Dublin Airport North Runway Relevant Action Application

Environmental Impact Assessment Report
Volume 2 - Main Report

September 2021

Bickerdike Allen Partners
Architecture Acoustics Technology

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Acronyms and Abbreviations

Abbreviation / Term	Definition
%	Percentage
µg/m³	Microgram per cubic meter
µm	Micro-metre. A measure of length equalling $1x10^{-6}$ of a metre
AA	Appropriate Assessment
ABP	An Bord Pleanála
ACA	Architectural Conservation Area
AEDT	Aviation Environmental Design Tool
ANCA	Aircraft Noise Competent Authority
ANPR	Automatic Number Plate Registration
ANQ	Annual Noise Quota
APU	Auxiliary Power Units
AQLV	Air Quality Limit Values
ATM	Air Traffic Movement
ASI	Archaeological Survey of Ireland
AQC	Air Quality Consultants
ACDM	Airport Collaborative Decision Making
BCT	Bat Conservation Trust
BNL	Basic Noise Level
BSI	British Standards Institute
CAR	Commission for Aviation Regulation
CAFE	Cleaner Air for Europe
CCD	Climb, Cruise and Descent
CCR	Climate Change Resilience
CEMP	Construction Environmental Management Plan
CFRAM	Catchment Flood Risk Assessment and Management
CGI	Computer Generated Imagery
CHD	Coronary Heart Disease
CH_4	Methane
CIEEM	Chattered Institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
cNAO	Candidate Noise Abatement Objective
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CODA	Central Office of Delay Analysis
CO_2	Carbon Dioxide
COMAR	Control of Major Accident Hazard
CTPRO	Change to Permitted Runway Operations
CSO	Central Statistics Office
CD	Cardiovascular Disease

Abbreviation / Term	Definition
C_6H_6	Benzene
DAA	Dublin Airport Authority
dB	The unit of noise measurement that expresses the loudness in terms of decibels (dB) based on a weighting factor for humans sensitivity to sound (A)
dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies
DBA	Desk-Based Assessment
DCHG	Department of Culture, Heritage and the Gaeltacht
DCLG	Department od Communities and Local Government
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
DfE	Department of Education
DfT	Department for Transport
DoEHLG	Department of Transport and the Department of Environment, Heritage and Local Government
DRAQMP	Dublin Regional Air Quality Management Plan
DTTAS	Department of Transport, Tourism and Sport
DUB	Dublin
EASA	European Aviation Safety Agency
EC	European Commission
ED	Electoral Divisions
EIA	Environmental Impact Assessment.
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPS	European Protected Species
EPUK	Environmental Protection UK
ETS	Emission Trading Scheme
EU	European Union
FAA	Federal Aviation Administration
FDI	Foreign Direct Investment
FEGP	Fixed Electrical Ground Power
FCC	Fingal County Council
FRA	Flood Risk Assessment
NFTMS	Flight Track Monitoring System
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GSE	Ground Support Equipment
ha	Hectare
HFCs	Hydrofluorocarbons
HIA	Health Impact Assessment
HSA	Health and Safety Authority

Abbreviation / Term	Definition
HSE	Health and Safety Executive
HT	High Technology
IAA	Irish Aviation Authority
IAI	Institute of Archaeologists Ireland
IAQM	Institute of Air Quality Management
ICAO	International Civil Aviation Organisation
ICE	Inventory of Carbon and Energy
ICCI	In-combination Climate Change Impact Assessment
IEMA	Institute of Environmental Management and Assessment
IFC	International Finance Corporation
IFI	Inland Fisheries Ireland
IGI	Institute of Geologists of Ireland
IHD	Ischaemic Heart Disease
IHT	Institution of Highways and Transportation
IPC	Integrated Pollution Control
IPPC	Intergovernmental Panel on Climate Change
ISO	International Organisation for Standardisation
IW	Irish Water
JA	Jobseekers Allowance
JB	Jobseekers Benefit
km	Kilometres
LAP	Local Area Plan
LAQM	Local Air Quality Management.
LDC	Least Developed Countries
LLDC	Landlocked Developing Countries
Ltd.	Limited
LTO	Landing and Take-off
mppa	Million Passengers Per Anum
NAO	Noise Abatement Objective
NAP	National Aviation Policy
N/A	‘Not applicable’ or ‘Not appropriate’
NDP	The National Development Plan 2018 – 2027
NFTMS	Noise and Flight Track Monitoring System
NF_3	Nitrogen Trifluoride
NIAH	National Inventory of Architectural Heritage
NIS	Natura Impact Statement
NLS	National Landscape Strategy
NMS	National Monument Service
NMTs	Noise Monitoring Terminals
NO_2	Nitrogen Dioxide
NOEL	No Observed Effect Level
NO_x	Nitrogen Oxides

