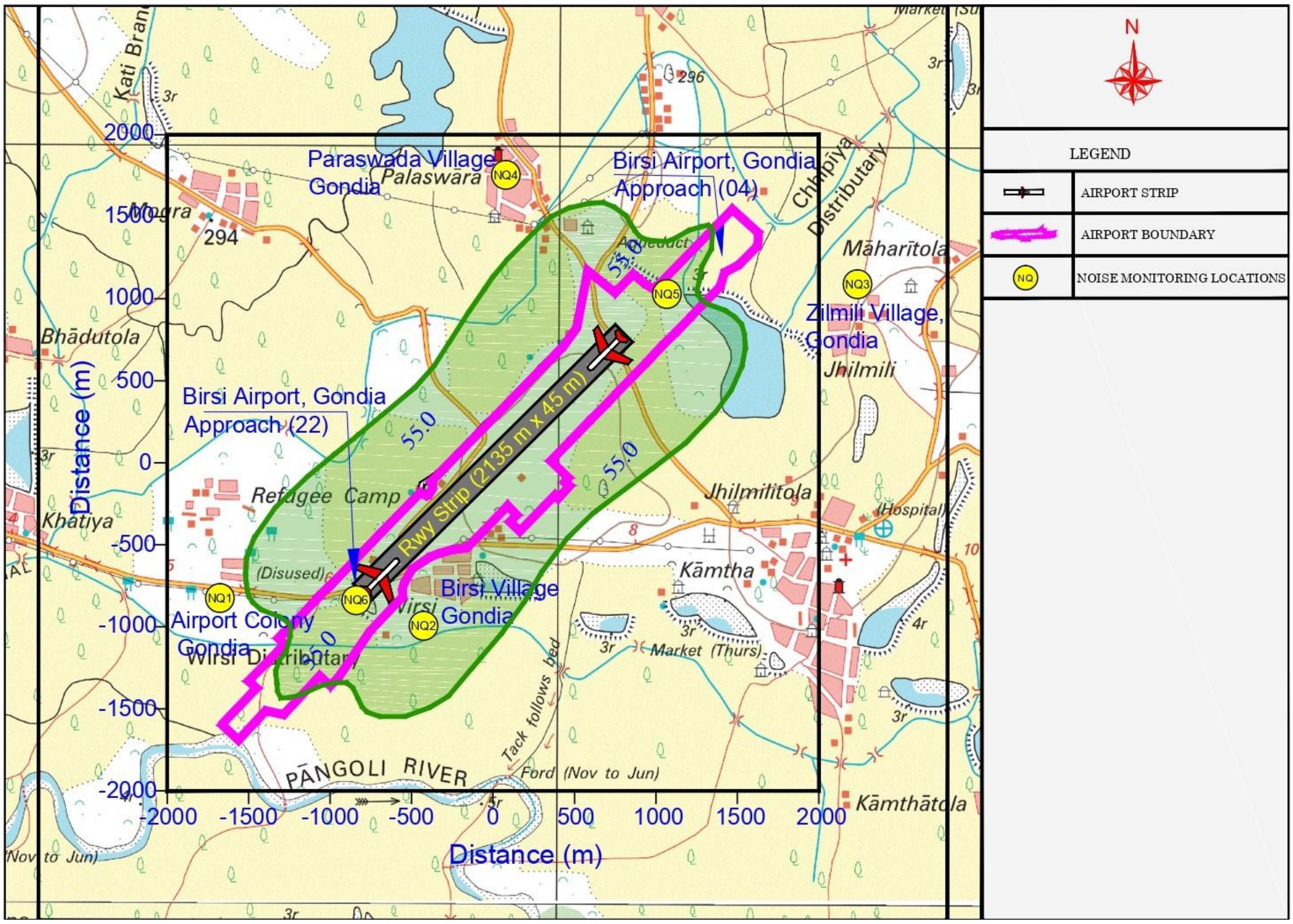



**Figure 6.5: Airport Daytime Noise Zone (LAEQD_55 