



Draft for Public Consultation

Noise Action Plan for Dublin Airport 2019 - 2023

September 2018



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1. Introduction

Under the Environmental Noise Regulations 2006 (the 'Regulations'), Statutory Instrument 140 of 2006, Fingal County Council (FCC) is the designated Action Planning Authority with responsibility for preparing a Noise Action Plan for Dublin Airport during 2018. These Regulations give effect to the European Union (EU) Directive 2002/49/EC relating to the assessment and management of environmental noise. This Directive is commonly referred to as the Environmental Noise Directive or END, and has the aim of establishing an EU common approach to avoiding, preventing or reducing the harmful effects due to exposure to environmental noise. The Regulations set out the approach to meeting the requirements of the END in Ireland.

This is the first Noise Action Plan for Dublin Airport, and replaces the airport section of the Dublin Agglomeration Noise Action Plan 2013-2018, which is currently under review. The Noise Action Plan is primarily a tool for reporting the findings of the strategic noise maps, as produced by the Dublin Airport Authority (daa), the competent Noise Mapping Body (NMB).

The minimum requirements of the Noise Action Plan are set out within Annex V of the END and include the identification of existing noise emissions, the current methods of noise management, and their appropriateness and possible improvements in line with latest developments in policy and research.

The Noise Action Plan is designed to manage noise issues and effects associated with Dublin Airport in its existing two-runway operation, and where necessary, present measures to reduce the adverse effects of aviation noise where practical. In this sense, the Noise Action Plan describes the current situation according to a noise metrics and indicators required by the END and in use at Dublin Airport for noise management.

In 2007, Dublin Airport was granted permission to build a 3110m long runway, 1.6km north of the existing main runway, the 'North Runway Project'. A revision to this Noise Action Plan and associated strategic noise maps will be required to account for the first full year of three-runway operations at Dublin Airport, likely to be 2022. The three-runway scenario includes the use of the Cross-wind Runway; however, its use has been limited in accordance with the conditions of the aforementioned grant of permission.

1.1 Policy Objective

The Dublin Agglomeration Noise Action Plan 2013-2018 was aimed at managing environmental noise to avoid, prevent and reduce the harmful effects, including annoyance of road traffic, rail and aircraft noise. Its key objective for the management of transportation noise was:

"to avoid, prevent and reduce, where necessary, on a prioritised basis the harmful effects, including annoyance, due to long term exposure to environmental noise from road traffic, rail and aircraft."

The Dublin Agglomeration Noise Action Plan 2013-2018 stated that this key objective would be achieved "by taking a strategic approach to managing environmental noise and undertaking a balanced approach in the context of sustainable development".



Given the context of this Noise Action Plan which relates specifically to Dublin Airport, it is considered that the key objective should be formed to reflect the relevant context and latest evidence in relation to the effect of aircraft noise. Accordingly, for the purpose of the Dublin Airport Noise Action Plan 2018, the following key objective is set out.

“to avoid, prevent and reduce, where necessary, on a prioritised basis the effects due to long term exposure to aircraft noise, including health and quality of life through implementation of the International Civil Aviation Organisation’s ‘Balanced Approach’ to the management of aircraft noise as set out under EU Regulation 598/2014”

1.2 Purpose

The aim of this Noise Action Plan is to provide an overview of the Regulations, to review the results of the latest strategic noise maps for Dublin Airport and to set out an approach to the strategic management and control of environmental noise over the next five years having regard to the existing noise management framework.

1.3 Scope

This draft Noise Action Plan complies with the requirements of the END, and the corresponding transposed Environmental Noise Regulations 2006, Statutory Instrument 140 of 2006 (the ‘Regulations’).

Under these Regulations, and with respect to noise from Dublin Airport, daa is the competent Noise Mapping Body (NMB) for the production of strategic noise maps, FCC is the competent Action Planning Authority (APA) responsible for the preparation of this Noise Action Plan, and the Environmental Protection Agency (EPA) the competent authority for the Noise Action Plans review and subsequent submission to the European Commission (EC). More information regarding the Regulations can be found in **Section** Error! Reference source not found..

In accordance with the Regulations, this Noise Action Plan addresses the following:

- A description of the airport related noise sources;
- The responsible authorities;
- The relevant legal and policy context;
- Any limit values in place;
- The noise situation at the airport based on a summary of the results of the noise mapping, including and evaluation of the estimated people exposed to noise;
- Identification of problems and situations that need to be improved;
- A record of public consultations that have taken place (to be completed following consultation on this draft);
- A description of existing and planned measures to manage aircraft noise;
- A long-term strategy;
- Actions which are to take place over the duration of this Noise Action Plan; and
- Provisions envisaged for evaluating the implementation and the results of this Noise Action Plan.



1.4 Strategic Environment Assessment and Appropriate Assessment

This plan was screened to assess whether the plan required a Strategic Environment Assessment and an Appropriate Assessment under the Habitat Regulations. The result of the screening assessment that neither an SEA or Appropriate Assessment under the Habitat Regulations was required

1.5 Consultation

Noise Action Plans are required to be reviewed and revised every five years and to be subject to a public consultation process involving feedback, including statutory consultees, public bodies, and the public and other stakeholders. Consultees include a variety of bodies and agencies. The statutory consultees and public bodies to be consulted are those listed in **Appendix B**.

This draft Noise Action Plan provides the basis for feedback and input from the statutory authorities and the public consultation process to help inform the Noise Action Plan and how Dublin Airport can improve its noise management procedures.

This Draft Noise Action Plan is available for public consultation from September 2018 to October 2018.

Please consult <https://consult.fingal.ie> for details on making a submission.

1.6 Noise Action Plan Timetable

Following consultation on this draft, and any updates with respect to the feedback received, the final version of this Noise Action Plan will be published by the end of 2018, and will operate from 2018-2023, or may be reviewed earlier in the event of a material change in environmental noise around Dublin Airport.

The proposed timetable for the adoption of the Noise Action Plan is as follows:

- Draft Noise Action Plan to be submitted to Environmental Protection Agency (EPA) for review;
- September to October 2018 – Public consultations on Draft Noise Action Plan;
- November 2018 – Noise Action Plan to be finalised;
- 10th December 2018 – Report to the County Council on the consultation process and the Dublin Airport Noise Action Plan;
- December 2018 – finalised Noise Action Plan to be submitted to the EPA;
- January 2019 – noise control programs and measures to be reported to the European Commission (EC) by EPA;
- January 2019 – Summary of Noise Action Plans, including Dublin Airports', to be submitted to the EC by the EPA.



2. Aircraft Noise and Effects on Health and Quality of Life

Noise can be characterised as “unwanted sound” or “sound that is loud, unpleasant or unexpected” (‘Future Noise Policy - European Commission Green Paper’, 1996)¹ and that can eventually cause disturbance, impairment or damage to health.

Sound levels are expressed in decibels (dB) on a logarithmic scale, where 0 dB is nominally the “threshold of hearing” and 120 dB is nominally the “threshold of pain”. One effect of using the decibel scale is that a doubling of the sound energy results in a 3 dB increase in the sound level.

Noise from aircraft is produced both on the ground and in the air. In general, these sources are considered separately and are typically described as:

- Air noise; and
- Ground noise

Air noise is created by aircraft in the air or on the runway when taking off or landing. This noise comprises of two components – airframe and engine noise and is the main source of noise at civil airports.

Airframe noise occurs when the air passes over the body of the aircraft. This results in drag which produces turbulence which in turn produces noise. The amount of airframe noise produced by an aircraft depends on its type, along with its speed and how it is configured in flight. For example, on approach when the landing gear is in the down position, an aircraft produces more drag, creating more noise than if the gear was in the up position.

Engine noise is produced by the engines of aircraft and their various components. This means engine noise can sound different at different positions around the aircraft. Towards the front of the aircraft, the engines fan and combustor can be heard. Towards the rear, the sound of hot air exiting the engine and mixing with cooler aircraft produces a rumble which can be heard. Engine noise is most dominant during aircraft departures.

Whilst the focus of the Regulations is air noise, noise from aircraft ground operations can also give rise to adverse effects. Ground noise is usually only experienced near to the airfield, however it may become more noticeable in other areas during quiet periods, for instance during the night-time. Common measures adopted by airports to reduce the impact of ground noise on the community include restricting engine testing to daytime periods, unless in exceptional circumstances, and also requesting that aircraft do not use reverse thrust during the night-time, as adopted by Dublin Airport (daa ‘Dublin Airport – Noise Management Plan’, 2018²). Measures associated with the management of ground noise have therefore been considered within this Noise Action Plan.

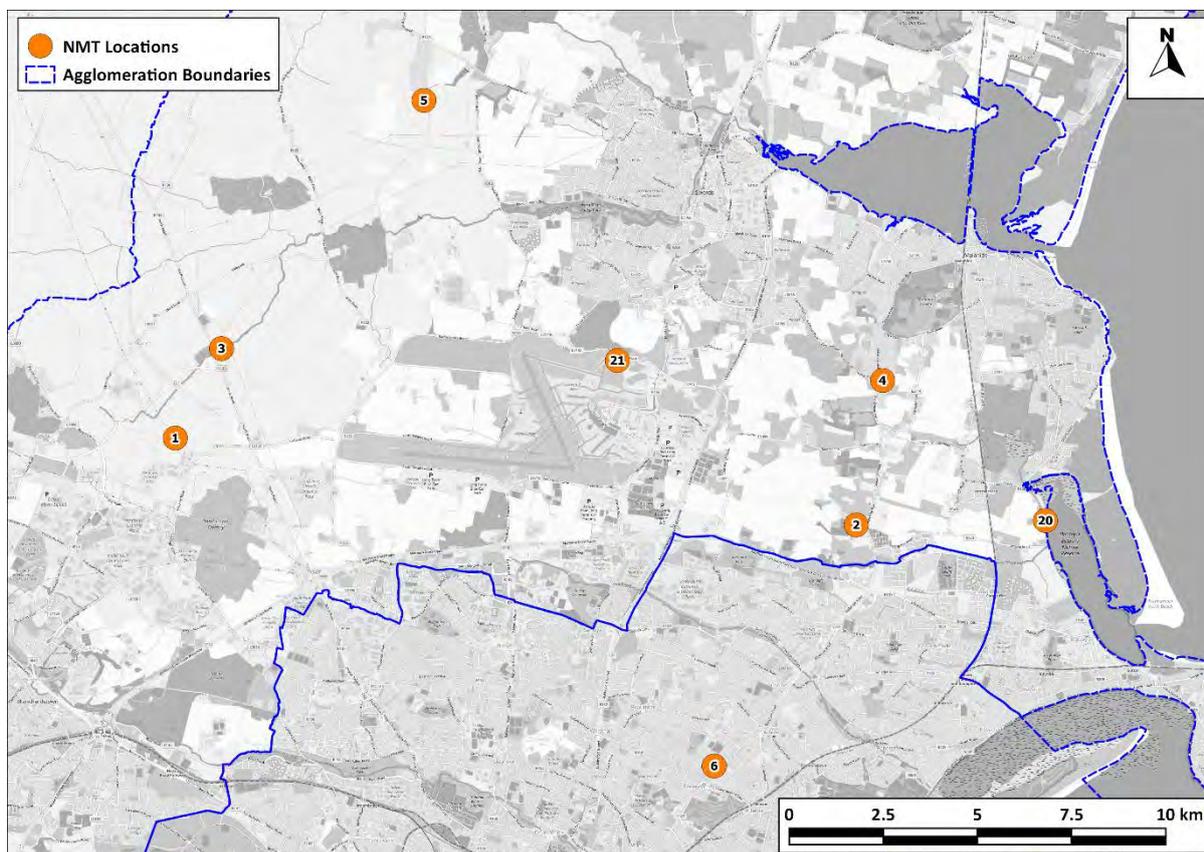
¹ Future Noise Policy Available European Commission COM(96) 540 final available here <https://publications.europa.eu/s/imFU>

² Available online here: <https://www.dublinairport.com/docs/default-source/noise/dublin-airport-noise-management-plan.pdf?sfvrsn=2>



2.1 Measuring and Assessing Aircraft Noise

The process of measuring and assessing aircraft noise and its impacts is not straightforward. Aircraft noise can be measured using noise monitoring terminals. Dublin Airport has eight fixed noise monitoring terminals (NMTs), including one on the airfield, and a ninth mobile noise monitor. All NMT are connected to the airport’s radar which allows noise from each event at the location of the terminal to be measured.



(NMT1) Bay Lane

(NMT2) St. Doolaghs

(NMT3) Bishopswood

(NMT4) Feltrim

(NMT5) Balcultry

(NMT6) Artane

Additional

(NMT20) Coast Road

(NMT21) Monitoring noise produced by aircraft on the ground at a location close to the airport

N.B. Numbering not sequential, so there is no NMT7 to NMT 19.

Figure 1 - Dublin Airport Noise Monitoring Terminals

Many people who live around an airport experience aircraft noise as a series of aircraft events which may potentially change over the course of a day or between days according to factors such as the airport’s schedule, aircraft routing and the operating direction. This means that quantifying the overall effects from aircraft noise can be complex.



It has become a standard practice to use airport noise calculation models along with a range of aircraft noise metrics to help understand the pattern of noise around an airport according to how it operates, and identify how and where effects may occur, and relate the noise levels to likely impacts on health and quality of life.

2.2 Effects on Health and Quality of Life

Noise can have a significant and disruptive effect on everyday life. Since the implementation of the Regulations, there have been extensive studies into the links between environmental noise exposure and health. These studies have considered transportation noise sources including road, rail and aircraft with responses being found to differ depending upon source. This work has resulted in organisations such as the European Environment Agency (EEA) and the World Health Organisation (WHO)³ developing guidelines and advice based on reviews and meta-analysis of the available research. This research has shown evidence supporting the association of environmental noise (including aircraft noise) with some or all of the following health outcomes:

- cardiovascular disease - including hypertension, coronary heart disease (CHD), acute myocardial infarction (AMI) and stroke
- cognitive impairment - including the impact on children's reading and education
- sleep disturbance - i.e. interference with sleep and awakenings
- tinnitus - i.e. loss of hearing
- annoyance - i.e. becoming or increasingly disturbed or bothered by aircraft noise
- wellbeing - i.e. impacts on quality of life and mental health

Most of the evidence gathered by researchers over the past 10 years appears to indicate that people are becoming more annoyed by aircraft noise and that the health effects of aircraft noise occur at lower levels of exposure than previously thought.

Research is on-going, and it is expected that further guidelines from WHO will be issued during the course of this Noise Action Plan. We will monitor developments in this area and will consider the implications of any relevant publication in terms of policy provision.

2.3 Aircraft Noise Metrics

There are a range of noise metrics that can be used to describe and manage aircraft noise. It is universally recognised that there is not one single noise metric that can be used for assessing, describing and communicating aircraft noise effects. For example, some noise metrics are better correlated with describing long-term health effects, whereas others are best used to describe the amount of noise produced and experienced during an aircraft noise event.

Some of these noise metrics are used to help develop policies and describe overall exposure to noise, namely L_{eq} noise metrics. These noise metrics describe the 'equivalent continuous sound level' and are a measure of the average sound energy over time. Whilst these are often

³ Burden of disease from environmental noise - Quantification of healthy life years lost in Europe, World Health Organisation (2011)



described as ‘an average’ it is important to note that these allow comparison of the total amount of noise exposure in one location as opposed to another.

In the context of this Noise Action Plan and under the Regulations, the key noise metrics used in policy are the L_{den} and L_{night} which are equivalent sound level (L_{eq}) noise metrics.

L_{den}	<ul style="list-style-type: none"> • Day-evening-night noise indicator • Representative of 24hr period • 5 dB penalty applied to evening levels and 10 dB penalty to night levels to reflect peoples extra sensitivity to noise during these periods • Noise indicator for overall annoyance
L_{night}	<ul style="list-style-type: none"> • Night-time equivalent sound level • Representative of night period (2300-0700 hr) • Noise indicator for sleep disturbance

Another key noise metric used in policy, and in Dublin Airport’s granted planning permission for a North Runway, is the $L_{Aeq, 16hr}$.