Abbreviation / Term	Definition
NPPF	National Planning Policy Framework. (UK)
NPF	National Planning Framework
NPPG	National Planning Policy Guidance (UK)
NPWS	National Parks and Wildlife Services
NQP	Night Quota Period
NRA	National Roads Authority
NSO	National Strategic Outcomes
NSS	National Spatial Strategy
NTA	National Transport Authority
NTS	Non-Technical Summary
N_2O	Nitrous Oxide
O-D	Origin-Destination
OPW	Office of Public Works
OS	Ordnance Survey
OSI	Ordnance Survey Ireland
PAX	Annual Passengers
PDA	Planning and Development Acts
PFCs	Perfluorocarbons
PM_{10}	Particulate Matter
$PM_{2.5}$	Particulate Matter
PWHT	Polluted Water Holding Tank
QC	Quota Count
QI	Qualifying Interest
RMP	Record of Monument and Places
RMSE	Root Mean Square Error
RoI	Republic of Ireland
RPS	Record of Protected Structures
RSES	Regional Spatial and Economic Strategy
PSZ	Public Safety Zones
SA	Small Areas
SAC	Special Area of Conservation
SCI	Special Conservation Interests
SEAI	Sustainable Energy Authority of Ireland
SF_6	Sulphur Hexafluoride
SI	Statutory Instrument
SID	Standard Instrument Departure
SIDS	Small Island Developing States
SO_2	Sulphur Dioxide
SPA	Special Protected Area
SRI	Societal Risk Index
SSSI	Site of Special Scientific Interest
TFS	Trans Frontier Shipping

Abbreviation / Term	Definition
TII	Transport Infrastructure Ireland
TOC	Total Organic Carbon
TPA	Tom Philips + Associates
TTA	Traffic and Transport Assessment
UK	United Kingdom
UV	Ultraviolet
VOC	Volatile Organic Compounds
WFD	Water Framework Directive
WHO	World Health Organisation
ZOI	Zone of Influence

Key Concepts and Terminology Used in the EIAR

(Proposed) Relevant Action
The proposed **Relevant Action** is to amend condition no. 3(d) and replace condition 5 of the **North Runway Planning Permission**, as described in Chapter 1 ('Introduction') and Chapter 2 ('Characteristics of the Project').

32 million passengers per annum (mppa) Cap (32 mppa Cap)
Cap on the permitted annual passenger capacity of the Terminals at Dublin Airport as a result condition no. 3 of the **Terminal 2 Planning Permission** and condition no. 2 of the **Terminal 1 Extension Planning Permission**. These conditions provide that the combined capacity of Terminal 1 and Terminal 2 together shall not exceed 32 million passengers per annum.

Permitted Scenario
This scenario assumes that the North Runway becomes operational but the airport is constrained by the restrictions on night-time use of the runway system at Dublin Airport, namely the restriction on the number of flights permitted between the hours of 23:00 and 07:00 which limits the number of flights to an average of 65 between these hours and the restriction of the use of North Runway at night (no use between 23:00 and 07:00) (i.e. conditions no. 3(d) and no. 5). These conditions do not currently apply to Dublin Airport but would come into force once the North Runway becomes operational. The **Permitted Scenario** also assumes that the current **32 mppa Cap** remains in place. Taken together, these characteristics mean that the **Permitted Scenario** represents the 'do nothing' case.

Proposed Scenario
This scenario represents the situation with the proposed **Relevant Action** in place. It assumes that the North Runway becomes operational but the airport is not constrained by the restrictions on night-time use of the runway system at Dublin Airport, namely the restriction on the number of flights permitted between the hours of 23:00 and 07:00 which limits the number of flights to an average of 65 between these hours (i.e. conditions no. 3(d) and no. 5). Instead the **Proposed Scenario** involves use of North Runway in the shoulder hours 06:00 to 07:00 and 23:00 to 00:00 and the introduction of a noise **Quota Count System** to replace the 65 average number of flights restriction. The **Proposed Scenario** also assumes that the current **32 mppa Cap** remains in place.

Current State of the Environment
The is the description of the current environmental conditions, as required by the EIA Directive 2011/92/EU (as amended by Directive 2014/52/EU). It is determined through desk-study and surveys undertaken between 2018 and 2021, as detailed in the technical chapters.

Future Receiving Environment
The **Future Receiving Environment** is the predicted state of the environment in three **Assessment Years** (2022, 2025 and 2035) and represents the likely evolution of the **Current State of the Environment** without implementation of the proposed **Relevant Action**. It is also used as the baseline environment against which the assessment of effects of the **Proposed Scenario** is undertaken. It is derived from the **Current State of the Environment**, adjusted to reflect likely changes occurring between now and the assessment years (insofar as it is possible to determine these).
This is in line with the draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2017) which explain that the predicted future baseline may be referred to as the likely future receiving environment.

Assessment of Effects
The effects of the proposed **Relevant Action** are identified by examining the predicted impacts of the **Permitted Scenario** on the **Future Receiving Environment** and comparing these with the predicted impacts of the **Proposed Scenario** on the same **Future Receiving Environment**.

Assessment Year(s)
The **Assessment Years** are the points in time at which the likely significant effects of the proposed **Relevant Action** are assessed. The reasons for selecting these years are given below.

- **2022**: the year when the North Runway is first expected to become operational.

- **2025**: the first year of highest use of the runway system in the **Proposed Scenario** (i.e. when 32 million passengers per annum throughput is first expected to be reached but not exceeded). This is also the first year of predicted maximum environmental effects in the **Proposed Scenario**.