dBA)**



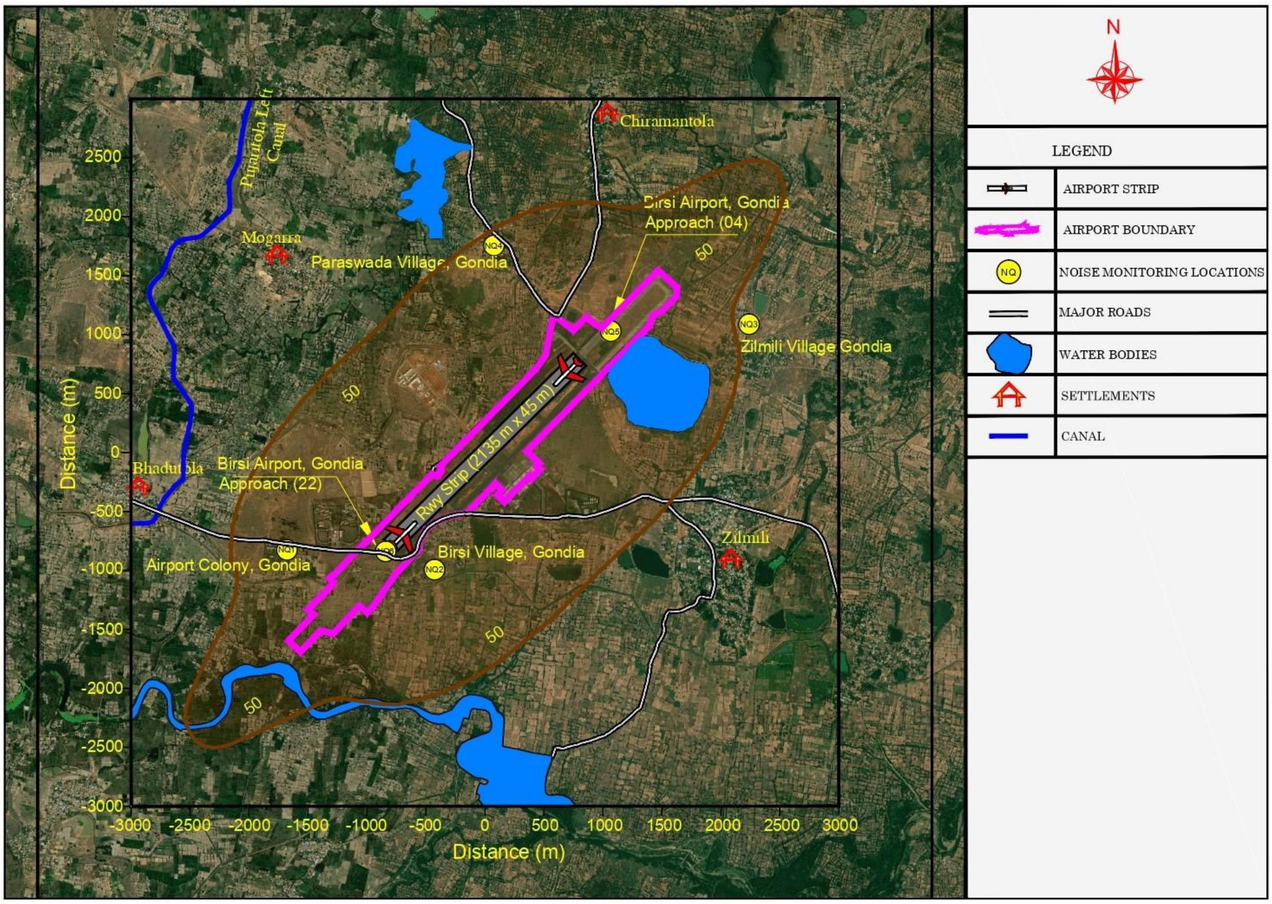
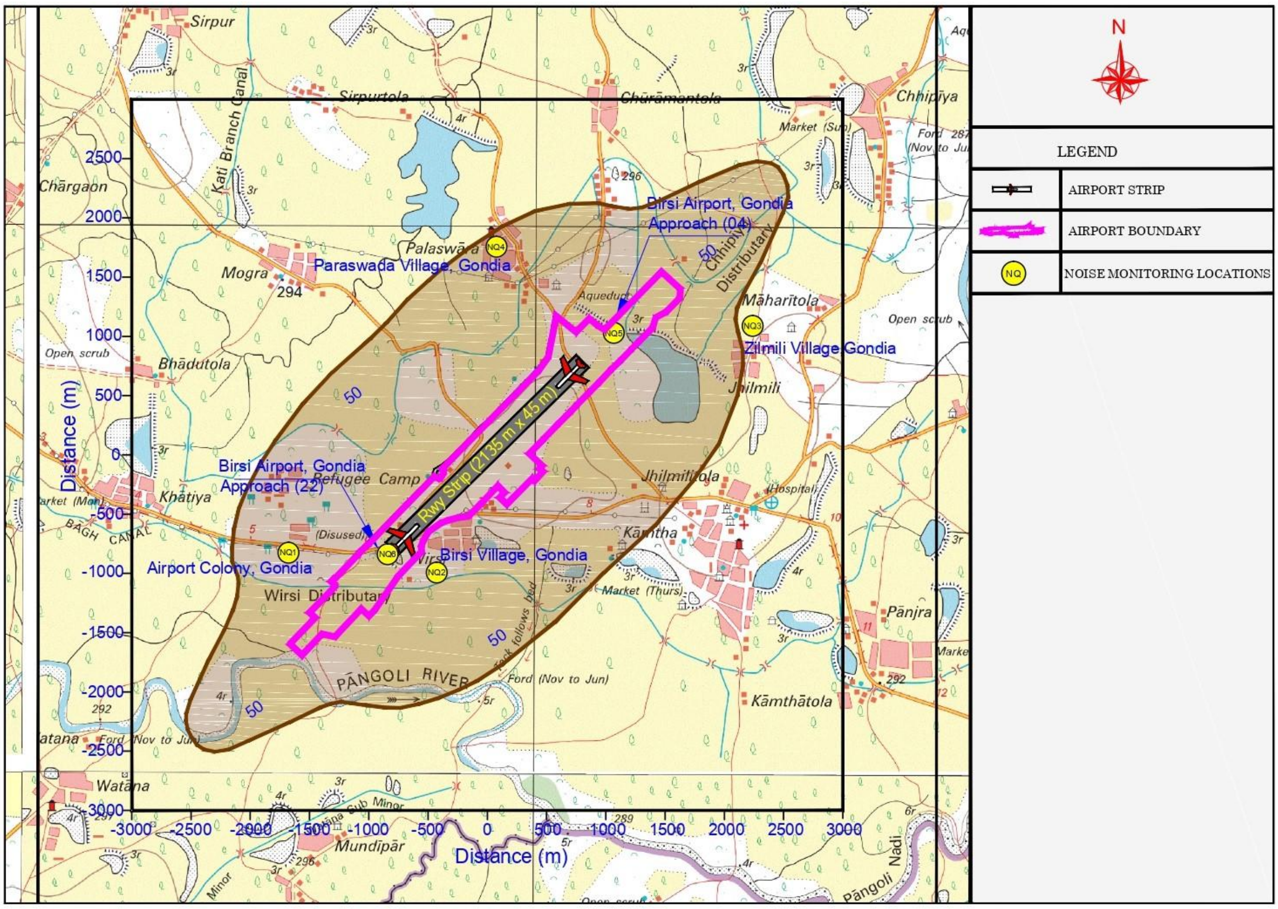