$L_{Aeq, 16hr}$	<ul style="list-style-type: none"> • Day-evening equivalent sound level • Representative of 16 hour daytime period (0700-2300hr)
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The $L_{Aeq, 16hr}$ noise metric has been used in planning and noise management decisions at Dublin Airport in relation to its expansion, and for noise insulation and compensation schemes. The $L_{Aeq, 16hr}$ noise metric has also been used by FCC as the basis of managing noise and new development through its extant local area plan.

The Strategic Noise Maps and Noise Action Plan developed under the Regulations and the END are based on the annual average aircraft movements, therefore the L_{den} , L_{night} and $L_{Aeq, 16hr}$ results presented are for an annual average situation.

Where the $L_{Aeq, 16hr}$ noise levels have been used for the basis of planning controls and noise management decisions, these have been based on the aircraft movements for an average summer day, which is based on the 92-day period from 16 June to 15 September in accordance with research undertaken in the United Kingdom (UK)⁴. This means that the noise contour maps used for planning may not be exactly the same as those produced for the Regulations as they present an average summer day, rather than an annual average day.

Other metrics relevant to aircraft noise, all expressed in terms of dB, are listed below.

⁴ The 92-day summer period which is defined as from 16 June to 15 September inclusive has been used since the early 1990’s in the UK as the basis for calculating $L_{Aeq, 16hr}$ contours. The rationale for this is that the summer period is where people are more likely to be outside and due to the warmer climate will have their windows open.



L_{dn}	<ul style="list-style-type: none"> • Day-night equivalent sound level • Representative of 24 hour period • 10 dB penalty applied to night levels (2300-0700)
L_{Amax}	<ul style="list-style-type: none"> • Maximum sound level during measurement period
$L_{Aeq, T}$	<ul style="list-style-type: none"> • Equivalent sound level of period of T hours • Most common are $L_{Aeq, 16hr}$, $L_{Aeq, 24hr}$
SEL	<ul style="list-style-type: none"> • Numerically equivalent to the total sound energy of an event normalised to 1-second.

No single noise metric best correlates with all adverse health outcomes associated with environmental noise effects. The noise metrics which are considered to best correlate with health effects are set out in

Table 1.

Table 1 – Health Effect Noise Metrics

Noise Metric	Health Effects
L_{den}	Cardiovascular disease, Cognitive impairment and Annoyance
L_{dn}	Annoyance
L_{Aeq}	Cognitive impairment
$L_{Aeq, 16hr}$ (daytime)	Cardiovascular disease and Wellbeing
$L_{Aeq, 8hr}$ (night-time)	Sleep disturbance and Wellbeing
$L_{Aeq, 24hr}$	Cardiovascular disease and Annoyance
L_{night}	Sleep disturbance and Wellbeing
L_{max} and SEL	Sleep disturbance and Cognitive impairment



3. Legal and Policy Framework

The legal and policy framework for aircraft noise is enacted through layers of international, European, national and local regulations and policies set out by:

- the International Civil Aviation Authority (ICAO);
- the European Union (EU);
- The Oireachtas and National Government;
- Local Government; and
- Dublin Airport itself.

3.1 International Regulations

Dublin Airport, like most airports, is subject to International Civil Aviation Organisation (ICAO) rules and procedures. ICAO is a specialised agency of the United Nations, created to promote the safe and orderly development of international civil aviation throughout the world. It sets standards and regulations necessary for aviation safety, security, efficiency and regularity, as well as for aviation environmental protection. After a standard is adopted it is put into effect by each ICAO member state in its own territories.

The hierarchy of the tiers of international, EU and national regulation, which govern aircraft noise in Ireland is shown below, in addition to local and Dublin Airport controls.

International	<ul style="list-style-type: none"> • United Nations - Certification • International Civil Aviation Organisation - Balanced Approach
European Union	<ul style="list-style-type: none"> • EC Directive 92/14/EEC • EC Directive 2002/49/EC • EU Regulations 598/2014
National	<ul style="list-style-type: none"> • Environmental Protection Agency Act, 1992 • Environmental Noise Regulations, 2006 • A National Aviation Policy for Ireland, 2015 • Project Ireland 2040 - National Planning Framework, 2018
Local	<ul style="list-style-type: none"> • Eastern and Midland Regional Assembly Regional Spatial and Economic Strategy (To replace current Regional Planning Guidelines for the Greater Dublin Area 2010-2022) • Fingal Development Plan 2017-2023, 2017 • Dublin Airport Local Area Plan, 2006 • Dublin Airport Central Masterplan, 2016 • Dublin Airport Strategic Issues Paper - Local Area Plan, 2018
Dublin Airport	<ul style="list-style-type: none"> • Dublin Airport - Noise Management Plan, 2018

ICAO works with 191 Member States and industry groups to reach consensus on international civil aviation standards and recommended practices and policies. In relation to the management of aircraft noise, ICAO is responsible for:

- Aircraft noise certification standards; and
- The ICAO Balanced Approach to Aircraft Noise Management



Aircraft Noise Certification Standards

ICAO is responsible for the setting of aircraft noise standards through a process of certification. Since their introduction, ICAO has set progressively tighter noise certification standards for civil aircraft. Aircraft which operate in ICAO member states must conform to these certification standards, which are specified into one of four categories, known as 'Chapters', as summarised below. Aircraft commonly operating at Dublin Airport have Chapter 3, 4 or 14 noise certifications.

CAN 1973 - Chapter 2 aircraft

- aircraft falling in this category are all banned from operating within the EU since 1 April 2002
- example aircraft - Hawker Siddeley HS 748

CAN 1977 - Chapter 3 aircraft

- currently no international agreements in relation to phasing out Chapter 3 aircraft, however EU Regulation 598/2014 specifies scenarios where aircraft that are 'marginally compliant' with the Chapter 3 requirements may be withdrawn
- example aircraft - Boeing 757-200 & Airbus A320-231

CAEP/5 2001 - Chapter 4 aircraft

- 10 dB overall noise reduction when compared to Chapter 3 aircraft
- example aircraft - Boeing 737-800

CAEP/9 2013 - Chapter 14 aircraft

- 7 dB overall noise reduction when compared to Chapter 4 aircraft
- Example aircraft - Boeing 737 MAX 200 and Airbus A320 NEO

The noise certification Chapter of each aircraft is determined by the measurement of aircraft noise levels at three certification points during an aircraft's take-off and approach. The measurements are undertaken during reference conditions, including specified aircraft flight profiles, engine thrust (power), and atmospheric conditions. The aircraft's noise certification is defined by comparing the noise levels from the certification measurement points and the associated Chapter noise limits.

In 2017 over 90% of aircraft using Dublin Airport were the quietest types (Chapter 4 and 14) compared to 83% in 2008 and 46% in 2003¹.

ICAO 'Balanced Approach'

¹ Dublin Airport FAQ <https://www.dublinairport.com/north-runway/latest-news-downloads/faqs> [Accessed August 2018]



The ICAO framework relating to the management of aircraft noise is set out within the ICAO published manual 'A Balanced Approach to Aircraft Noise Management', 2001 (the 'Balanced Approach').

The Balanced Approach recommends identifying noise issues associated with an airport and then considering the measures available to reduce the noise, namely with appropriate consideration of the following elements:

- The reduction of noise at source (quieter aircraft)
- Use of land planning and management
- Noise abatement operational procedures, such as noise preferential routes
- Operating restrictions, only after consideration of the other preceding measures, and may include air traffic movement caps and noise quotas.

ICAO has developed policies on each of the elements, which have been followed in development of the Noise Action Plan.

3.2 European Union

European Union directives and regulations seek to define a common aviation policy in Europe and to implement international regulations set by ICAO. Those which are most relevant to aircraft noise are set out below.

EC Directive 2006/93/EC

Sets out the requirements of EU Member States for the regulation of Chapter 3 civil subsonic aircraft and replaces the repealed EU Directive 92/14/EEC.

The EU Member States are required to ensure that all civil subsonic aircraft operating from airports in their territory comply with the Chapter 3 requirements, barring specific exemptions, such as those of specific historical interest.

EC Directive 2002/49/EC

Under EU Directive 2002/49/EC (the 'END') relating to The Assessment and Management of Environmental Noise requires member states to publish strategic noise maps and noise action plans for major airports (defined as having more than 50,000 movements a year) every five years. The END is implemented in Ireland through the Environmental Noise Regulations 2006 (S.I. No. 140 of 2006).

EU Regulation 598/2014

Regulation EU No.598/2014 establishes rules and procedures with regard to the introduction of noise-related operating restrictions at EU airports within the ICAO Balanced approach.

A fundamental requirement of the Balanced Approach as implemented within EU Regulation 598/2014 is that in determining the most appropriate combination of noise mitigation measures for a given airport, operating restrictions should only be introduced after consideration of the other three elements.



3.3 National Regulations and Policies

Environmental Protection Agency Act 1992

In Ireland, statutory provisions relating to environmental noise pollution, including those which relate to airport operations, come primarily from the Environmental Protection Agency Act (1992).

The Act identifies noise as a form of environmental pollution and contains provisions for dealing with noise deemed 'a nuisance or would endanger human health or damage property or harm the environment'.

With regards to noise, Section 106-107 is most relevant:

- Section 106 Regulations for control of noise and
- Section 107 Power of local authority or Agency to require measures to be taken to prevent or limit noise.

Section 108 is also relevant to environmental noise except it excludes aircraft noise

Environmental Noise Regulations 2006 and Environmental Protection Agency Guidance

In Ireland, the END is transposed as the Environmental Noise Regulations 2006. These regulations set out the requirements of the END in Irish Law.

The aims of the Regulations can be generally set out as a three-staged approach, namely:

- Undertake strategic noise mapping to determine exposure to environmental noise;
- Ensure information on environmental noise and its effects is made public; and
- Adopt an action plan, based on the noise-mapping results, with a view to preventing and reducing environmental noise where necessary, particularly where exposure levels can induce harmful effects on human health, and to preserving environmental noise quality where it is good.

The Regulations establish the EPA as the national competent authority. The Agency exercise general supervision over the functions and actions of noise-mapping bodies and action planning authorities and provide guidance or advice where necessary. To date the EPA have issued four guidance documents on strategic noise mapping and noise action planning under the Regulations².

Dublin Airport is designated as a "major airport" under the Regulations as it has more than 50,000 movements per year. Under the Regulations, Dublin Airport Authority (daa) is responsible for undertaking strategic noise mapping of the annual average airport movements on a five-year cycle. The Noise Action Plan for the airport is the responsibility of Fingal County Council (FCC) as designated authority.

Under the Regulations as the APA it is the duty of FCC to make and approve a noise action plan in consultation with the EPA and daa. FCC has consulted with daa in developing this draft NAP,

² <http://www.epa.ie/pubs/advice/noisemapping/> [Accessed July 2018]



and taking into account the existing noise situation a range of proposed actions are set out in Section 7 of this draft NAP which are envisaged to take place over the duration of the Noise Action Plan. In addition to actions relating to the existing noise situation, daa have brought forward suggested a range of actions to ensure aspects of the noise management framework are encapsulated as actions within the noise action plan.

To assist the competent authorities in the implementation of the Regulations and the development of strategic noise maps and noise action plans, the EPA has published guidance. This includes:

- Guidance Note for Strategic Noise Mapping, Version 2, August 2011; and
- Guidance Note for Noise Action Planning, July 2009.

Within this guidance the EPA has proposed noise level values above which it recommends that a process is undertaken to identify the most important locations for a review regarding the potential for noise mitigation measures. For aircraft noise sources the levels presented are:

- Daytime: 63 dB $L_{Aeq, 16hr}$; and
- Night-time: 57 dB L_{night}

These values are expressed as an annual average based upon the strategic noise mapping. The guidance is at lengths to stress that the recommended levels:

“Do not constitute any form of design guidance for noise management, nor do they necessarily indicate that at or above such levels the environmental noise should be considered undesirable. They are set out as a starting point in a process which seeks to identify locations exposed to existing levels of environmental noise for which it may be considered necessary to address exposure through mitigation measures.”

A National Aviation Policy for Ireland, 2015

National policies and actions in relation to the mitigation of adverse environmental impacts, including noise, are set out within the Department of Transport, Tourism and Sport (DTTAS) ‘National Aviation Policy for Ireland’ (NAPI, 2015), which specifies the requirement for Irish airports to adopt the ICAO ‘Balanced Approach’ to noise management.

National Government plays an important role in setting policy for aviation noise management. The NAPI sets out the goals for aviation policy in Ireland, which look to enhance connectivity, whilst ensuring the maintenance of appropriate levels of safety, security and sustainability. With regards to noise, the policy states:

“Ireland will implement a ‘Balanced Approach’ to noise management at Irish airports in accordance with Regulation (EC) No. 598 of 2014 on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports”.

At this time, the Government is in the process of preparing the relevant national legislation for enacting EU Regulation 598 into national law. It is proposed that FCC will be the competent authority for the purposes of 598.



Additionally, the policy proposes to promote Dublin Airport as a secondary hub to open up new routes to the United States and compete directly with UK and European Airports. As a secondary hub, Dublin Airport would be required to further combine local passengers with transfer passengers, enabling airlines to operate services more frequently and to more destinations.

The National Aviation Policy for Ireland (NAP) shares the responsibility between Dublin Airport, the Irish Aviation Authority (IAA) and the airlines that operate there for the reduction of aircraft noise on communities close to the airport.

Project Ireland 2040 – National Planning Framework, 2017

The National Planning Framework (NPF) is a high-level strategic plan to guide development and investment over the coming years. In addition to setting aims associated with infrastructure and investment, targets are also set around social outcomes.

The Framework (2018-27) supports the implementation of the National Aviation Policy and identifies the importance of high quality international connectivity as being: ‘crucial for overall international competitiveness and addressing opportunities and challenges from Brexit through investment in airports in line with sectoral priorities already defined through National Aviation Policy and signature projects such as the second runway for Dublin Airport...’

The NPF has ten National Strategic Outcomes, including ‘High-Quality International Connectivity’, which specifies the development of the approved additional runway and terminal facilities at Dublin Airport.

The NPF also states that enhanced access to Dublin Airport by improved public transport access, connections from the road networks and rail, should be a key future planning and development policy priority for the Dublin City and Metropolitan Area.

The NPF has a stated objective of developing national planning guidance relating to environmental noise.

3.4 Local Policies and Regulations

Eastern and Midland Regional Assembly Regional Spatial and Economic Strategy (In review of Regional Planning Guidelines for the Greater Dublin Area 2010-2022)

The previous Regional Planning Guidelines (RPG) set out the planned growth within the Dublin Area until 2022, and sets out policies integrating land use, transport, economic growth and investment in water utilities, broadband and energy. The National Spatial Strategy (NSS) was implemented for the Dublin and Mid-East Regions through this RPG.

The RPG sets out specific recommendations that Local Authorities support the delivery of high quality transport links to Dublin Airport, and appropriately restrict development in designed Airport Noise Zones.

The RPG will be replaced by Regional Spatial and Economic Strategies (RSES), which are currently being prepared. The RSES will support the implementation of national government policies such as the NPF and will also set the framework for local economic development and spatial planning in each of the 12 local authorities in the region. The RSES when complete will include:



- A spatial strategy for the future location of employment, housing and retail development along with supporting infrastructure and services, for the regions cities and towns;
- A strategy to protect against the impacts of climate change;
- An economic strategy with strategic policies to boost competitiveness and support a strong future economy and job creation; and
- A Dublin Metropolitan Area Strategic Plan (MASP) to plan for the future sustainable growth of the capital city region as set out in the NPF.

Fingal Development Plan 2017-2023, 2017

The Fingal Development Plan 2017-2023 (FDP), in accordance with the requirement of the Planning and Development Act (2000, as amended), sets out FCC's proposed policies and objectives for the sustainable development of the County over the period 2017-2023.

The FDP includes a 'Core Strategy' for medium and long-term spatial development, which is consistent with the policies set out within the NSS and Regional Planning Guidelines for the Greater Dublin Area.