- **2035**: this year has been included in the assessment in response to a request from Fingal County Council for Further Information which sought assessment of a longer-term scenario (i.e. 10 or 15 years post opening year scenario (2022).

North Runway Planning Permission

The **North Runway Planning Permission** is the planning application FCC Reg. Ref. No. F04A/1755; ABP Ref. No.: PL06F.217429 granted on 29th August 2007, and as amended by FCC F19A/0023, ABP Ref. No. ABP-305298-19 granted on the 18th March 2020 by An Bord Pleanála.

Terminal 1 Extension Planning Permission

The **Terminal 1 Extension Planning Permission** is the planning application FCC Reg. Ref. No. F06A/1843, ABP Ref. PL06F. 223469 granted on the 10th January 2008 by An Bord Pleanála.

Terminal 2 Planning Permission

The **Terminal 2 Planning Permission** is the planning application FCC Reg. Ref. No. F06A/1248, ABP Ref. PL06F.220670 granted on the 29th August 2007 by An Bord Pleanála.

Balanced Approach

The principle of the "balanced approach" to aircraft noise management was adopted by the International Civil Aviation Organisation (ICAO) Assembly in 2011. The **Balanced Approach** recognises the importance of achieving a careful balance between the interests of developing airport growth as well as managing noise levels; operating restrictions are only considered when all other elements of the **Balanced Approach** have been assessed.

Noise Abatement Objective

The Aircraft Noise (Dublin Airport) Regulation Act 2019 (Aircraft Noise Act) implements European Union Regulation 598/2014 on the establishment of rules and procedures with regard to the introduction of noise related operating restrictions at EU Airports within the **Balanced Approach**.

The Aircraft Noise Act also sets out a process of aircraft noise regulation whereby the Aircraft Noise Competent Authority (ANCA) shall ensure that the **Balanced Approach** is adopted where a noise problem at the airport has been identified and requires the identification of a **Noise Abatement Objective** (NAO) as appropriate.

Quota Count System

A Quota Count (QC) system is designed to limit the overall amount of noise produced by aircraft using an airport, based on an allowable Annual Noise Quota (ANQ) for a given time period. A QC value is assigned to each individual aircraft movement based on the certified noise level of that aircraft. Lower QC values are attributed to aircraft with lower noise levels, higher values to noisier aircraft. The QC accumulates for each Air Traffic Movement (ATM) against the allowable ANQ across the chosen time period. As such, the system allows a greater number of quieter aircraft movements within a given quota thereby encouraging the use of quieter aircraft at the airport.

Requests for Further Information from the Aviation Noise Competent Authority

The Aviation Noise Competent Authority (ANCA) to Dublin Airport made a request for further information (RFI) (Direction 01, dated 24th February 2021), in respect of daa's Relevant Action Application for the Dublin Airport North Runway. It is noted that pursuant to Section 9(10) of the Aircraft Noise (Dublin Airport) Regulation Act 2019, ANCA is exercising its power by directing daa to provide the information.

In the main the responses have been provided in the AECOM report *Dublin Airport North Runway, Relevant Action Application Final - Response to ANCA Direction 01 in relation to planning application F20A/0668*. However, some RFIs could be answered more easily in the context of the revised EIAR. The location of these RFI responses is given in the table below.

ANCA RFI Number	Location of Information
5	Chapter 9: Traffic and Transport
7	Chapter 11: Climate and Carbon, Section 11.3 Methodology
9	Chapter 1: Introduction, Section 1.5 EIAR Methodology and Relevant Guidelines 'Scenarios Assessed'
10	Chapter 14: Ground Noise and Vibration
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1. Introduction

1.1 Background

1.1.1 This revised Environmental Impact Assessment Report (EIAR) has been prepared on behalf of daa (hereafter referred to as 'the Applicant') to accompany the application for a proposed development comprising the taking of a 'relevant action' only within the meaning of Section 34C of the Planning and Development Act 2000, as amended (the "PDA").

1.1.2 The Applicant applied to Fingal County Council (FCC) for a proposed Relevant Action in December 2020. By letter dated 19th February 2021, FCC requested further information in respect of the proposed Relevant Action (the "Request for Further Information"). Item 1 in the Request for Further Information sought the provision of various clarifications and additional information, to be presented in a revised EIAR. This revised EIAR has been prepared in response to the Request for Further Information.

1.1.3 The proposed Relevant Action relates to the night-time use of the runway system at Dublin Airport. It involves the amendment of the operating restriction set out in condition no. 3(d) and the replacement of the operating restriction in condition no. 5 of the North Runway Planning Permission, as well as proposing new noise mitigation measures.

1.1.4 The proposed Relevant Action, if permitted, would remove the numerical cap on the average number of flights permitted between the hours of 23:00 and 07:00 that is due to come into effect in accordance with the North Runway Planning Permission, replacing it with an annual night-time noise quota between 23:30 and 06:00 and also to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00. Overall, this would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 over and above the number stipulated in condition no. 5 of the North Runway Planning Permission, in accordance with the annual night-time noise quota.