**Figure 6.6: Airport Nighttime Noise Zone (LAEQN_50 dBA)**



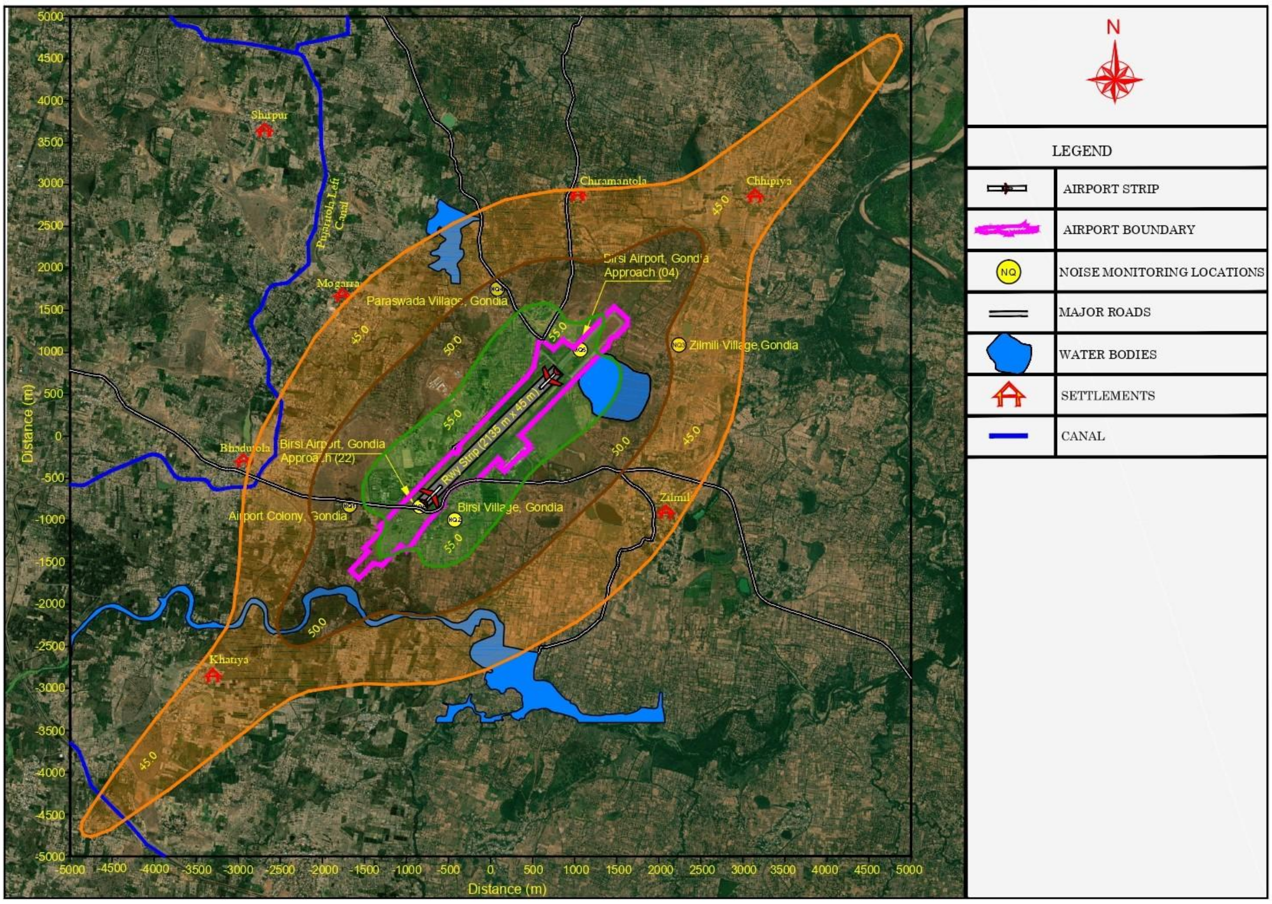
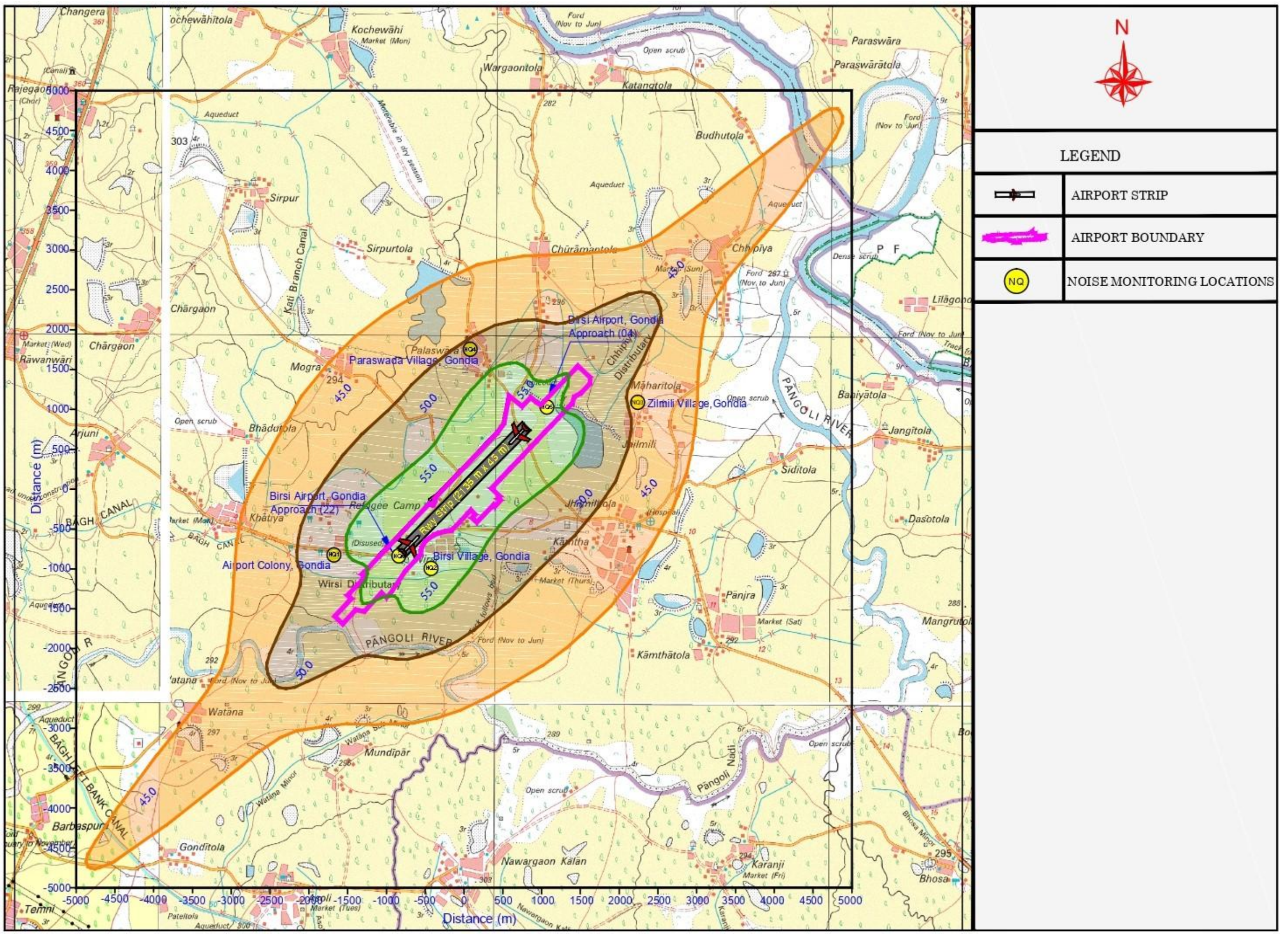