The FDP sets out stringent requirements on housing developments proposed within Dublin Airport's designated 'Inner' and 'Outer' Airport Noise Zones. In the 'Outer' Zone, Fingal County Council restricts inappropriate development, and where necessary, and for consented developments requires noise insulation to be part of the development's construction. Residential and sensitive developments within the 'Inner Zones' are resisted. The restriction on development looks to avoid the potential negative impact of aircraft noise, whilst not placing unreasonable restrictions on airport development.

The FDP also specifies that Dublin Airport should ensure that all aircraft related development and operational procedures should have regard to the ICAO 'Balanced Approach', in particular, the restriction of the Cross-wind Runway to occasional use only.

3.5 Dublin Airport Specific Policies

Dublin Airport Local Area Plan, 2006

The development of a Local Area Plan (LAP) for Dublin Airport is a requirement of the FDP. The previous Dublin Airport LAP was adopted by FCC in 2006 and is currently under review.

The 2006 Dublin Airport LAP preceded a period of significant growth at Dublin Airport, including the grant of permission by An Bord Pleanála for a second parallel runway to the existing main runway, and a 2nd Terminal with capacity for 32 million passengers per annum.

In the context of the potential development of Dublin Airport, the LAP promoted the concept of a Designated Airport Area, and the strict control of sensitive developments within the Airport Noise 'Outer Zone', and actively resisting development in the Airport Noise 'Inner Zone'.

A new Dublin Airport LAP is currently under review and when adopted, will provide a development management tool for the airport area together with the Fingal Development Plan.

Dublin Airport Central Masterplan, 2016



The Dublin Airport Central Masterplan (DACP) was prepared by FCC, and sets out a framework for the development of strategically situated lands adjacent to Dublin Airport.

The proposed development is largely planned commercial office space with provision for associated parking and road network links.

Dublin Airport Strategic Issues Paper – Local Area Plan, 2018

The Dublin Airport Strategic Issues Paper (SIP) was prepared to set out and collect public opinion on the principal challenges of the Airport in recognition of FCC's review of the existing Dublin Airport LAP.

The consultation aims of the SIP are to capture the views of communities, businesses and individuals on the future of Dublin Airport. It acknowledges that existing national strategic plans, specifically the National Aviation Policy for Ireland³ NAP, identify the importance of considering adverse noise effects associated with the growth of the Airport.

Dublin Airport – Noise Management Plan, 2018

A document produced by daa which describes the management of noise associated with activities at Dublin Airport. The 'Dublin Airport – Noise Management Plan' (2018) sets out key performance indicators relating to noise, which are to be achieved and reported upon.

Key performance indicators are reviewed annually, and relate to the percentage of responses to noise enquiries within defined deadlines, and the performance of third parties noise abatement procedures, such as: preferential runway usage; operation within noise preferential routes; and the number of engine test runs within an allocated time.

Dublin Airport publishes reports at regular intervals on its delivery against the key performance indicators, including monthly noise complaint reports and half yearly reports on the outputs from its noise monitoring terminals (NMT).

³ A National Aviation Policy for Ireland 2015 Department of Transport Tourism and Sport available here

<http://www.dttas.ie/sites/default/files/publications/aviation/english/national-aviation-policy-ireland/national-aviation-policy-ireland.pdf>



4. Dublin Airports and its Surroundings

Dublin Airport is located approximately 10 km north of Dublin City Centre, near the M50 and M1 motorways. It consists of lands of over 1,000 hectares and currently has two operational runways:

- the main 10/28 'South Runway' (2,637m long) which runs in an east-west direction; and
- a 'Cross-wind Runway' 16/34 (2,072m long) which lies on a north-west to south-east orientation.

Dublin Airport in its two-runway scenario is the 'existing situation'.

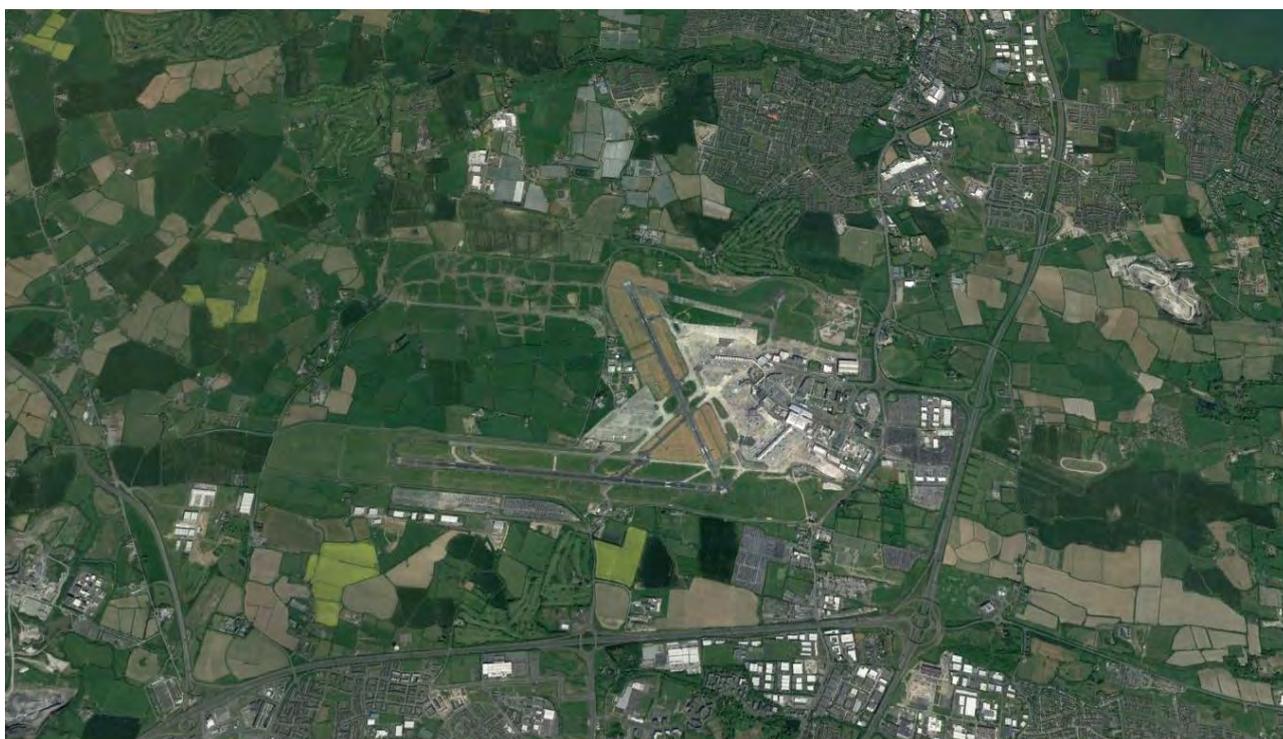


Figure 1 - Dublin Airport

4.1 Communities

Dublin Airport is the principal gateway to Ireland with 85% of all air traffic to and from the Republic of Ireland passing through the airport in 2016.

The Airport has 56 scheduled and charter airlines operating from the airport providing direct services to more than 190 destinations in 40 countries on four continents, and is the home base for two major carriers: Ryanair and Aer Lingus. In terms of connectivity (which is essential to doing business), Dublin Airport is ahead of many other European airports of its size e.g. in the connectivity index for 2015, Dublin Airport ranked above London Gatwick, Milan, Manchester and Lisbon airports.

The Airport has experienced a strong increase in passenger demand prior to the recession in 2008, returning to growth in 2011. During the recession, passenger demand fell dramatically by 5 million, from a high of 23.5 million in 2008 to 18.4 million in 2010, returning to growth thereafter as shown in **Figure 3**.

Air Traffic Movements (ATM) have also recovered in recent years as highlighted in **Figure 4**, albeit slower than passenger numbers post-2008 due in part to a combination of higher seat load factors per aircraft (i.e. more passengers per aircraft) and an increase in aircraft seat capacity (i.e. larger aircraft).

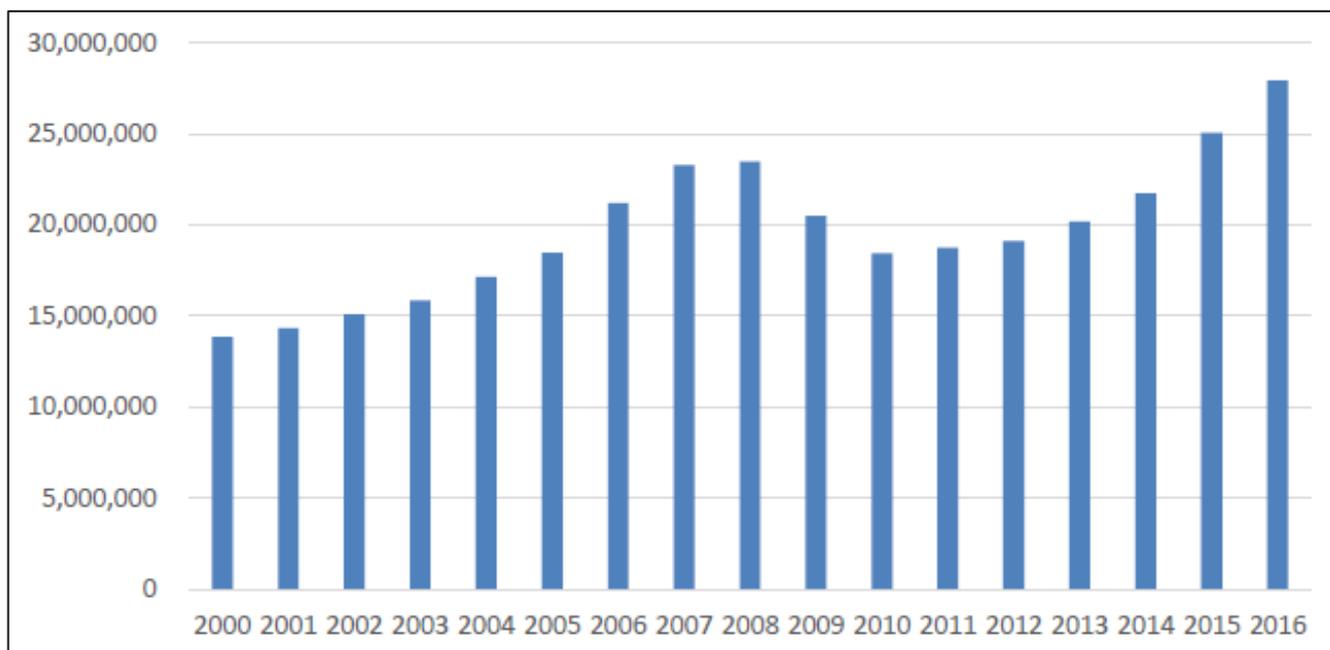


Figure 2 - Passenger Numbers 2000-2016



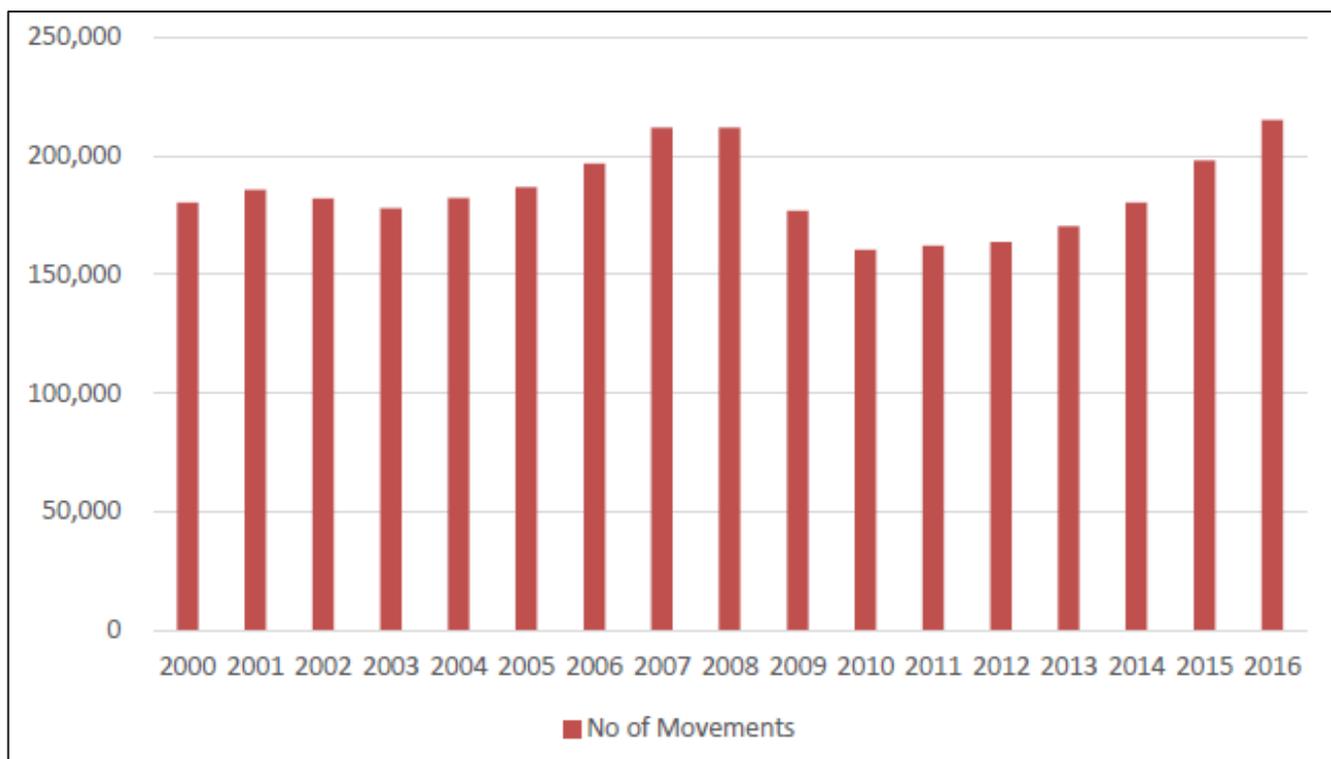


Figure 3 - Air Traffic Movements (ATMs) 2000 - 2016

4.2 Airspace

Dublin Airport is not just physical infrastructure but is served by controlled airspace which is designed for the efficient arrival and departure of aircraft.

The location and relative use of the airspace serving Dublin Airport for an example period (17 – 30 July 2017) is presented in **Figure 4** and **Figure 6** for arrivals and departures, respectively. The sample size is 4,879 aircraft movements. Helicopter and military aircraft movements have been excluded from the data.



The Category A and B aircraft represented in **Figure 4** and

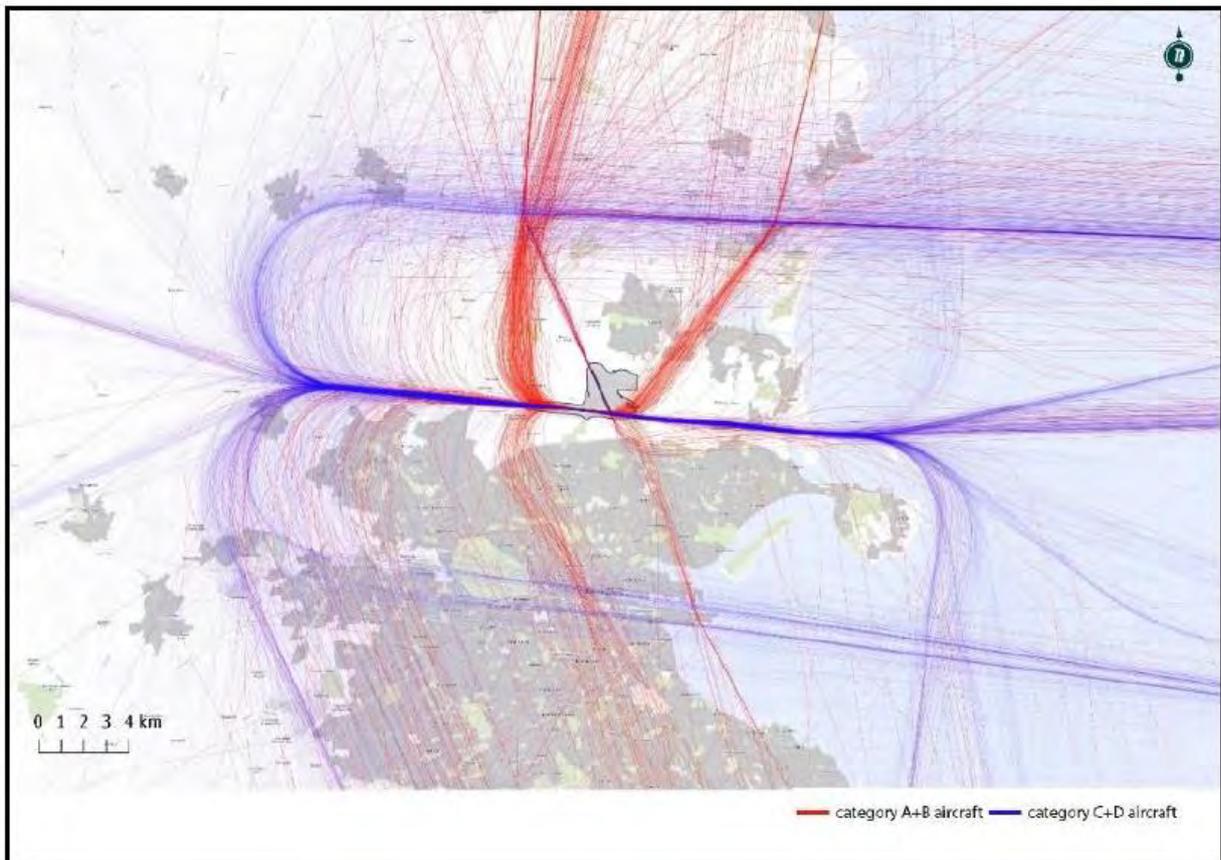


Figure 5 are small single and multi-engine aircraft at speeds less than 120 knots. Category C and D aircraft are jet aircraft, including large commercial jets and military jets. The majority of aircraft using Dublin Airport are Category C and D aircraft.