1.2 Project Overview

1.2.1 The application site, shown in Figure 1-1 (*EIAR Volume 3: Figures*) is defined as being located at Dublin Airport, Co. Dublin, in the townlands of Collinstown, Toberbunny, Commons, Cloghran, Corballis, Coultry, Portmellick, Harristown, Shanganhill, Sandyhill, Huntstown, Pickardstown, Dunbro, Millhead, Kingstown, Barberstown, Forrest Great, Forrest Little and Rock on a site of c. 580 ha. The application site includes the runaway system at the airport, including the North Runway itself which is currently under construction in the northern extent of the airport.

1.2.2 The North Runway Planning Permission contains 31 planning conditions. Two of these planning conditions (conditions no. 3(d) and 5) relate to operating restrictions on the use of the runways and overall number of permitted flights at night, and these are due to come into force once the North Runway is operational. In addition, condition no. 4 of the North Runway Planning Permission introduces a restriction on the use of the Crosswind Runway (16/34) to essential occasional use only. For avoidance of doubt there is no intention to apply to amend, review or revoke condition no. 4.

1.2.3 Since the North Runway Planning Permission was granted, there has been rapid growth in passenger numbers, and the current runway infrastructure was already at capacity at peak times in 2018 and 2019.

1.2.4 Notwithstanding the current situation with the Covid-19 pandemic, there is still a need to safeguard recovery in air traffic movements at the airport at night-time which means addressing the night-time operating restrictions attached to the North Runway Planning Permission. The proposed Relevant Action application has therefore been prepared to request an amendment to condition 3(d) and a replacement of condition no. 5 as conditioned by the North Runway Planning Permission.

1.2.5 The proposed Relevant Action pursuant to Section 34C (1) (a) is to amend condition no. 3(d) of the North Runway Planning Permission. Condition no. 3(d) and the exceptions at the end of condition no. 3 state the following:

> *'3(d). Runway 10L-28R shall not be used for take-off or landing between 2300 hours and 0700 hours.*
>
> *except in cases of safety, maintenance considerations, exceptional air traffic conditions, adverse weather, technical faults in air traffic control systems or declared emergencies at other airports.'*

1.2.6 The proposed Relevant Action seeks to amend the above condition so that it reads:

> *'Runway 10L-28R shall not be used for take-off or landing between 0000 hours and 0559 hours*
>
> *except in cases of safety, maintenance considerations, exceptional air traffic conditions, adverse weather, technical faults in air traffic control systems or declared emergencies at other airports or where Runway 10L-28R length is required for a specific aircraft type.'*

1.2.7 The net effect of the proposed amendment, if permitted, would change the normal operating hours of the North Runway from 07:00 to 23:00 to 06:00 to 00:00.

1.2.8 The proposed Relevant Action also seeks to replace condition no. 5 of the North Runway Planning Permission which provides as follows:

> *'5. On completion of construction of the runway hereby permitted, the average number of night time aircraft movements at the airport shall not exceed 65/night (between 2300 hours and 0700 hours) when measured over the 92 day modelling period as set out in the reply to the further information request received by An Bord Pleanála on the 5th day of March, 2007.*
>
> ***Reason**: To control the frequency of night flights at the airport so as to protect residential amenity having regard to the information submitted concerning future night time use of the existing parallel runway.'*

1.2.9 It is proposed to replace condition no. 5 of the North Runway Planning Permission with a Noise Quota System in respect of night-time noise at the airport. The airport shall be subject to an Annual Noise quota of 7,990 quota count points between 23:30 and 06:00.

1.2.10 In addition to the proposed night-time noise quota, the proposed Relevant Action also entails the introduction of the following noise mitigation measures:

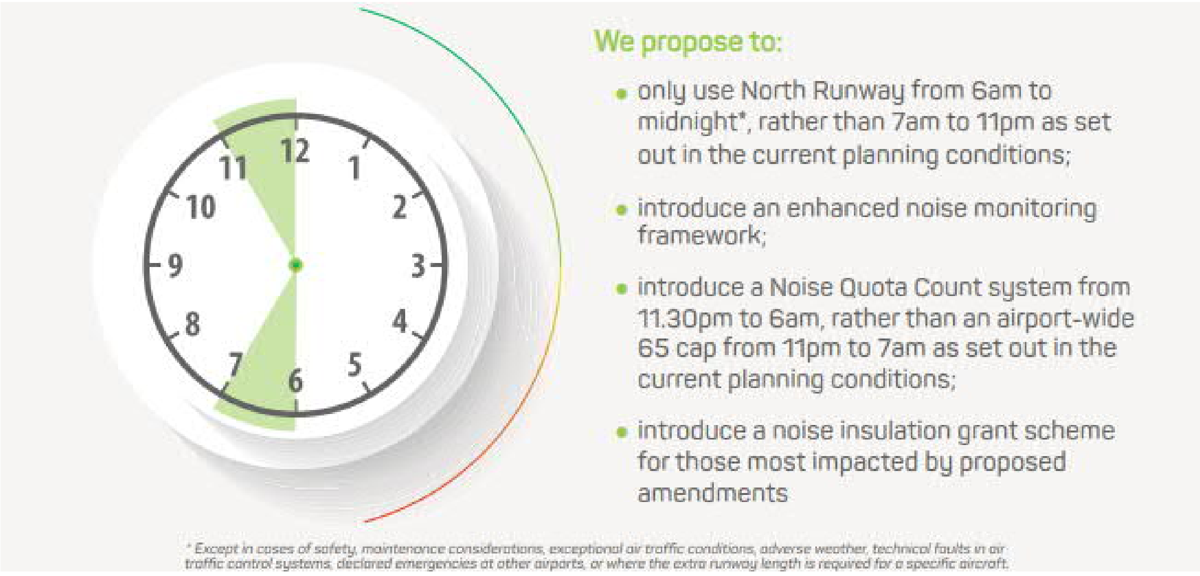
- A noise insulation grant scheme for eligible dwellings within specific night noise contours; and
- A detailed Noise Monitoring Framework to monitor the noise performance with results to be reported annually to the Aircraft Noise Competent Authority ("ANCA"), in compliance with the Aircraft Noise (Dublin Airport) Regulation Act 2019.