Figure 6.7: Combined Airport Noise Zones (LAEQD_55 dBA, LAEQN_45 & 50 dBA)



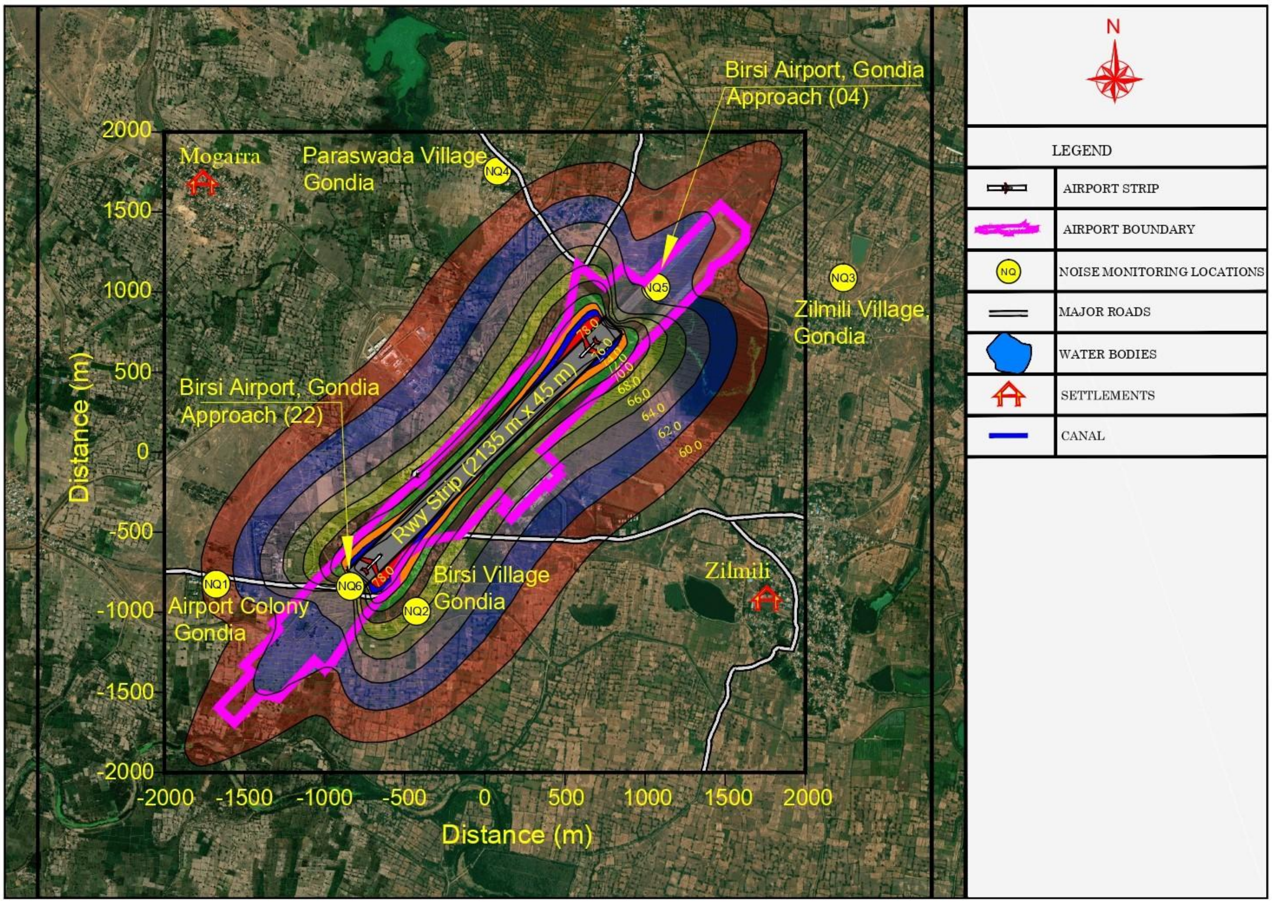
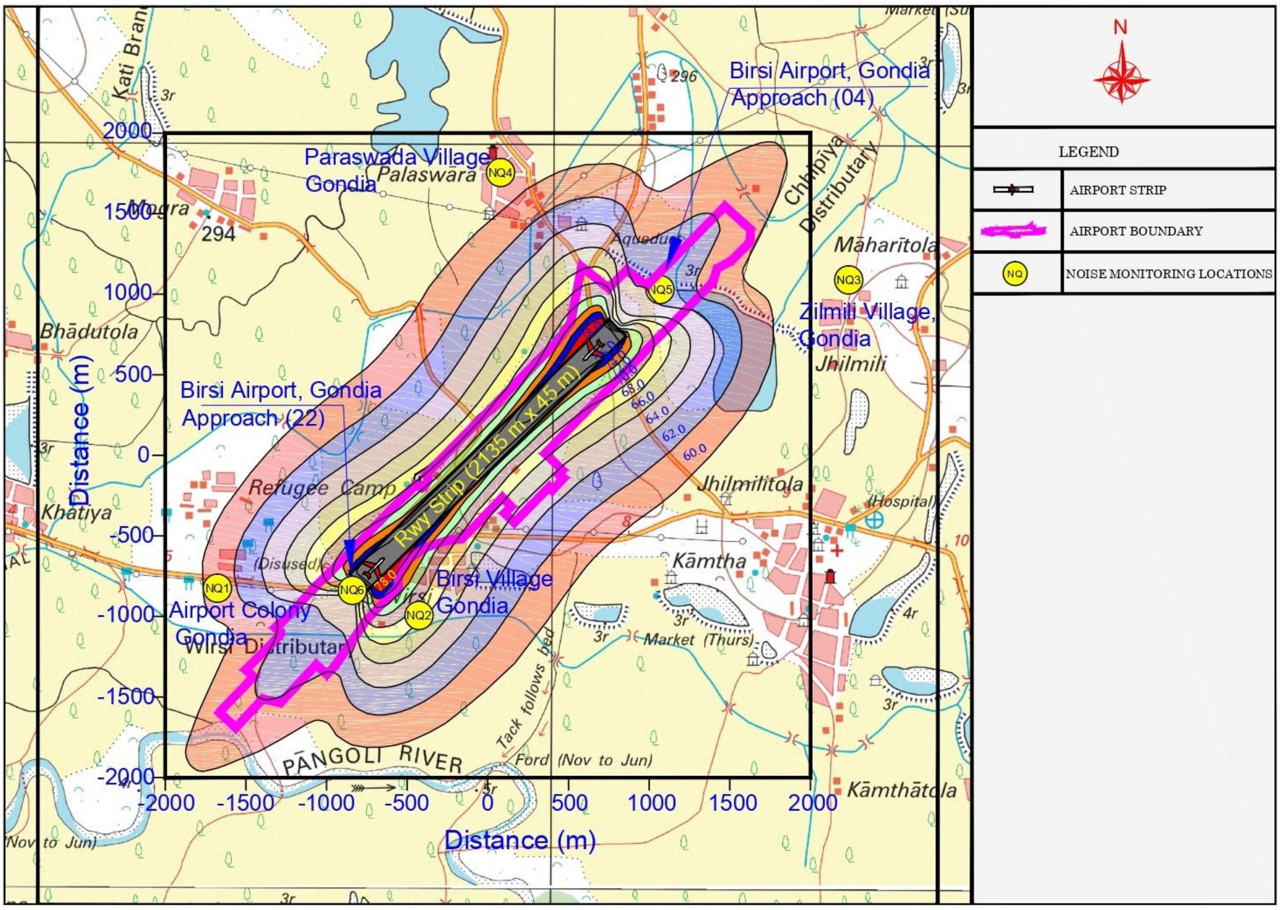



**Figure 6.8: Predicted Noise Level (DNL) Around Airport Boundary**



## 6.6 KEY ZONES AND SENSITIVE RECEPTORS FOR BIRSI AIRPORT

- **High Noise Zones:**

Primarily along the runway approaches where aircraft take-off and landing operations occur include areas such as Birsi Village, which lies under the flight path and experiences higher noise levels.