Figure 4 - Dublin Airport - Airspace for Arrivals

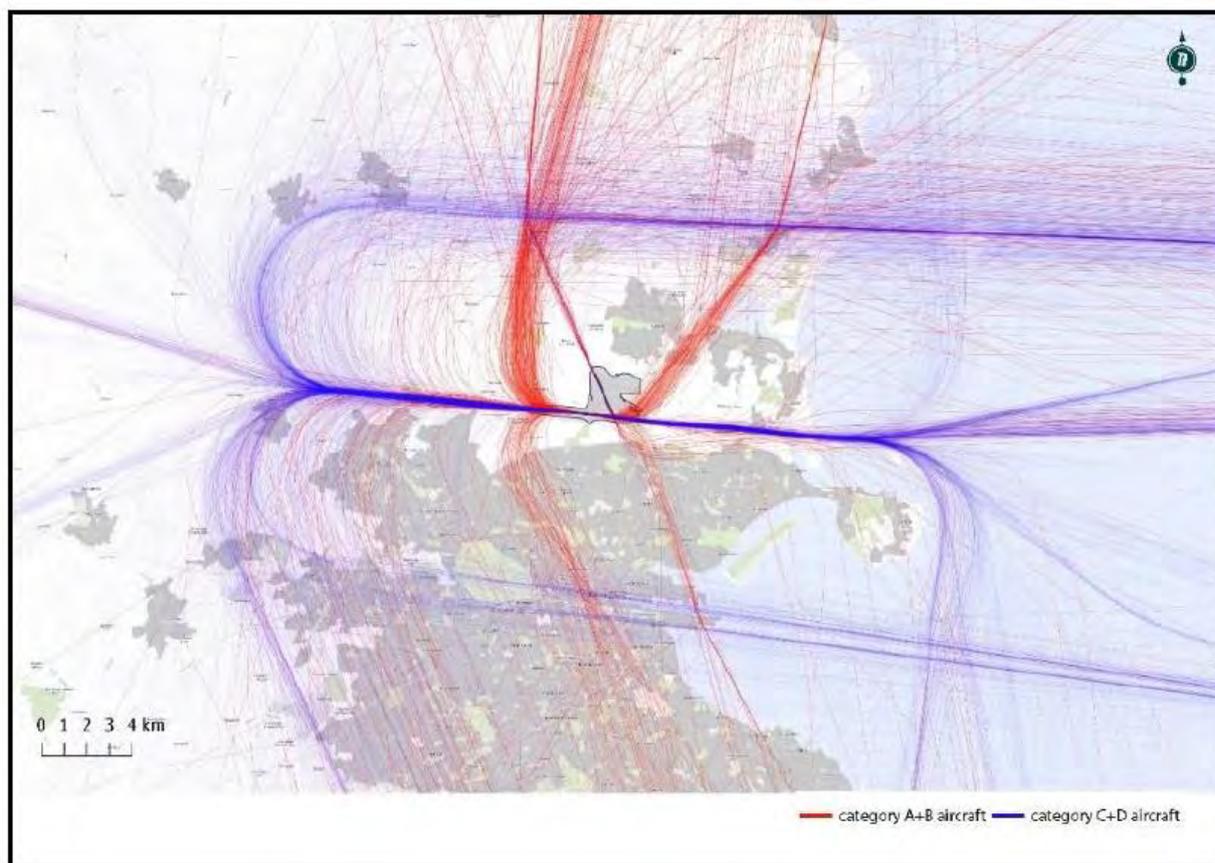


Figure 5 - Dublin Airport – Airspace for Departures

4.3 Future Developments

In 2007, Dublin Airport was granted permission to build a 3110m long runway, 1.6km north of the existing main runway, the 'North Runway Project'. The construction of the runway has commenced and is scheduled to be delivered by 2021. The North Runway Project is a requirement of the Irish Government's long-term strategic plan, set out in 'A National Aviation Policy for Ireland' (2015) and again in 'Project Ireland 2040 – National Planning Framework' (2018).

The 2007 planning consent was subject to 31 planning conditions including a number relating to noise. In summary, these conditions require:

- The development of a voluntary noise insulation scheme for schools predicted to fall within the 60 dB $L_{Aeq, 16hr}$ contour within 12 months of the runway opening;
- The development of a scheme for the voluntary noise insulation of existing dwellings predicted to fall within the 63 dB $L_{Aeq, 16hr}$ contour within 12 months of the runway opening;
- The development of a scheme for the voluntary purchase of dwellings predicted to fall within the 69 dB $L_{Aeq, 16hr}$ contour within 12 months of the runway opening;
- The requirement to monitor through the operation of a noise and track keeping system to help monitor noise and re-evaluate eligibility to the schemes;

- A mode of operation intended to mitigate noise in certain areas and at certain times; and
- A restriction on the average number of night time aircraft movements of 65 per night (2300-0700hrs).
- A restriction on the use of the crosswind runway (16-34) to essential occasional use on completion of the new runway in accordance with Objective DA03 of the Fingal County Development Plan, 2005-2011. 'Essential' use is interpreted as use when required by international regulations for safety reasons.

The 2022 Round 4 strategic noise maps will be based on 2021 annual aircraft movements, which are expected to include commissioning flights on the new North Runway. The first full year of three-runway use will likely be 2022, which would trigger the requirement for a revised Dublin Airport Noise Action Plan and associated strategic noise maps. This will likely be in 2023.

The three-runway scenario includes the use of the Cross-wind Runway; however, its use will be limited.



5.Existing Noise Management Framework at Dublin Airport

Dublin Airport have in place arrangements for working and engaging with the Fingal and airport related communities, including activities such as community sponsorship, educational and school programmes and dedicated engagement forums.

Like many similar sized airports, an on-going challenge is the adoption of an appropriate balance between the growing airport whilst addressing the requirements of airport effected communities. Although the noise generated by the airport cannot be eliminated, it can be managed responsibly and sustainably.

The ICAO Balanced Approach requires that airports assess the noise situation specific to its operations and develop appropriate measures for its management.

The four key elements under the Balanced Approach relate to:

- the reduction of noise at source (quieter aircraft);
- use of land planning and management;
- noise abatement operational procedures; and
- imposing operational restrictions.

In recognising the existing noise framework at Dublin Airport and improvements that can be made, a number of actions have been proposed which are set out in **Section 7**.

5.1 Reduction of Noise at Source

The models and types of aircraft using Dublin Airport have evolved with changing profiles in passengers and business models, changes in aircraft technology and the introduction of more stringent noise standards for aircraft.

Through increasing stringency on aircraft noise emissions as implemented by ICAO, aircraft have become quieter. In 2015, around 94% of the aircraft using Dublin Airport were 'Chapter 4' and 'Chapter 14' compared to around 84% in 2008 and around 77% in 2006, as shown in **Figure 1**.





Figure 1 - Dublin Airport - Aircraft Noise Chapter Percentages

FCC would expect daa to make particular efforts to encourage airlines using the airport to utilise quieter aircraft. A number of actions have been proposed in **Section 7** that will require daa to report annually on the noise performance of aircraft using the airport and to consider the use of incentives to attract quieter aircraft.

5.2 Land Use Planning and Management

Land-use planning is the responsibility of FCC, Meath County Council (MCC) and Dublin City Council (DCC) and relies on appropriate provisions to be made during the planning process to determine the acceptability of development in areas affected by aircraft noise and public safety. It is critical that land-use planning does not lead to inappropriate development and encroachment which could result in the creation of future noise and safety issues.

These matters were addressed for Fingal through the FDP and the Dublin Airport Local Area Plan (LAP) which expired in 2015.

The land use and planning frameworks including the FDP and Dublin Airport LAP, (currently under review), defines 'Inner' and 'Outer' Airport Noise Zones on drawings within the LAP which are based on forecast average 63 dB and 57 dB $L_{Aeq, 16hr}$ noise exposure contours, taking into account the future three-runway operation at Dublin Airport.

Objective TL4 of the expired LAP states that the noise zones are to be used to

"...strictly control inappropriate development and to require noise insulation where appropriate within the Outer Noise Zone, and to resist new provision for residential development and other noise sensitive uses within the Inner Noise Zone..."

FCC are currently in the process of revising the land use planning frameworks associated with Dublin Airport including the review of policies in relation to noise-sensitive development and noise around the airport. Actions have been proposed in **Section 7** to this effect.



5.3 Noise Abatement Operating Procedures

daa works with stakeholders, including IAA (air traffic control), to develop best practices for lower noise operating procedures. These include consideration of new airspace management and operating procedures, with the aim to reduce the impact of aircraft noise on residents.

Dublin Airport's current approach to managing aircraft noise is set out in 'Dublin Airport – Noise Management Plan' (NMP). The NMP specifies operational procedures which aim to ensure aircraft are operated in a manner which is safe, and which reduces as far as practicable the noise in areas surrounding the airport.

The noise abatement procedures are continuously monitored by Dublin Airport and, where necessary, proposals are made to the IAA to update them. The noise mitigation operational procedures, which are published in the Dublin Airport Aeronautical Information Publication (AIP) (http://iaip.iaa.ie/iaip/IAIP_Frame_CD.htm), currently include:

- **Noise Preferential Runway Usage:** Aircraft must use the preferred runway under specific conditions and time of day/night. These are selected for noise abatement purposes, the intent being to utilise whenever possible the runways which enable aircraft to avoid noise-sensitive areas during the initial departure and final approach phases of flight;
- Noise Preferential Routes (NPRs) and Track Keeping: NPRs are used to minimise disruption by routing aircraft away from built-up areas, where possible. daa has regular meetings with the IAA to continuously review the track-keeping of aircraft in the vicinity of Dublin Airport. If a complaint is made to Dublin Airport the flight track is reviewed to assess whether the aircraft was off-track. 99% of aircraft using Dublin Airport adhere to the established routings;
- **Environmental Noise Corridors** which aircraft must adhere to on arrival and departure to minimise noise impact. These corridors apply to the majority of aircraft that use the airport;
- Continuous Decent Approach (CDA): The airport operates a Continuous Decent Approach (CDA) which reduces the noise experienced on the ground by reducing the overall thrust required during the initial descent and keeping aircraft at higher altitudes for longer;
- Noise Abatement Departure Procedures (NADP): Specific rules on how aircraft should perform take-off climbs to ensure that noise is minimised. Dublin Airport requires compliance with a take-off climb profile, which is based on noise abatement departure climb guidance contained in an ICAO document (Doc 8168 Vol 1);
- Rules on the use of reverse thrust: Reverse thrust is used to aid the deceleration of aircraft on landing through the use of the aircraft's engines. This should not be used at night, unless required for safety reasons;
- Engine Ground Running: Engine testing is only permitted at certain times to minimise ground noise. Engine testing is restricted between 2000-0700hrs for all aircraft types with only the smaller aircraft being able to undertake engine testing between 0700-0900hrs; and
- Limitations on the use of the Cross-wind Runway.



In line with the ICAO balanced approach, FCC expects daa to at least maintain and explore further noise abatement procedures. To this end, the actions proposed in **Section 7** include review and reporting of the airport's departure noise abatement procedures.

5.4 Operating Restrictions

At present, there are no operating restrictions at Dublin Airport in its current form.

5.5 Monitoring and Community Engagement

The FDP through the adoption of Objective DA06, encourages engagement between airport operators and communities. Fingal County Council and Dublin Airport participate in regular meetings with the Dublin Airport Environment Working Group (DAEWG), Community Liaison Group (CLG) and the Dublin Airport Stakeholders Forum (DASF). Dublin airport have a community engagement programme in place that includes newsletters and various programmes that support the local community in the form of initiatives and funds.

Minutes of and presentations to these community group meetings are made publicly available on the Dublin Airport website.

A flight tracking system (the 'Noise and Flight Track Monitoring System') is in place, which enables the analysis of aircraft movements to assess whether they are operating within defined corridors. The primary objective of the Noise and Flight Track Monitoring System is to gather information on aircraft approach and departure routes and resultant noise levels at a number of key locations. This information is used by daa to respond to any complaints relating to aircraft noise.

Noise and Flight Track Monitoring Reports (NFTMR) are published on the Dublin Airport website (www.dublinairport.com/about-us/-community-affairs/airport-noise-noise-reports). The reports include:

- Noise complaint analysis by operating runway, location and period (i.e. day or night); and
- Aircraft track keeping performance statistics.

Noise monitoring reports are also prepared by Dublin Airport twice a year covering the periods January to June, and July to December. These reports rely on data collected by the airport's Noise and Track Keeping (NTK) system, reporting statistics at each Noise Monitoring Terminal (NMT) such as:

- The number of correlated aircraft noise events in total and by arrival or departure, hour of the day and aircraft type;
- Average measured noise levels in terms of daytime LAeq, 16hr and night-time LAeq, 8hr, and by month and hour with and without aircraft noise;
- Maximum noise level distributions (LAm_{ax});
- Runway use and weather conditions; and
- Overflight statistics including the height of aircraft over each monitoring terminal.



Section 7 includes five proposed actions in relation to monitoring and community engagement, including annual noise contouring and enhancement to the airport's Noise and Flight Track Monitoring System.

5.6 Sound Insulation Scheme

In 2017, Dublin Airport launched its Home Sound Insulation Programme (HSIP) which is designed to address the existing impact of the Airport on those most affected by aircraft noise.

HSIP is voluntary to households which qualify by being located within the 2016 63dB $L_{Aeq, 16 \text{ hr}}$ noise contour, and is broadly based on the voluntary Residential Noise Insulation Scheme required under consent for the Airport's North Runway.

HSIP eligibility is for residential dwellings located in the 63 dB 2016 $L_{Aeq 16 \text{ hour}}$ contour in addition to those which were previously insulated under a previous insulation scheme associated with the opening of the Airport's southern runway.

The scheme provides for the supply and installation of a full noise insulation package for eligible homes including measures such as glazing and loft insulation. The provision of these measures at no cost to the homeowner exceeds the requirements set by policy or planning at other European airports, where airports may only need to provide one aspects of the insulation package, such as glazing, or make only a financial contribution to the insulations costs.

The roll-out of individual dwelling surveys for the provision of the insulation is currently underway. It is expected that daa will complete the sound insulation scheme in 2020. This Noise Action Plan has proposed an action in **Section 7** that will require daa to demonstrate they are promoting the scheme and report the number of households participating in the scheme.