1.2.11 These measures are discussed in *Chapter 13: Aircraft Noise & Vibration* of the EIAR.

1.2.12 The proposed Relevant Action does not seek any amendment of conditions of the North Runway Planning Permission governing the general operation of the runway system (i.e., conditions which are not specific to night-time use, namely conditions no. 3(a), 3(b), 3(c) and 4 of the North Runway Planning Permission) or any amendment of permitted annual passenger capacity of the Terminals at Dublin Airport. Condition no. 3 of the Terminal 2 Planning Permission provides that the combined capacity of Terminal 1 and Terminal 2 together shall not exceed 32 million passengers per annum (mppa) ('the 32mppa Cap').

1.2.13 The planning application for the proposed Relevant Action will be subject to an assessment by the Aircraft Noise Competent Authority (ANCA) in accordance with the Aircraft Noise (Dublin Airport) Regulation Act 2019 (the Aircraft Noise Act) which implements European Union (EU) Regulation 598/2014 on the establishment of rules and procedures with regard to the introduction of noise related operating restrictions at EU Airports. It introduces the concept of the 'Balanced Approach' developed by the International Civil Aviation Organization (ICAO), which is an approach to managing noise at an airport. Under the Balanced Approach after identification of a noise problem at an airport, analysis of the various measures available to reduce noise is carried out through the exploration of four principal elements (reduction at source, land use planning and management, noise abatement operational procedures and operating restrictions). The Aircraft Noise Act amends the PDA to cater for revoking, amending or replacing operating restrictions at Dublin Airport. The planning application is accompanied by information provided for the purposes of such Balanced Approach assessment[1].

1.2.14 The proposed Relevant Action relates to the night-time use of the runway system at Dublin Airport. As set out above, it involves the amendment of the operating restriction set out in condition no. 3(d) and the replacement of the operating restriction in condition no. 5 of the North Runway Planning Permission, as well as proposing new noise mitigation measures. Conditions no. 3(d) and no. 5 have not yet come into effect or operation, as the construction of the North Runway on foot of the North Runway Planning Permission is ongoing.



1.2.15 Further detail regarding the characteristics of the proposed Relevant Action is presented in *Chapter 2: Characteristics of the Project*, and further detail of the need for the proposed Relevant Action is given in *Chapter 3: Need for the Project*, of this EIAR.

1.3 EIA Process

1.3.1 EIA is the process for assessing the likely significant effects, if any, which proposed development, if carried out, would have on the environment. An EIA is required for certain classes of project as defined in domestic legislation that transposes the EIA Directive 2011/92/EU (as amended by Directive 2014/52/EU). Amendments introduced by the 2014 Directive were transposed into Irish law on the 1st September 2018 in the form of the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (hereafter referred to as 'the EIA Regulations'), which amended the Planning and Development Regulations, 2001.

1.3.2 An EIA is required for certain classes of projects defined in Schedule 5, Part 2(10) (d)) of the Planning and Development Regulations 2001, as amended. Where a project falls into one of these classes and exceeds a related size threshold (also defined in the legislation) an EIA is required. Where the project is below the threshold an EIA may still be required if there is the potential for significant environmental effects and this potential is assessed in relation to criteria set out in Annex III of the EIA Directive.

1.4 Need for an EIA

1.4.1 The application relates to a proposed Relevant Action only and will involve no construction works or changes to the consented physical infrastructure of the North Runway. Therefore, the proposed Relevant Action is not a project within the meaning of the EIA Directive.

1.4.2 On the basis of the case law of the Court of Justice of the European Union (CJEU), and, in particular, the Judgments in the *Brussels Airport* Case (Case C-275/09) and *Pro-Braine* (Case C-121/11), this application to amend condition no. 3(d) and replace condition no. 5 of the North Runway Planning

[1] Ricondo: Dublin Airport North Runway, Regulation 598/2014 (Aircraft Noise Regulation) Cost Effectiveness Analysis Report (Revision 2 – September 2021)

Permission is not an application for development consent for a 'project' within the meaning of the EIA Directive, and is therefore outside the scope of that Directive. Strictly without prejudice to that position, daa is submitting an EIAR with the application in order to allow a comprehensive assessment of the environmental effects of the proposed Relevant Action take place.