- **Moderate Noise Zones:**

Areas slightly farther from the airport, where noise levels are lower but still noticeable, such as Paraswada and Zilmili Villages.

- **Sensitive Receptors:**

Residential areas, schools, and hospitals near the airport are identified as sensitive receptors and are subject to close monitoring to ensure compliance with limits.

# CHAPTER-7

# CONCLUSION & NOISE MANAGEMENT ACTION PLAN

## 7.1 CONCLUSION

The noise monitoring and mapping study at Birsi Airport, Gondia was aimed at understanding the noise pollution impacts due to aircraft operations. Using advanced computer simulation models, noise contours were developed for both daytime and nighttime operations, indicating that noise levels generally comply with prescribed limits by the Ministry of Environment, Forests and Climate Change (MoEF&CC) and relevant standards.

Key findings include:

- The measured noise levels at all monitoring locations around Birsi Airport were found to be within the prescribed limits for non-busy airports, with all observed values remaining below 65 dB(A) during daytime and 60 dB(A) during nighttime.
- The noise zone has been created based on daytime noise levels of $L_{55}$ dBA and nighttime noise levels of $L_{50}$ dBA.
- Noise maps were generated to highlight the areas most affected by aircraft noise, particularly within 0.62 to 1.2 km of the airport during daytime, and up to 5.5 km during nighttime.
- The noise zones were declared in compliance with G.S.R. 751 (E) guidelines, providing necessary data for urban planning and development to mitigate noise impacts in the future.
- According to the Traffic, Flight Tracks, and Corridors data, and the Airport Noise Notification dated June 18, 2018, Birsi Airport is categorized as a non-busy airport. For such airports, excluding proposed airports, the noise limits to be followed are 65 dB during the daytime and 60 dB at night.
- The present noise mapping study for Birsi Airport, Gondia, has been carried out considering the projected aircraft traffic, flight operations, and airport activities for the next ten (10) years. This ensures that the noise prediction, contour mapping, and management plan reflect both current and anticipated future operational conditions, providing a reliable basis for long-term compliance and planning.

## 7.2 NOISE MANAGEMENT ACTION PLAN

Airport operator can develop the following noise abatement procedures specific to their airport, jointly with AAI/ATC to reduce/minimize the noise generated through aircraft operations at their airports when the noise limits exceed:

- **Temporary Monitoring Stations:**

Set up mobile or temporary monitoring stations in high-exposure areas for specific durations, especially during peak traffic hours or when new flight paths are introduced.

- **Public Communication:**

Develop a system for public access to noise data, informing the local population about current noise levels and the airport's efforts to maintain compliance with noise regulations.

- **Flight Path Optimization:**

Collaborate with the airport authority to optimize flight paths to reduce noise exposure in highly sensitive areas, particularly near residential zones and schools.

- **Time-based Noise Control:**

Introduce restrictions or penalties for flights during late-night hours to minimize nighttime noise pollution.

- **Building Construction Regulations:**

Implement noise-reduction measures for buildings within the declared noise zone, such as soundproofing for new constructions, particularly for schools, hospitals, and residential complexes.

- **Review and Update of Noise Zones:**

Regularly review the noise zones to ensure they reflect any changes in air traffic patterns, fleet mix, and other operational factors. Update the noise contour maps accordingly to keep track of the noise levels and plan mitigations.

- **Noise Abatement Procedures:**

Encourage airlines to adopt noise abatement procedures such as Continuous Descent Approaches (CDA) or Continuous Climb Operations (CCO) to minimize noise impacts during critical stages of flight.

**ANNEXURE-I**

# MINUTES OF MEETING

SUBJECT: Minutes of meeting for Noise Study Report for "Noise mapping and declaration of Airport Noise zones at Birsi Airport, Gondia."

VENUE OF MEETING: O/o. APD, Gondia on 26.09.2024 at 1200 Hrs.