6. Existing Noise Situation and Results of the Mapping

This section sets out the existing noise situation and the results of the noise mapping at Dublin Airport. This has been undertaken with the use of the noise metrics required by the END along with other metrics also in use at Dublin Airport for noise management purposes.

The results of the 2016 noise mapping are presented along with comparisons to previous rounds. Whilst a comparison to previous rounds is not required under the END, it can be used to demonstrate trends which may provide context to the existing noise situation and similarly assist in the identification of noise problems and situations to be improved, from which actions can be determined.

6.1 Results of the 2016 Noise Mapping

In accordance with the Regulations, strategic noise maps and associated population exposure statistics have been prepared for 2016. The strategic noise maps and corresponding population exposure statistics have been produced by daa under their role as the Noise Mapping Body (NMB). The daa consultant report detailing the results of the strategic noise maps is included in **Appendix D** for reference.

Noise level contour plots have been generated using the Integrated Noise Model (INM, Version 7.0d) noise modelling software utilising a 10m by 10m grid. The choice of software was agreed with representative of the EPA and their technical advisors. The noise model was validated using results from the Dublin Airport Noise and Track Keeping (NTK) system.

The INM noise model has been used with AutoCAD Map 2017 in order to compare the noise level contour plots with the Agglomeration boundary. This enables noise metric statistics to be determined for areas:

- within the Dublin Agglomeration boundary;
- outside the Dublin Agglomeration boundary; and
- a total of the two i.e. the overall impact from the Airport.

The tables below show the statistics below for the area impacted by Dublin Airport both inside and outside the Dublin Agglomeration. The breakdown between the Dublin Agglomeration and the area outside the Dublin Agglomerations are shown in **Appendix C**

These statistics, rounded to the nearest hundred, in each of the three areas are reported for the L_{den} and L_{night} noise metrics from 55 dB and 50 dB, respectively, in 5 dB contour bands.



Table 2 2016 Noise Level Band Area Total L_{den}

Noise Band L_{den} dB(A)	Area (km ²)	Dwellings	Population
55 – 59.9	39.7	6,400	18,500
60 – 64.9	16.9	500	1,500
65 – 69.9	6.5	100	300
70 – 74.9	2.3	0	0
>= 75	1.6	0	0

Table 3 2016 Noise Level Band Area Total L_{night}

Noise Band L_{night} dB(A)	Area (km ²)	Dwellings	Population
50 – 54.9	24.1	2,200	6,200
55 – 59.9	9.1	100	400
60 – 64.9	3.3	0	0
65 – 69.9	1.3	0	0
>= 70	1.0	0	0

6.2 Comparison to Previous Rounds

A comparison between the current and previous rounds of the strategic noise mapping can be used to identify trends in noise exposure over time. This is considered appropriate given the changing activity at Dublin Airport.

To provide some context to this comparison,

4 outlines the aircraft and passengers using the airport in 2006, 2011 and 2016 (i.e. the last three relevant years for rounds of the noise mapping).

Table 4 Passenger and Aircraft Numbers At Dublin Airport (2006,2011 & 2016)

Year	Passengers (Pax) Millions	Movements	Passengers per Movement
2006	21.2	192,605	110
2011	18.7	160,664	117
2016	27.9	213,974	130

From

the following can be observed:



- Passenger (Pax) Millions and Movements in 2016 have increased 31.6% and 11.1%, respectively, to those in 2006; and
- Passengers per Movements increased by 6.4% in 2011 from 2006 figures, and 18.2% in 2016.

Figure 8 presents a breakdown of the ATMs over the day and night periods for the three relevant years. The Figure shows that the number of movements occurring at night i.e. 2300-0700hrs have increased over the period 2006 to 2016, with the increase between 2006 and 2016 occurring mainly in the period 0600-0700hrs. During the 12-hour daytime period (0700-1900hrs), the number of aircraft movements between 2006 and 2011 reduced, before increasing to a level above 2006. In the evening period, the number of aircraft movements in 2016 was comparable to 2006.

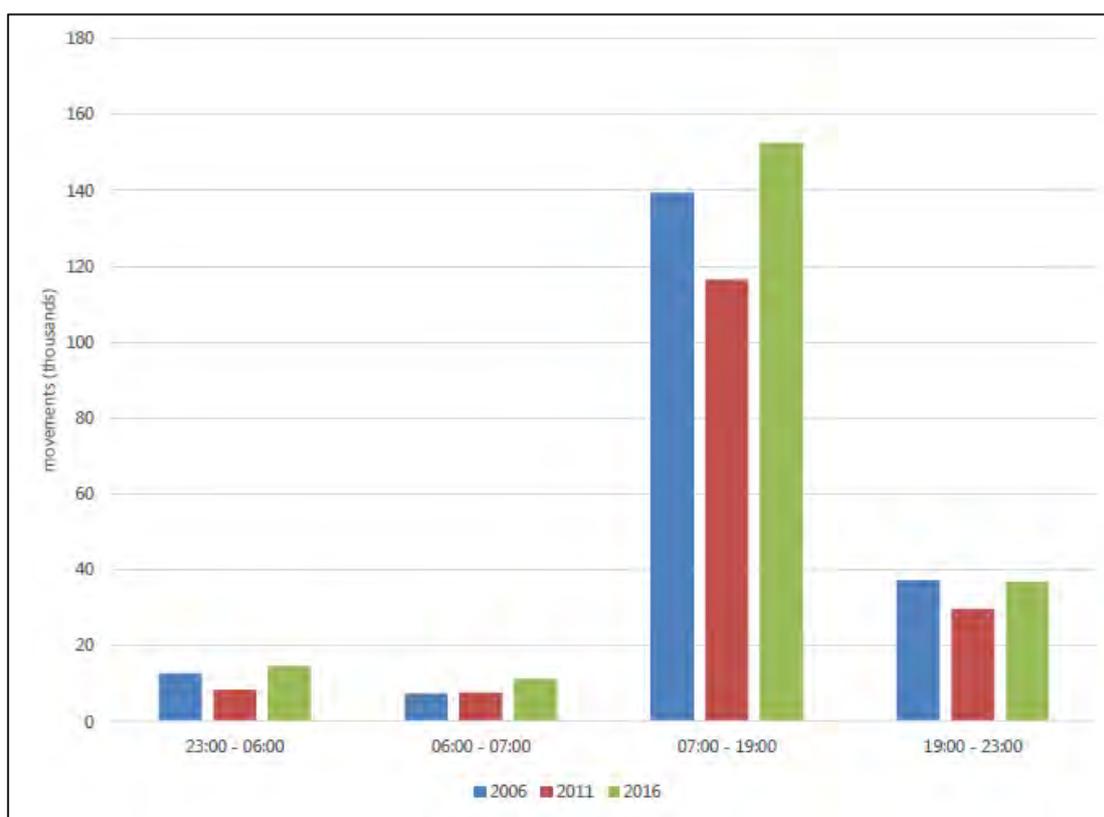


Figure 1 - Dublin Airport - Breakdown of ATMs by Time Period

A comparison is provided in

and below for population and dwellings respectively for the L_{den} noise metric. It should be noted that the results presented for 2006 are revised results from those originally submitted to the EPA at the time of the mapping in 2007. For completeness, the original results submitted in 2007 are presented. For consistency, the population data used for the 2006 (revised), 2011 and 2016 is based on the 2016 census. The original 2006 results were based on estimated population data.



Table 5 Population within Noise level Band Data for Total Area L_{den}

Noise Band L_{den} dB(A)	2006 (original)	2006 (revised)	2011	2016
55 – 59.9	2,800	13,000	11,900	18,500
60 – 64.9	200	1,200	300	1,500
65 – 69.9	100	200	200	300
70 – 74.9	0	0	0	0
≥ 75	0	0	0	0

Table 6 Dwellings within Noise level Band Data for Total Area L_{den}

Noise Band L_{den} dB(A)	2006 (original)	2006 (revised)	2011	2016
55 – 59.9	-	4,500	4,100	6,400
60 – 64.9	-	300	100	500
65 – 69.9	-	100	100	100
70 – 74.9	-	0	0	0
≥ 75	-	0	0	0

Dwellings not reported

From

and the following can be observed:

- The number of people exposed to noise levels greater than 55 dB(A) L_{den} decreased between 2006 and 2011, but increased between 2011 and 2016 resulting in around 5,900 people being exposed to more than 55 dB(A) L_{den} in 2016 than in 2006
- Of the 292,700 people living in the FCC administrative area, 6.9% of the population are exposed to aircraft noise above 55 dB(A) L_{den} ;
- 0% of the population are exposed to aircraft noise levels above 70 dB(A) L_{den} ; and
- The number of dwellings exposed to noise levels greater than 55 dB(A) L_{den} increased by 2,700 in 2016 from 2011 figures.

A comparison is provided in Table 7 and 8 below for population and dwellings respectively for the L_{night} noise metric.



Table 7 Population within Noise Level Band Data for Total Area L_{night}

Noise Band L_{night} dB(A)	2006 (original)	2006 (revised)	2011	2016
50 - 54.9	0	1,800	1,200	6,200
55 - 59.9	0	200	200	400
60 - 64.9	0	0	0	0
65 - 69.9	0	0	0	0
>= 70	0	0	0	0

Table 8 Dwellings within Noise Level Band Data for Total Area L_{night}

Noise Band L_{night} dB(A)	2006 (original)	2006 (revised)	2011	2016
50 - 54.9	0	600	400	2,200
55 - 59.9	0	100	100	100
60 - 64.9	0	0	0	0
65 - 69.9	0	0	0	0
>= 70	0	0	0	0

From



and the following can be observed:

- The number of people exposed to noise levels greater than 50 dB(A) Lnight increased by 5,200 in 2016 from 2011 figures;
- Of the 292,700 people living in the FCC administrative area, 2.3% of the population are exposed to aircraft noise above the desirable level of 50 dB(A) Lnight;
- 0% of the population are exposed to aircraft noise levels above 70 dB(A) Lnight; and
- The number of dwellings exposed to noise levels greater than 50 dB(A) Lnight increased by 1,800 in 2016 from 2011 figures;
- The number of people exposed to noise above 55 dB Lnight has increased from 200 in 2006 and 2011, to 400 in 2016. This is an increase in the number of people exposed to noise above the WHO 'Interim target' for night noise as set out in the Night Noise Guidelines for Europe¹.

The results indicate that noise from Dublin Airport has increased over the last 10 years. Whilst it is the case that there has been an increase in activity between 2011 and 2016, and a corresponding increase in the number of people within the L_{den} and L_{night} contours, it is also important to note that a number of developments will have been constructed and occupied around the airport over this timeframe and this will also contribute towards the increase in the population.

The daa consultants report, presented in **Appendix D**, points to the shape of the contours changing as a reason for the increase in exposure and indicates that:

- The changing in shape has resulted in some people being newly exposed to 55 dB L_{den} or above, as well as other being removed from this level of exposure;
- The areas newly exposed to 55 dB L_{den} and above are mainly located in Tyrrelstown (compared to 2011) and Balgriffin (compared to 2011 and 2006); and that
- The main changes in night-time noise exposure to 50 dB Lnight and 55 dB Lnight has occurred in Tyrrelstown, Balgriffin, Portmarnock Bridge and Santry.

Details of these changes are contained in the daa commissioned report by Bikerdike Allen Partners which is included as an appendix to this document

The noise mapping is for the year 2016. During 2016 there was greater than normal usage of the cross runway due to construction works on the main runway

6.3 $L_{Aeq, 16hr}$ Noise Contours

In addition to the L_{den} and L_{night} contours for 2016 as required under the Regulations, daa have also prepared $L_{Aeq, 16hr}$ noise contours and associated population exposure statistics for 2016. These contours underpin Dublin Airport's Home Sound Insulation Programme (HSIP) which was launched in 2017 and also provide some consistency with the noise metric used as part of

¹ World Health Organisation, Night Noise Guidelines for Europe, 2009. Available here: http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf



conditions associated with the North Runway and the expired LAP. daa have also provided population statistics for these contours in 2002 to enable comparison with the 2016 figures, as shown in **F**

These contours are provided in **Appendix F**

Table 9 Population within Noise Levels for Total Area $L_{Aeq, 16hr}$

Noise Band $L_{Aeq, 16hr}$ dB	Population 2002	Population 2016
57 - < 63	9,636	5,017
63 - < 69	1,168	274
> 69	99	29

From Table 8 Population within Noise Levels for Total Area $L_{Aeq, 16hr}$ the following can be observed:

- The number of people exposed to noise levels between 57 - 63 dB $L_{Aeq, 16hr}$ decreased by 4,619 over the period 2002 to 2016;
- The number of people exposed to noise levels between 63 – 69 dB $L_{Aeq, 16hr}$ decreased by 894 over the period 2002 to 2016; and
- The number of people exposed to noise levels greater than 69 dB $L_{Aeq, 16hr}$ in 2016 is 29, which is a decrease of 70 compared to 2002.

6.4 Other Noise-Related Information

Other information provided by daa has been used to help describe the current noise situation at Dublin Airport.

Complaint Statistics

Complaint statistics (provided in **Appendix E**) show that over recent years noise complaints and complainant have been increasing. However, information provided by daa indicates that was partly due to works taking places on the main runway which resulted in the increased use of the Cross-wind Runway at night. daa’s analysis also indicates that the increased complaints in 2016 coincided with the announcement by Dublin Airport that it would proceed with its plans to commence with the delivery of the North Runway.

Aircraft Fleet Mixes and Runway Use

An analysis of information regarding the fleet mixes in operation during the relevant noise mapping years (2006 to 2016) indicates a movement towards quieter aircraft as expressed through noise certification. The fleet mixes also indicate a movement towards larger aircraft which is partly reflected in the increase in the number of people per aircraft movement as expressed in



Runway use in 2011 and 2016 has been relatively consistent with most aircraft using the main runway and the main operating direction being westerly i.e. towards the west. Communities to the east, such as St. Doolagh's therefore observed more aircraft arrivals, and communities to the west, such as St Margaret's, experienced more aircraft departures.

In 2006, there was more use of the airport's Cross-wind Runway and some use of runway 29/11, which is now closed.

Comparisons Using Consistent Population Data

daa have provided comparisons of the three relevant noise mapping years using the same 2016 base dwellings data. This comparison is helpful in terms of identifying how noise exposure may have changed around the airport as a result of the changes in aircraft movements and types of aircraft in use.

This information, provided in **Appendix C** indicates that with regards to the L_{den} noise metric, the number of people exposed to at least 60 dB L_{den} in 2016 is reasonably consistent with those exposed in 2006, with a reduction in 2011 which was mainly due to a large drop in the number of flights following the economic crash in 2009. This indicates increases in the population exposed in the 55-55.9 dB L_{den} band to noise from 2006 to 2016 as expressed in and could be due to the construction of additional dwellings outside the outer noise zone established under the lapsed LAP to control development around the airport, however further work would be necessary to confirm whether this is the case.

One area which is highlighted in this analysis is an increase in population exposure at night. The analysis shows that when the population dataset is kept consistent, population exposure has increased. This analysis shows that when considering the same population base, the number of dwellings above 50 dB L_{night} has risen by more than 380% from 600 to 2,300 between 2006 and 2016, indicating that the airport is producing more noise during the night-time period.

The information provided in **Appendix C** is based on the L_{den} and L_{night} metrics, and not the $L_{Aeq, 16hr}$ metric which has been used for development control purposes through the LAP. Population increases within the 55 dB L_{den} and 50 dB L_{night} contours may have occurred at locations that fall outside of the outer zone defined by the LAP. As such, it is possible that population increases have occurred in areas which are not defined by for restrictive control under the LAP but would be captured by noise contours extending down to 55 dB L_{den} and 50 dB L_{night} .

A further study, considering other factors and other but similar comparisons would need to be undertaken to confirm encroachment and the effectiveness of the lapsed LAP in controlling development around the airport.



6.5 Discussion

The results of the noise mapping and other relevant sources of information indicate that noise from Dublin Airport has increased since 2011 along with the number of people exposed to aircraft noise.

These increases are due to both the airport's continued growth and apparent encroachment in the vicinity of the airport.

The results of the mapping also indicate an increase in night-time noise exposure both as a result of the airport and the apparent encroachment.