1.5 EIAR Methodology and Relevant Guidelines

Scoping the EIA

1.5.1 Scoping is the process by which the matters to be addressed in the EIAR are defined. The aim is to focus the assessment on matters where a project may have a significant effect upon the environment and to avoid unnecessary discussion of matters where there is evidently no impact.

1.5.2 According to the European Commission, scoping:

> "…*defines the EIA Report's content and ensures that the environmental assessment is focused on the Project's most significant effects on the factors listed in Article 3 of the Directive, and that time and money are not spent on unnecessary examinations*"[2]

1.5.3 An EIAR must address all the factors defined in Article 3 of the Directive, however this does not mean that any or all factors will necessarily be impacted by a project, and it is best practice to scope out of the assessment those matters where it is clear that no impacts will arise. To agree which matters may reasonably be scoped out, legislation makes provision for a formal scoping opinion to be requested from the competent authority, in this case FCC, but this is not mandatory.

1.5.4 No formal scoping opinion was sought for this revised EIAR because the Request for Further Information from FCC, in effect, defined the revised scope. All of the factors in Article 3 of the Directive have a chapter dedicated to them in the revised EIAR and each describes the matters that are considered in the assessment methodology sections, before proceeding to an assessment of the effects of the proposed Relevant Action. The detail in the assessment for the impacts varies from chapter to chapter, according to the degree to which significant effects on each factor have the potential or are likely to occur.

EIAR Preparation

1.5.5 An EIAR is defined by the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 246 of 2018) as:

> "…*a report of the effects, if any, which proposed development, if carried out, would have on the environment and shall include the information specified in Annex IV of the Environmental Impact Assessment Directive*".

1.5.6 An objective of the EIAR is therefore to identify baseline environmental conditions in and around the application site, identify significant environmental effects, predict potential significant beneficial and/or significant adverse effects of the proposed Relevant Action and propose appropriate mitigating measures where necessary, as set out in Plate 1-1 below.

[2] *Environmental Impact Assessment of Projects: Guidance on Scoping (Directive 2011/92/EU as amended by 2014/52/EU)*, European Commission (2017)

1.5.7 This EIAR assesses, as required, the direct effects and any indirect, secondary, cumulative, transboundary, short term, medium term and long term permanent and temporary, positive and negative effects of the proposed Relevant Action.

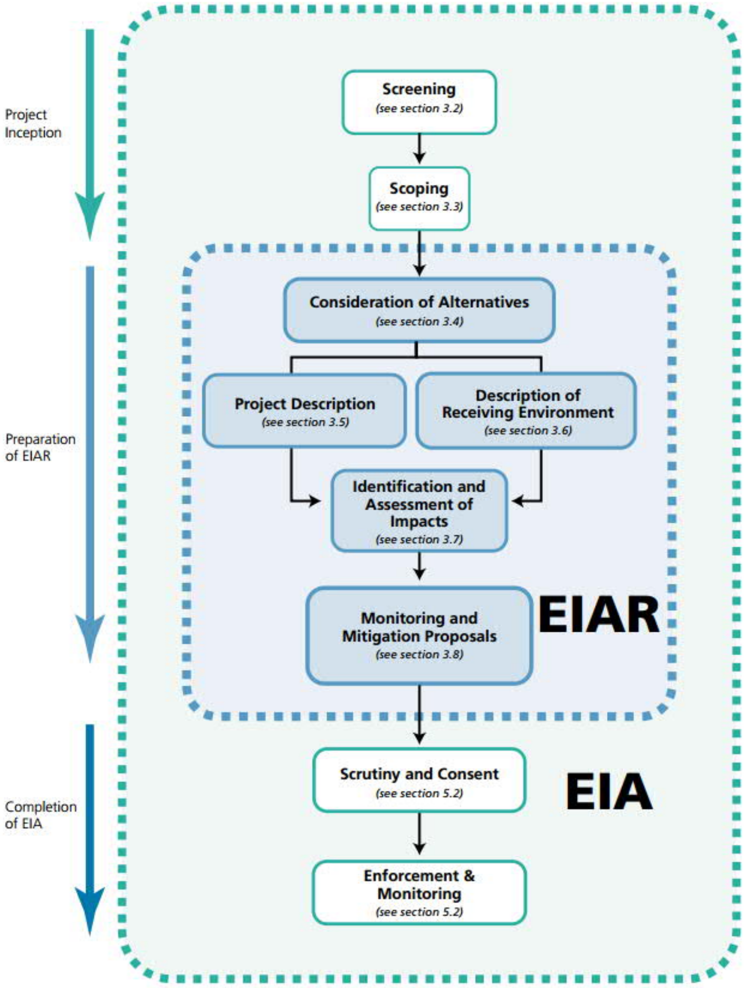


Plate 1-1: EIA Process (EIAR Draft Guidelines, EPA, 2017)

1.5.8 As outlined in Section 1.2, the proposed Relevant Action relates solely to proposals to amend condition no. 3(d) and replace condition no. 5 of the North Runway Planning Permission and does not comprise or require the development of any physical or other infrastructure.