MEMBERS/STAKE HOLDERS PRESENT: Following member were present in above meeting:

| Sr. No. | Name | Designation | Organization |
|---|---|---|---|
| 1. | Mohd. Shafique U. Shah | Airport Director | AAI |
| 2. | Sh. Pramod Soni | AGM(E-E) | AAI |
| 3. | Sh. Amit Kumar Rathore | CSO | AAI |
| 4. | Sh. Aadesh Yadav | AM-SIC | INDIGO |
| 5. | Sh. Shripad Takalkar | Representative | NFTI |
| 6. | Sh. Ravindra P. Thengne | Representative | NFTI |
| 7. | Dr. Manoj Kumar Mishra | Noise Mapping & Modelling Expert | Unistar Environment and Research Labs Private Limited |

The Airport Director Mohd. Shafique U. Shah welcomed all members/stake holders in the meeting. He directed Sh. Pramod Kumar Soni, AGM (Engg.-Electrical) to explain about the noise mapping and declaration of Airport Noise Zone at Gondia Airport to all the Member present in meeting. Accordingly, Sh. Pramod Kumar Soni explained about the requirement of Noise mapping work, its scope.

To comply the mandatory requirement of Ministry of Forest and Environment and Climate Change (MOEF & CC) and DGCA, noise mapping is required at Gondia Airport and this work is being done by the agency M/s. Unistar Environment and research labs Pvt. Ltd, Vapi.

The Electrical In-Charge explained to the stake holders about the requirement of conducting pre plan meeting to comply the mandatory requirement as per CAR F. No. 04-01/2010-AED (Vol. II) & that of DGCA.

AGM (EE)

1 of 2

Sh. Pramod Soni, AGM (Engg.-Electrical) explained that Noise measurements were carried out during 28th June 2024 to 27th July 2024. Field measurements have been taken by using Spot Noise Monitoring Terminal and Bedrock Class-1 Sound Level Meter for 24-hour duration at both approaches of Runway i.e. 04 & 22 side. Monitoring was divided in two parts as per Central Pollution Control Board (CPCB) guidelines, day time 6.00 am to 10.00 pm and night time 10.00 pm to 6.00 am. The noise monitoring terminal & sound level meter is calibrated prior to each measurement using a calibrator. Sound level meter is mounted on height of 4 m above the floor level as per the CPCB guideline. After caring out above study in details, a draft report has been submitted by the executing agency.

Dr. Manoj Kumar Mishra, representing UniStar Environmental Research Labs Pvt. Ltd., Vapi, explained the entire study and presented the report's findings. He also discussed the mitigation measures and provided a detailed explanation of how this noise mapping survey was conducted, including the procedures and methodologies followed during the process.

In-Charge Electrical requested to all Members present in the meeting to give feedback, any suggestion for mitigation of Noise by Aircraft at Gondia Airport. Accordingly, few members suggested that advance technology can be adopted by Aircraft manufacturing companies to reduce noise created by Aircraft.

In-Charge Electrical further replied to queries raised by stakeholders and informed that the Draft report will now be submitted to DGCA for clearance and approval.

The meeting ended with vote of thanks by the Airport Director, Gondia Airport.

26.09.24

**(Pramod Soni)**
Asst. Gen. Manager (Engg.-Elect.)
Airport Authority of India
Birsi Airport, Gondia -441601

2 of 2

भारतीय विमानपत्तन प्राधिकरण
AIRPORTS AUTHORITY OF INDIA
विमानपत्तन निदेशक का कार्यालय
**O/o Airport Director**
बिरसी विमानतल , गोंदिया
**BIRSI AIRPORT, GONDIA**

## ATTENDANCE SHEET

**Meeting regarding Noise mapping & preparation of Noise contour at Birsi Airport, Gondia conducted on 26.09.2024, at Birsi Airport, Gondia**

| Sr.No. | Name, Designation & organization | Signature |
|---|---|---|
| 1 | M. SHAFIQUE U. SHAH Airport Director, Gondia Airport | [signature] |
| 2 | Amit Kumar Rathore, CSO | [signature] 26/09/24. |
| 3 | Pramod Soni AGM (EE) | [signature] 26.09.24 |
| 4 | AADESH YADAV (AM SIC) INDIGO | [signature] 26/09/2024 |
| 5 | Shripad Takalkar (CSO NFTI) | [signature] |
| 6 | Ravindra P. Thengne | [signature] 26/09/2024 |
| 7 | Dr. Manoj Kumar Mishra | [signature] for unistar |
| 8 | | |
| 9 | | |
| 10 | | |

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ई.मेल apcgondia@aai.aero

******* **End of Report*******