Noise complaints, whilst increased in recent years, may not necessarily be connected to this increased noise exposure but may more likely be as a result of other factors.

6.6 Identification of Noise Problems and Situations to be improved

The results of the noise mapping and the situation described above indicates that night noise and land-use planning are areas which may be a problem and may need to be improved. However, further work needs to be undertaken. To this end, actions have been proposed which will prompt further work.



7. Proposed Actions to be Taken

7.1 Long-term Noise Strategy

The long-term strategy of Fingal County Council, including proposed policies and objectives is set out in the FDP. The Development Plan sets aims to safeguard the current and future operation of Dublin Airport, and its ongoing development.

With regards to noise from Dublin Airport, Objective DA09 of the Development Plan states:

“Ensure that aircraft-related development and operation procedures proposed and existing at the Airport consider all measures necessary to mitigate against the potential negative impact of noise from aircraft operations (such as engine testing, taxiing, taking off and landing), on existing established residential communities, while not placing unreasonable, but allowing reasonable restrictions on airport development to prevent detrimental effects on local communities, taking into account EU Regulation 598/2014 (or any future superseding EU regulation applicable) having regard to the ‘Balanced Approach’ and the involvement of communities in ensuring a collaborative approach to mitigating against noise pollution.”

The implementation and assessment of performance against the Development Plans objectives is primarily the responsibility of Fingal County Council.

7.2 Actions to Take Place Over the Duration of the Noise Action Plan

Taking into account the existing noise situation at Dublin Airport and the Identification of Noise Problems and Situations to be improved as presented in Section 6.6, a range of proposed actions have been proposed which are envisaged to take place over the duration of the Noise Action Plan.

In addition to actions relating to the existing noise situation, daa have brought forward suggested a range of actions to ensure aspects of the noise management framework are encapsulated as actions within the noise action plan.

All proposed actions are presented in following table



Table 10 Actions

Actions	Description	KPI	How action fulfils ICAO requirement	When
Reduction of noise at source				
1	Encourage daa to work with airline partners to introduce quieter aircraft, particularly at night – including consideration of incentives	Report issued	Reduction of noise at source through use of quieter aircraft	Annually
2	Encourage daa to promote quieter aircraft through incentives such as FlyQuiet programmes.	Report issued	Reduction of noise at source by encouraging quieter operations, such as pilots and air traffic controllers using preferential runways and flighttracks	Ongoing
Land use planning and management				
3	Keep under review land-use policies in relation to aircraft noise through the review of existing land use planning frameworks in so far as they relate to Dublin Airport.		Enable proactive management of noise through appropriate sensitive development	
4	Monitor noise encroachment associated with Dublin Airport to ensure that airport noise policy is appropriately informed through land use planning frameworks in so far as they relate to Dublin Airport.	Encroachment Analysis Report	Land use planning and management to avoid encroachment of sensitive development in relation to Dublin Airport	2019 Onwards
Noise abatement operating procedures				
5	Request daa to undertake a review of Departure Noise Abatement Procedures and to publish the findings	Progress report issued	Endeavour to achieve lower noise operating procedures through review of current Departure Noise Abatement Procedures	Q3 2019
6	Request daa to monitor and publicly report key performance with respect to	Report issued	Sustain noise operating procedures through monitoring and managing	Annually

	the Airport's existing Noise Abatement Procedures		the current Abatement Procedures	Departure Noise	
Monitoring and community engagement					
7	Request daa to produce annual noise contours and metrics and to share this information with interested parties	Annual noise contour report	Monitoring and engagement through annual report	community production of	2019 Onwards
8	Encourage daa to continue to operate noise complaint management systems and respond to all aviation-related noise complaints in a timely manner	Submission of progress report using target of 95% of aircraft noise complaints responded to within 28 days	Monitoring and engagement through response times to all aviation related noise complaints	community adequate	Ongoing
9	Promote the introduction of live (or near live) flight reporting software (such as Webtrak)	Submission of progress report on status of publicly accessible flight tracking platform	Monitoring and engagement through facing platform for reviewing airport flights and noise.	community	2020
10	Engage proactively with communities through the Dublin Airport Environment Working Group (DAEWG) and the St. Margaret's Community Liaison Group	Quarterly meeting and agreed minutes	Monitoring and engagement through quarterly meetings.	community quarterly	Ongoing
11	Promote the enhancement of the Noise Flight Track System to include where appropriate additional fixed and/or mobile noise monitoring terminals	Submission of progress report outlining number of new	Noise abatement procedures & Monitoring and	operating community	2019 onwards

		locations	engagement	
All				
12	Review any updates in advice from bodies such as the WHO and the European Environment Agency in relation to aircraft noise and its health and quality of life effects	Internal Policy Development Report	All	
13	Request the submission of an annual report by daa outlining measures undertaken to achieve actions listed in this table	Report		Annually

8.Our Approach to Monitoring and Reporting on Noise Action Plan Delivery

We are committed to systematically reviewing our performance in the delivery of the Noise Action Plan. Our progress is informed by a review of the separate performance indicators and their associated target timescales.

We will use our review to identify the actions requiring further committed resources, and those which are most successfully managing noise impacts.

We are committed to annually reporting the progress of our Noise Action Plan, in addition to making information available on our website.



9. Summary and Conclusions

This Noise Action Plan has been prepared as required by the Environmental Noise Regulations 2006, Statutory Instrument 140 of 2006. These Regulations give effect to EU Directive 2002/49/EC relating to the assessment and management of environmental noise.

The objective of the Noise Action Plan is:

“to avoid, prevent and reduce, where necessary, on a prioritised basis the effects due to long term exposure to aircraft noise, including health and quality of life through implementation of the International Civil Aviation Organisation’s ‘Balanced Approach’ to the management of aircraft noise as set out under EU Regulation 598/2014”

This Noise Action Plan presents the results of the Round 3 strategic noise mapping for Dublin Airport under the Regulations, including the estimated number of people exposed to noise.

A comparison of the results from R1, 2006 and R2, 2011 is also presented, which indicates that the long-term management of noise exposure from the airport through the previous noise action plans for Dublin Agglomeration, and the FCC Local Area Plan 2006-2106, have been successful in restricting the increase in exposed dwellings and people over the 2006 to 2016 period. The comparison indicates that exposure outside the current LAP outer noise zone, in the 50-55.0 dB L_{den} band and 50-54.9 dB L_{night} band, has increased which has resulted in proposed actions to monitor encroachment and review the FCC approach to land use planning.

The following highlights the main findings from the noise assessment arising from the noise mapping:

At the end of the Noise Action Plan, a review of the programme program of works and policies developed over the first 5 years assessing the effectiveness of the measures adopted and determining if the measures were cost effective and value for money.



Appendix A - Definitions & Explanations

- Agglomeration: 'Agglomeration' shall mean part of a territory, delimited by the Member State, having a population in excess of 100,000 persons and a population density such that the Member State considers it to be an urbanised area.
- Agglomeration of Dublin: 'Agglomeration of Dublin' means the county borough of Dublin, the administrative county of Dun Laoghaire/Rathdown other than those areas excluded in the First Schedule to the Air Pollution Act 1987 (Marketing, Sale and Distribution of Fuels) Regulations 1998 (S.I. No. 118 of 1998), and the administrative counties of Fingal and South Dublin;
- Environmental Noise: Shall mean unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic, and from sites of industrial activity such as integrated pollution prevention and control licensed industries. Noise is sometimes defined as unwanted sound.
- Decibel dB(A) : A unit of measurement of sound.
- Lden: (day-evening-night noise indicator) shall mean the noise indicator for overall annoyance. This comprises of adding the average value for the 12-hour day time period with the average value of the 4-hour evening period plus a 5 decibel weighting or penalty, and the average value for the 8 hour night time period with a 10 decibel weighting or penalty. Lden is calculated as follows:

$$L_{den} = 10 \times \left(\frac{1}{24} \right) \left(12 \times 10^{\left(\frac{L_{day}}{10} \right)} + 4 \times 10^{\left(\frac{5+L_{evening}}{10} \right)} + 8 \times 10^{\left(\frac{10+L_{night}}{10} \right)} \right) \text{dB(A)}$$

- Daytime: Between the hours of 7am and 7pm
- Lday: (day-noise indicator) shall mean the noise indicator for annoyance during the day period. This is the average value in decibels for the daytime period
- Evening time: Between the hours of 7pm and 11pm



Appendix B - Public Consultation

The following Bodies\Agencies will be circulated for comment on this draft document:

- An Taisce
- Bord Fáilte (Planning Section)
- Chambers of Commerce
- Department of Communications, Climate Action and Environment
- Department of Housing, Planning and Local Government
- Department of Transport, Tourism and Sport
- Dublin Airport Authority
- Dublin City Council
- Easter & Midlands Regional Assembly
- Environmental Protection Agency
- Health Service Executive
- Irish Aviation Authority
- Meath County Council
- Regional Authority
- The Fingal Public Participation Network (PPN)



Appendix C - Noise Exposure Statistics

Noise Exposure Statistics for Areas both outside and within the Dublin Agglomerations

Table 11 2016 Noise level Band Area - Within Dublin Agglomeration

Noise Band L_{den} dB(A)	Area (km ²)	Dwellings	Population
55 – 59.9	35.7	6,400	18,000
60 – 64.9	16.9	500	1,500
65 – 69.9	6.5	100	300
70 – 74.9	2.3	0	0
>= 75	1.6	0	0

Table 12 2016 Noise Level Band Area - Within Dublin Agglomeration, L_{night}

Noise Band L_{night} dB(A)	Area (km ²)	Dwellings	Population
50 – 54.9	24.1	2,200	6,200
55 – 59.9	9.1	100	400
60 – 64.9	3.3	0	0
65 – 69.9	1.3	0	0
>= 70	1.0	0	0

Table 13 2016 Noise Level Band Area - Outside Dublin Agglomeration L_{den}

Noise Band L_{den} dB(A)	Area (km ²)	Dwellings	Population
55 – 59.9	4.0	0	500
60 – 64.9	0.0	0	0
65 – 69.9	0.0	0	0
70 – 74.9	0.0	0	0
>= 75	0.0	0	0



Table 14 2016 Noise Level Band Area - Outside Dublin Agglomeration, Lnight

Noise Band L_{night} dB(A)	Area (km ²)	Dwellings	Population
50 - 54.9	0.0	0	0
55 - 59.9	0.0	0	0
60 - 64.9	0.0	0	0
65 - 69.9	0.0	0	0
>= 70	0.0	0	0



Appendix D

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DUBLIN AIRPORT STRATEGIC NOISE MAPPING COMPARISON OF DWELLING EXPOSURE FOR YEARS 2006, 2011 AND 2016

Report to

daa

A11195-R02-NW
07 June 2018

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Philippa Gawley, Giles Greenhalgh, Peter Henson, Roger Jowett



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Acoustic Consultants: Expertise in planning and noise, the control of noise and vibration and the sound insulation and acoustic treatment of buildings.

Construction Technology Consultants: Expertise in building cladding, technical appraisals and defect investigation and provision of construction expert witness services.



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3.0 Discussion of Results	7
4.0 Summary	8

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1.0 INTRODUCTION

Bickerdike Allen Partners LLP (BAP) have been retained by daa to assess the differences in dwelling exposure for the three rounds of strategic noise mapping produced to date for Dublin Airport, that is 2006, 2011, and 2016 in compliance with the Environmental Noise Regulations 2006. These were previously reported by BAP in the reports A9583-R03-NW (2006), A9583-R01-DC (2011), and A11036-R02-DR (2016).

This report presents the dwelling exposure statistics for each of the three years for the two key noise indices, L_{den} and L_{night} , and also compares how much of the differences are due to residential development having been built since the earlier assessments were carried out.



2.0 DWELLING EXPOSURE RESULTS

Table 1 below presents the dwelling exposure statistics, alongside the contour areas, as previously reported.

Contour Band	2006		2011		2016	
	Area (km ²)	# Dwellings	Area (km ²)	# Dwellings	Area (km ²)	# Dwellings
55-59.9 dB L _{den}	35.5	4,500	29.9	4,100	39.7	6,400
60-64.9 dB L _{den}	13.0	300	10.7	100	16.9	500
65-69.9 dB L _{den}	5.4	100	4.6	100	6.5	100
70-74.9 dB L _{den}	2.1	0	1.7	0	2.3	0
≥75 dB L _{den}	1.6	0	1.4	0	1.6	0
50-54.9 dB L _{night}	17.0	600	14.6	400	24.1	2,200
55-59.9 dB L _{night}	6.6	100	5.9	100	9.1	100
60-64.9 dB L _{night}	2.8	0	2.3	0	3.3	0
65-69.9 dB L _{night}	1.0	0	0.8	0	1.3	0
≥70 dB L _{night}	0.9	0	0.8	0	1.0	0

Table 1: Previously Reported Contour Areas and Dwelling Exposure

As can be seen, 2016 has the largest contours and as would be expected in this case, the highest dwelling exposure.

For the 2006 and 2011 assessments, the population dataset was based on the GeoDirectory 2011 Q2 release. For the 2016 assessment, the 2016 Q1 release was used. Part of the reported difference in dwelling exposure is likely to be due to residential development in the vicinity of the airport since 2011. In order to assess the magnitude of this, BAP have re-assessed the 2006 and 2011 contours based on the 2016 population dataset in order to allow for a more direct comparison of the different years. This is presented in Table 2 below.



Contour Band	# Dwellings (2016 Assessment Method)		
	2006	2011	2016
55-59.9 dB L _{den}	6,100	4,500	6,400
60-64.9 dB L _{den}	300	100	500
65-69.9 dB L _{den}	100	100	100
70-74.9 dB L _{den}	0	0	0
≥75 dB L _{den}	0	0	0
50-54.9 dB L _{night}	500	400	2,200
55-59.9 dB L _{night}	100	100	100
60-64.9 dB L _{night}	0	0	0
65-69.9 dB L _{night}	0	0	0
≥70 dB L _{night}	0	0	0

Table 2: Dwelling Exposure Based on 2016 Dataset



3.0 DISCUSSION OF RESULTS

3.1 L_{den}

When considering the 2016 dataset, the quietest contour band, 55-59.9 dB L_{den} , has a dwelling exposure in 2016 of 6,400. This is only slightly higher than the 6,100 that would have been exposed to the same noise level from operations in 2006, were they to occur now. The dwelling exposure in 2011 would however have been lower at 4,500. Similarly when looking at the next quietest contour band, 60-64.9 dB L_{den} , the dwelling exposure goes from 300 in 2006 down to 100 in 2011 and back up to 500 in 2016. For the higher contour bands the results are identical in all 3 years.

3.2 L_{night}

When considering the effect on L_{night} based on the 2016 dataset, the quietest contour band, 50-54.9 dB L_{night} , has a dwelling exposure in 2016 significantly greater than the other two years, at 2,200 compared to 500 in 2006 and 400 in 2016. For the higher contour bands the results are identical in all 3 years.

3.3 Location of newly exposed dwellings

Considering the largest L_{den} contours assessed, as these are the only ones that show significant changes, in 2016 there were 2,370 dwellings exposed to 55 dB L_{den} or higher that were not in 2011, and 854 dwellings exposed to 55 dB L_{den} or higher that were not in 2006. However there were 405 dwellings exposed to 55 dB L_{den} or higher in 2006 that were not in 2016, due to changes in the contour shape. These additional dwellings exposed in 2016 are mainly located in Tyrrelstown (compared to 2011) and Balgriffin (compared to 2011 and 2006).

In 2016 there were 1,883 dwellings exposed to 50 dB L_{night} or higher that were not in 2011, and 1,734 dwellings exposed to 50 dB L_{night} or higher that were not in 2006. These additional dwellings exposed in 2016 are mainly located in Tyrrelstown and Portmarnock Bridge.

Figures 01-08 present the 2016 55 dB L_{den} and 50 dB L_{night} contours, against the respective 2011 and 2006 contours. They also show the location of the dwellings in the 2016 dataset which are inside the 2016 contours but not their older counterparts. This is presented both as an overview of the whole contour and a detailed view of the four areas showing the most changes, that is Tyrrelstown, Balgriffin, Portmarnock Bridge and Santry.