1.5.9 The Environmental Protection Agency (EPA) is required to "prepare Guidelines on information to be contained in environmental impact statements" (as outlined in Section 72 of the Environmental Protection Agency Act 1992, as amended, which established the EPA). The Environmental Protection Act 1992 (as amended) further provides that those preparing and evaluating EIARs shall have regard to such guidelines. This is intended to provide developers, competent authorities and the general public with guidance on the preparation and assessment of EIARs, within the context of established development consent procedures.

1.5.10 The following EIA regulations and EPA guidelines were considered by AECOM in preparing this EIAR:

- The requirements of EC Directives and Irish Regulations regarding EIA, the EIA Directive 2011/92/EU (as amended by Directive 2014/52/EU) and the Planning and Development Regulations 2001 European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296/2018);
- Guidelines on the information to be contained in Environmental Impact Statements, EPA, (Draft August 2017) (hereafter referred to as 'the Draft EPA Guidelines');
- Advice Notes for preparing Environmental Impact Statements, EPA, Draft September 2015; and

- Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU), European Union, 2017.

1.5.11 In addition to this, a number of specific guidance documents have been used in individual assessments where required. These will be addressed within the policy and legislation section of each assessment topic covered within the EIAR.

1.5.12 Information on the proposed Relevant Action and the receiving environment was obtained through a number of means including:

- Review of existing data for the general area of the application site;
- Review of previous studies carried out at the application site and locality;
- Site visits and field surveys;
- Aerial photographs;
- Meetings with FCC; and
- Engagement with local communities as part of the Dublin Airport consultation programme.

Identifying Potentially Significant Environmental Effects

1.5.13 The Draft EPA Guidelines states the identification of potential likely significant impacts from different phases of a proposed development should be considered as far as reasonably possible. The environmental assessments have evaluated the effects of the proposed Relevant Action (the Proposed Scenario), and the likelihood, extent, magnitude, duration, reversibility and significance of any likely potential impacts of the proposed Relevant Action versus the consented operations (the Permitted Scenario).

1.5.14 Where appropriate, specific criteria for certain technical disciplines have been utilised, giving due regard to the following criteria from the Draft EPA Guidelines:

- The magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected);
- The nature of the impact;
- The transboundary nature of the impact;
- The intensity and complexity of the impact;
- The probability of the impact;
- The expected onset, duration, frequency and reversibility of the impact;
- The accumulation of the impact with the impact of other existing and/or approved projects; and
- The possibility of effectively reducing the impact.

Assessment Terminology

1.5.15 In order to provide a consistent approach across the different technical disciplines, the following terminology will be used throughout the EIAR. This terminology has been adapted from the Draft EPA Guidelines. Where individual environmental topics use different terminology due to specific guidance or legislative requirements, this is described further in that section.

1.5.16 To define residual effects (i.e. the effect after the application of any required additional mitigation measures), the following terminology is used:

- Positive/Beneficial Effects – A change which improves the quality of the environment (for example, by increasing species diversity; or improving the reproductive capacity of an ecosystem, or by removing nuisances or improving amenities);

- Negative/Adverse Effects – A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance); and
- Neutral Effects – No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.

1.5.17 When addressing the duration of an effect, the following terminology is used:

- Momentary Effects – Effects lasting from seconds to minutes;
- Brief Effects – Effects lasting less than a day;
- Temporary Effects – Effects lasting less than a year;
- Short-term Effects – Effects lasting one to seven years;
- Medium-term Effects – Effects lasting seven to fifteen years;
- Long-term Effects – Effects lasting fifteen to sixty years;
- Permanent Effects – Effects lasting over sixty years;
- Reversible Effects – Effects that can be undone, for example through remediation or restoration; and
- Frequency of Effects – Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).

1.5.18 The extent and context of an effect will also be described as this can affect the perception of significance. These terms are defined as:

- Extent – Describe the size of the area, the number of sites, and the proportion of a population affected by an effect; and
- Context – Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?).

1.5.19 Where adverse or beneficial effects are identified, these are assessed against the following scale:

- Imperceptible – An effect capable of measurement but without significant consequences;
- Not significant – An effect which causes noticeable changes in the character of the environment but without significant consequences;
- Slight Effects – An effect which causes noticeable changes in the character of the environment without affecting its sensitivities;
- Moderate Effects – An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends;
- Significant Effects – An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment;
- Very Significant – An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment; and
- Profound Effects – An effect which obliterates sensitive characteristics.

1.5.20 Finally, the probability of an effect has been defined to establish how likely it is to occur.

- Likely Effects – The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented; and
- Unlikely Effects – The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

Significance Criteria

1.5.21 For each technical EIAR chapter, the classification and significance of effects have been evaluated with reference to definitive standards, accepted criteria and legislation where available. Where it has not been possible to quantify effects, qualitative assessments were carried out, based on professional opinion and professional judgement. Where uncertainty exists, this is noted in the relevant EIAR chapter.