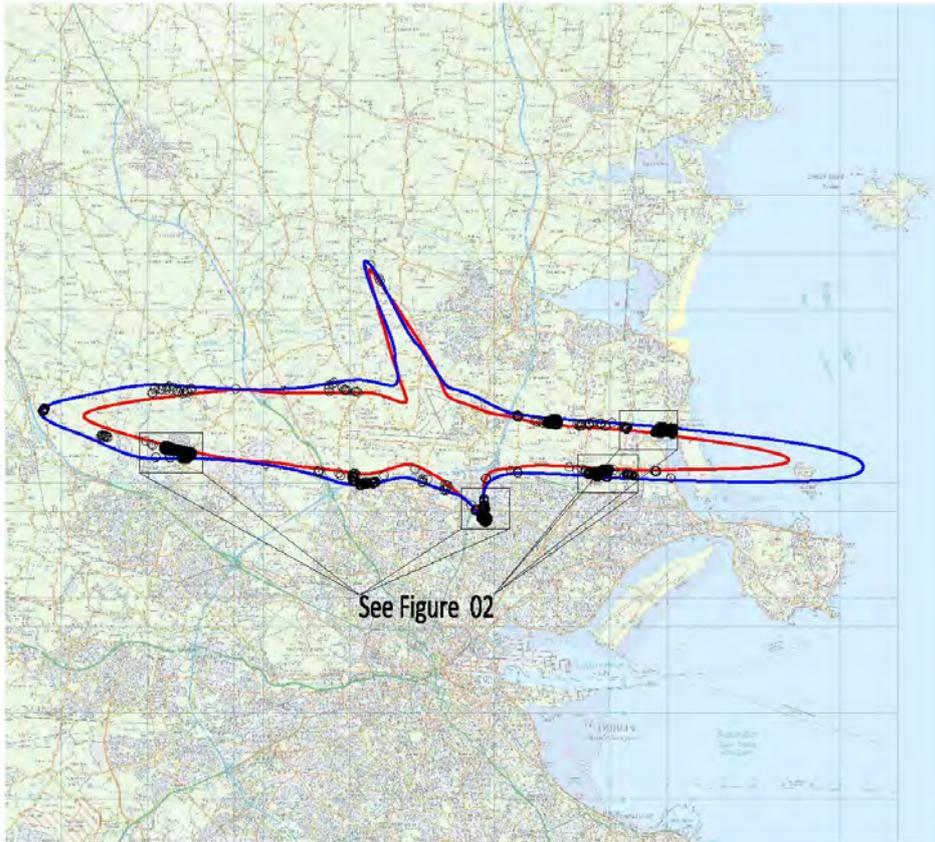
4.0 SUMMARY

BAP have compared the dwelling exposure statistics for the three years of strategic noise mapping carried out to date, 2006, 2011 and 2016. An assessment of all three years using the same population dataset as was used for 2016 has been carried out in order to allow for a more direct comparison. The size of the noise contours assessed, both for the L_{den} and L_{night} indices, are larger in 2016 than in 2006, which themselves are larger than those in 2011. Considering the number of dwellings exposed, the finding is that other than the lowest noise contours assessed, 55-59.9 dB L_{den} and 50-54.9 dB L_{night} , the dwelling exposure is very similar in all three years. The L_{den} dwelling exposure is slightly more in 2016 than 2006, but significantly more than in 2011. The L_{night} dwelling exposure is significantly more in 2016 than in both 2006 and 2011. The newly exposed dwellings are primarily located in Tyrrelstown, Balgriffin, and Portmarnock Bridge.

Nick Williams
for Bickerdike Allen Partners LLP

Peter Henson
Partner

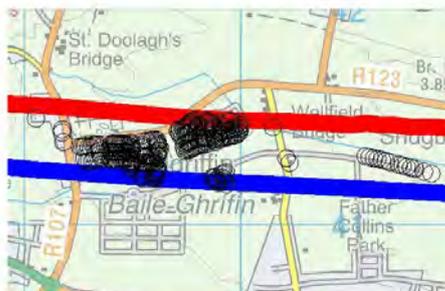




Tyrrelstown - 725 dwellings



Santry - 202 dwellings



Balgriffin - 503 dwellings



Portmarnock Bridge - 225 dwellings

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LEGEND:

- 2016 Contour, 55 dB Lden
- 2011 Contour, 55 dB Lden
- Dwelling Point

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Dublin Airport Strategic Noise Mapping 2016

Airborne Aircraft Noise Contours Annual Lden Dwelling Exposure Comparison of 2016 and 2011 (Detailed)

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FIGURE No: **A11195/02**





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- LEGEND:**
- 2016 Contour, 50 dB Leq
 - 2011 Contour, 50 dB Leq
 - Dwelling Point

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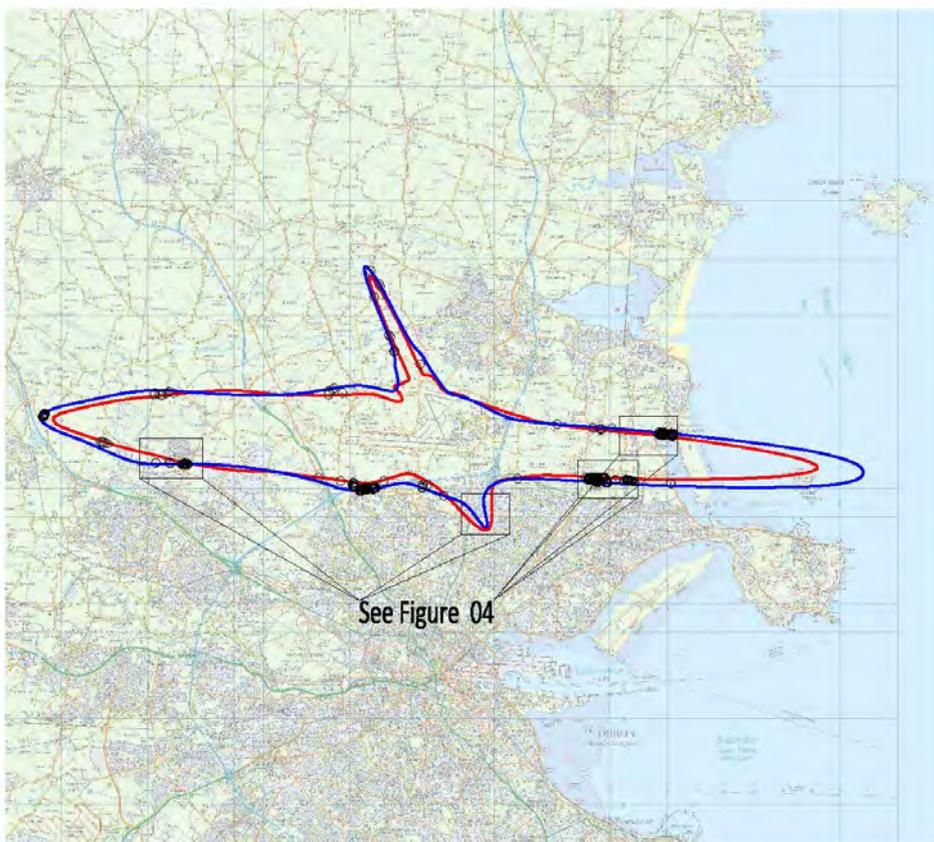
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**Airborne Aircraft Noise Contours
Annual Leq, Dwelling Exposure
Comparison of 2016 and 2011**

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FIGURE No: **A11195/05**



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- LEGEND:**
- 2016 Contour, 55 dB Leq
 - 2006 Contour, 55 dB Leq
 - Dwelling Point

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Comparison of 2016 and 2006**

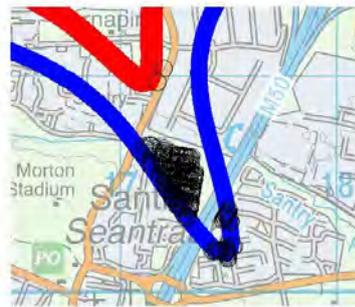
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FIGURE No: **A11195/03**





Tyrrelstown - 757 dwellings



Santry - 209 dwellings



Balgriffin - 66 dwellings



Portmarnock Bridge - 600 dwellings

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LEGEND:

- 2016 Contour, 50 dB LAeq
- 2011 Contour, 50 dB LAeq
- Dwelling Point

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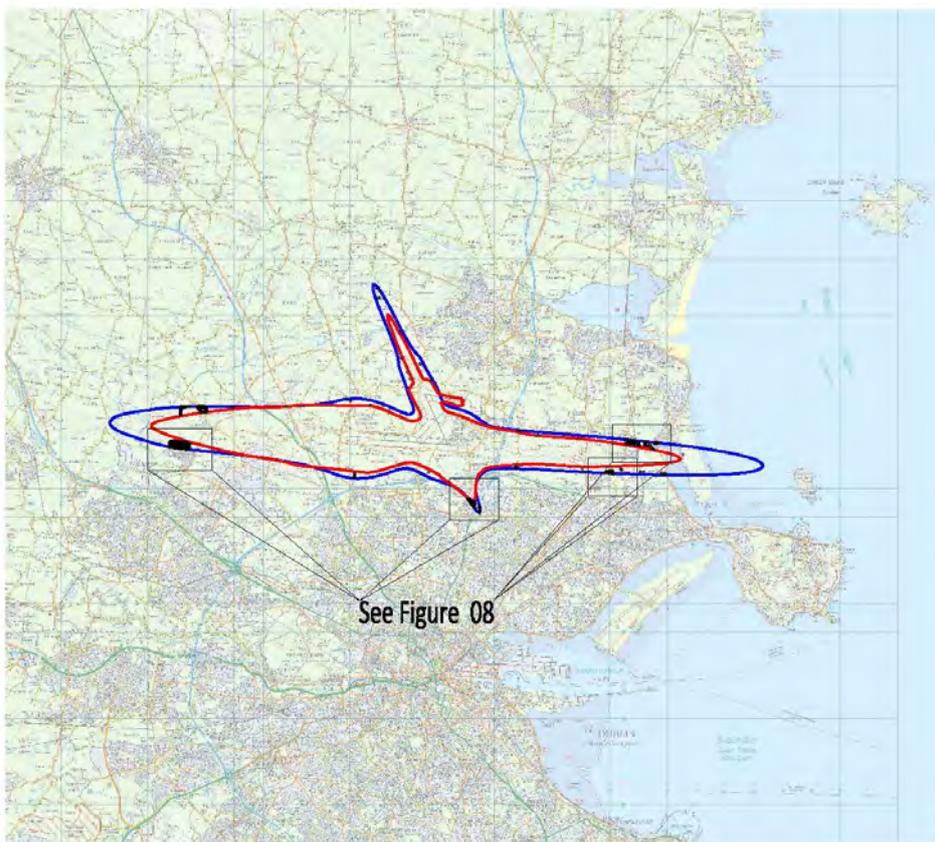
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Airborne Aircraft Noise Contours
Annual LAeq Dwelling Exposure
Comparison of 2016 and 2011 (Detailed)

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FIGURE No:

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LEGEND:

- 2016 Contour, 50 dB LAeq
- 2006 Contour, 50 dB LAeq
- Dwelling Point

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Comparison of 2016 and 2006

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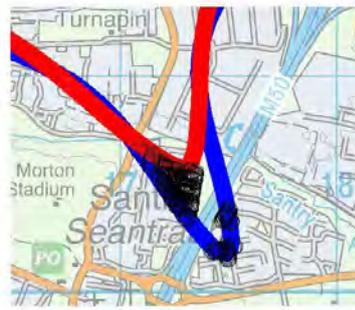
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A11195/07





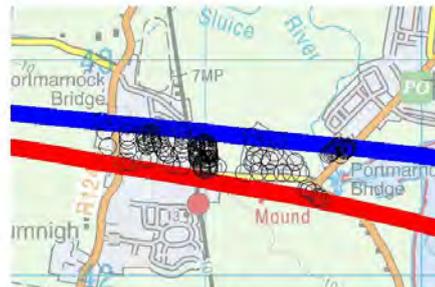
Tyrrelstown - 741 dwellings



Santry - 151 dwellings



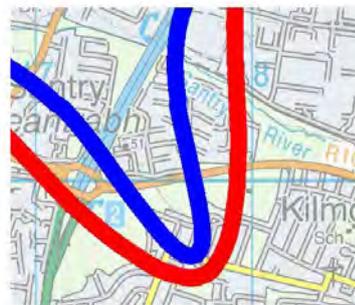
Balgriffin - 66 dwellings



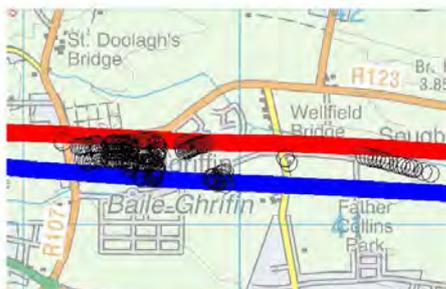
Portmarnock Bridge - 586 dwellings



Tyrrelstown - 45 dwellings



Santry - 0 dwellings



Balgriffin - 402 dwellings



Portmarnock Bridge - 83 dwellings

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LEGEND:
 — 2016 Contour, 50 dB L_{den}
 — 2006 Contour, 50 dB L_{den}
 ○ Dwelling Point

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 Annual L_{den} Dwelling Exposure
 Comparison of 2016 and 2006 (Detailed)
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 FIGURE No: **A11195/08**

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LEGEND:
 — 2016 Contour, 55 dB L_{den}
 — 2006 Contour, 55 dB L_{den}
 ○ Dwelling Point

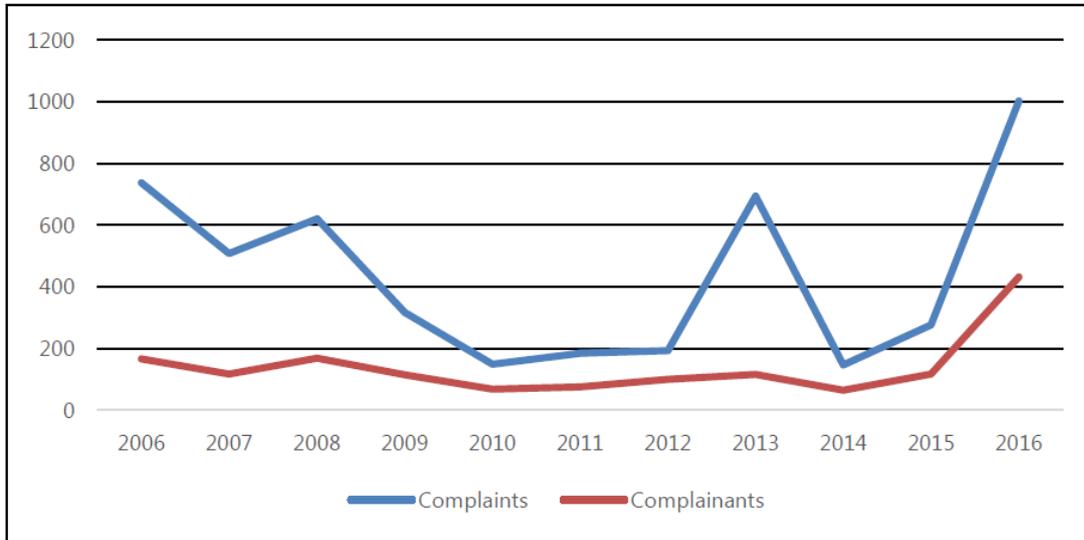
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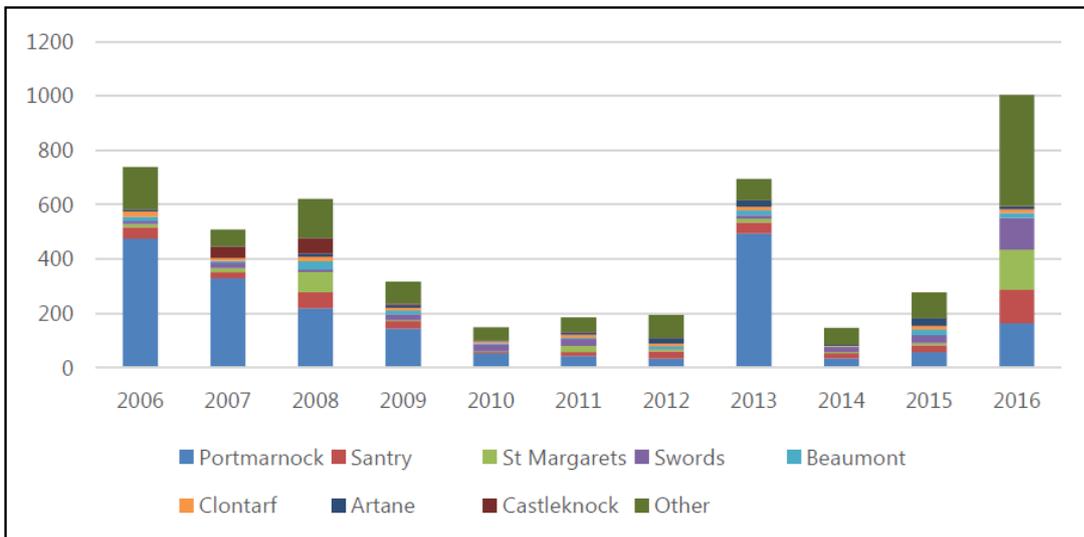
Dublin Airport Strategic Noise Mapping 2016
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 Comparison of 2016 and 2006 (Detailed)
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 FIGURE No: **A11195/04**



Appendix E – Complaint Statistics

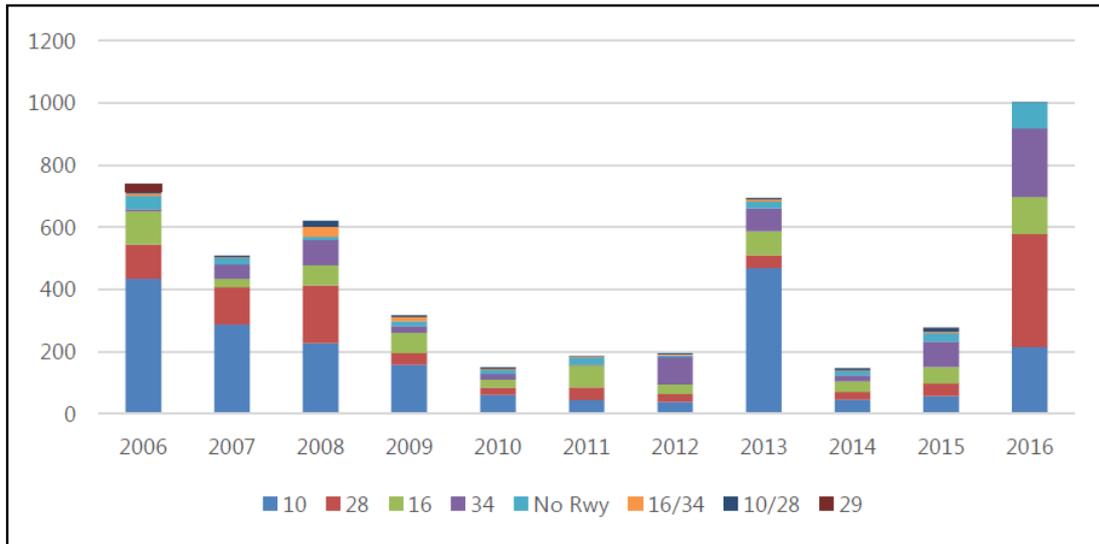


Complaint Summary 2006 – 2016



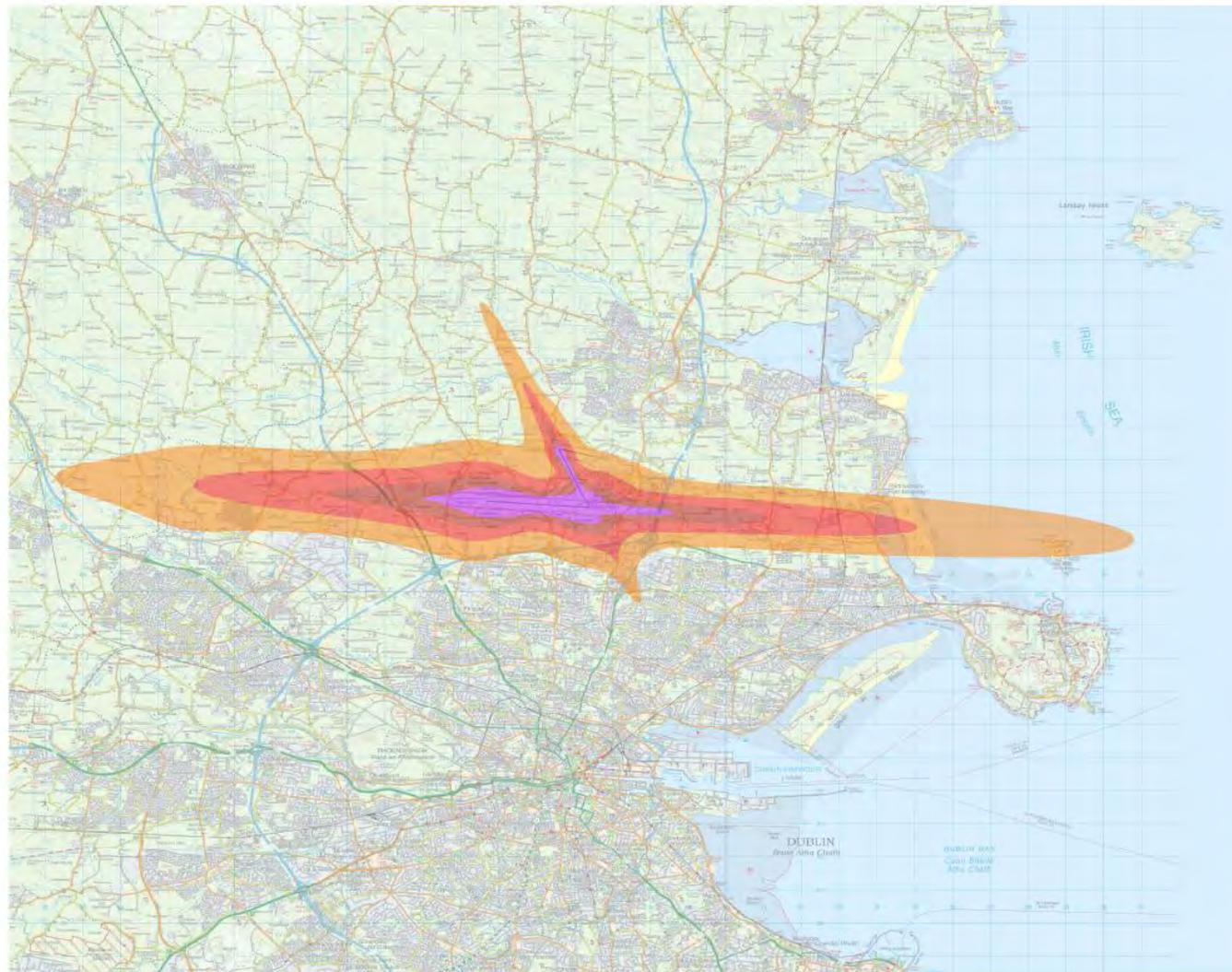
Location Summary of Complaints 2006 – 2016





Runway Usage and Complaints Summary 2006 – 2016

Appendix F - Noise Exposure Maps



This drawing contains Ordnance Survey data © Crown Copyright and database right 2016.

LEGEND:

- Noise Contours,
- 55 to 59 dB Lden
 - 60 to 64 dB Lden
 - 65 to 69 dB Lden
 - Greater than or equal to 70 dB Lden

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Dublin Airport
Strategic Noise Mapping 2016

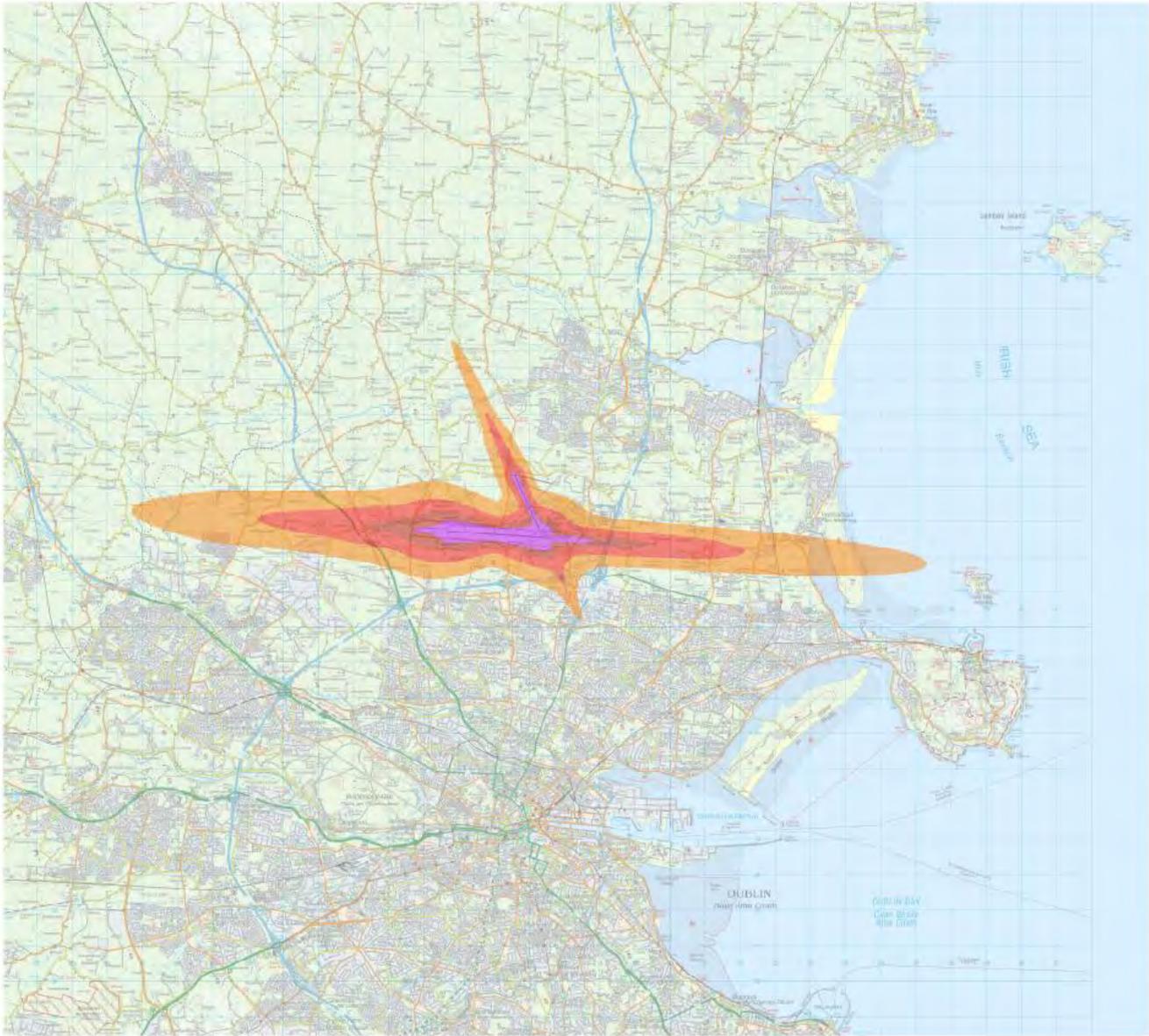
Airborne Aircraft Noise Contours
Annual Lden

DRAWN: DR CHECKED: NW

DATE: June 2017 SCALE: 1:150000@A4

FIGURE No: **A11036/01**

Figure 1 - 2016 Lden Noise Exposure Contours



This drawing contains Ordnance Survey data © Crown Copyright and database right 2016.

LEGEND:

- Noise Contours,
- 50 to 54 dB L_{night}
 - 55 to 59 dB L_{night}
 - 60 to 64 dB L_{night}
 - Greater than or equal to 65 dB L_{night}

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**Dublin Airport
Strategic Noise Mapping 2016**

**Airborne Aircraft Noise Contours
Annual L_{night}**

DRAWN: DR CHECKED: NW

DATE: June 2017 SCALE: 1:150000@A4

FIGURE No: **A11036/02**

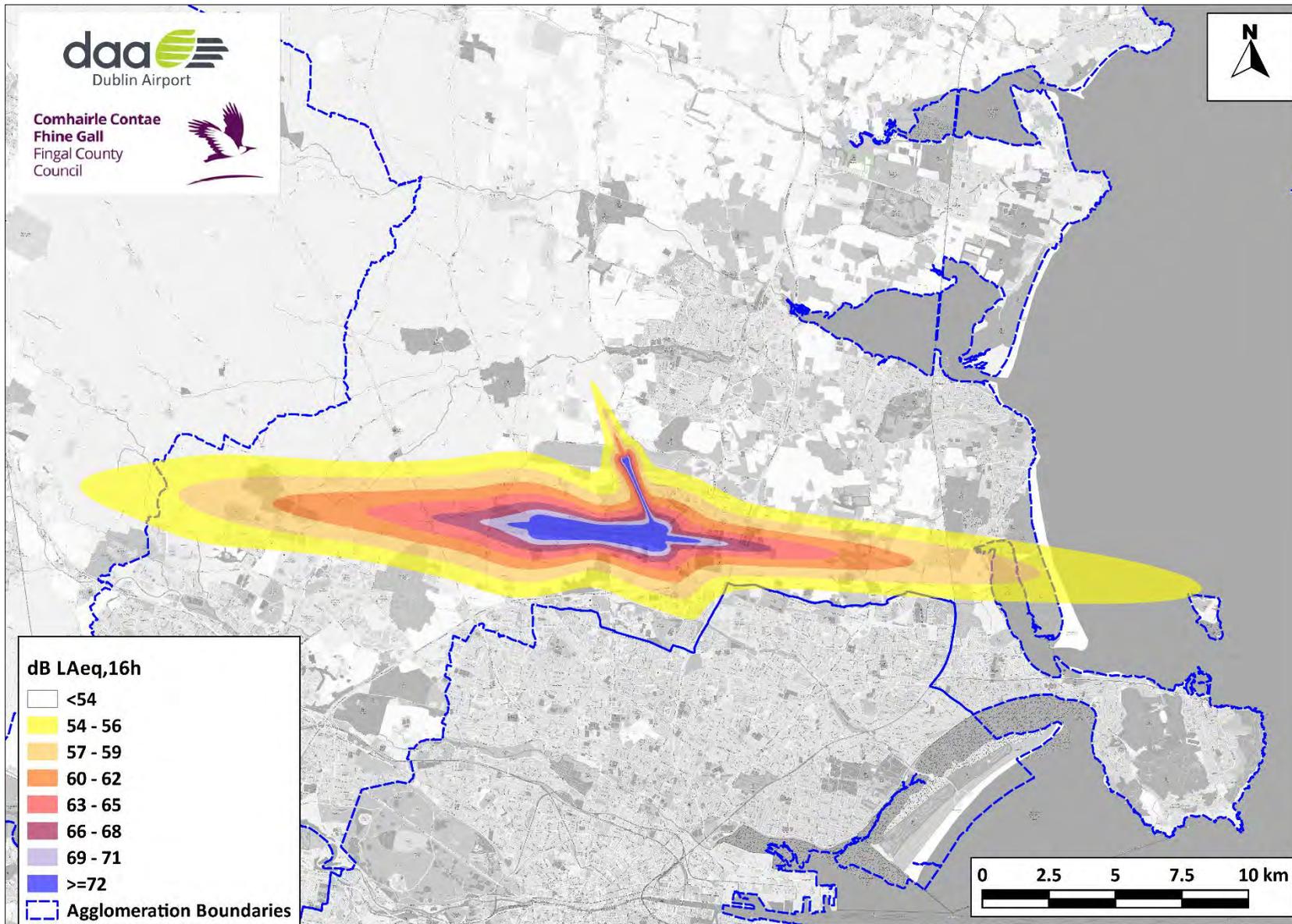


Figure 2 - 2016 $L_{Aeq, 16hr}$ Noise Exposure Contours