1.5.22 For each topic, the technical assessment considered the magnitude of impacts and the sensitivity of the resources / receptors that could be affected in order to classify the effect. Each technical discipline has its own method based on applicable standards and approaches, which are detailed in a transparent and understandable way within the EIAR chapter.

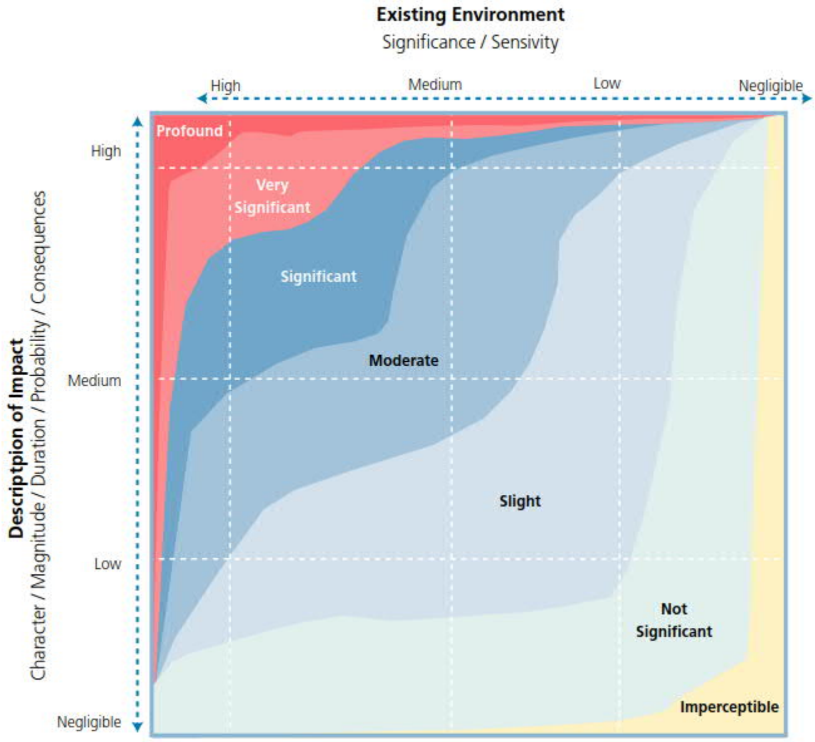


Plate 1-2: Determination of the Significance of an Effect (Source: Environmental Protection Agency[3])

1.5.23 In general, residual effects found to be 'significant', 'very significant' or 'profound' are deemed to be significant, whilst effects found to be 'moderate', 'slight', 'not significant' and 'imperceptible' are considered to not be significant.

Cumulative Effects

1.5.24 The EIA Directive states in Annex IV (5) that an EIAR should contain:

> '*A description of the likely significant effects of the project on the environment resulting from…the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources*.'

1.5.25 The EIA Directive therefore makes clear that the description of the likely significant effects should cover cumulative effects. The Draft EPA Guidelines explains that cumulative effects are '*the addition of many minor or significant effects, including the effects of other projects, to create larger, more significant effects'*.

[3] Environmental Protection Agency (2017), draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports

1.5.26 *Chapter 21: Interactions & Cumulative Effects*, assesses the cumulative and synergistic effects associated with the proposed Relevant Action. These two types of environmental effects are defined as:

- Synergistic Effects - Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of oxides of sodium and oxides of nitrogen to produce smog).; and
- Cumulative Effects - The potential for effects of the proposed Relevant Action to combine with effects from other projects in the vicinity and lead to significant effects.

1.5.27 Interactions with other schemes and transboundary effects has also been considered. Further detail is provided in *Chapter 21: Interactions & Cumulative Effects*.

Scenarios Assessed

1.5.28 As discussed in Section 1.2, the proposed Relevant Action involves the amendment of the operating restriction set out in condition no. 3(d) and the replacement of the operating restriction in condition no. 5 of the North Runway Planning Permission. This is referred to in the EIAR as the Proposed Scenario (i.e. unconstrained by conditions no. 3(d) and no. 5).

1.5.29 If condition no. 3(d) is not amended and condition no. 5 is not replaced), then the restrictions would take effect when the North Runway becomes operational. This is referred in the EIAR as the Permitted Scenario (i.e. constrained by condition no. 3(d) and no. 5).

1.5.30 The EIA focuses on the comparison between these scenarios i.e. the Permitted and the Proposed Scenario. The Assessment Years for these scenarios across the technical topics are 2022, 2025 and 2035. These scenarios and assessment years are discussed further below.

Permitted Scenario

1.5.31 This scenario assumes that the North Runway becomes operational but the airport is constrained by the restrictions on night-time use of the runway system at Dublin Airport, namely the restriction on the number of flights permitted between the hours of 23:00 and 07:00 which limits the number of flights to an average of 65 between these hours and the restriction of the use of North Runway at night (no use between 23:00 and 07:00) (i.e. conditions no. 3(d) and no. 5). These conditions do not currently apply to Dublin Airport but would come into force once the North Runway becomes operational. The Permitted Scenario also assumes that the current 32 mppa Cap remains in place. Taken together, these characteristics mean that the Permitted Scenario represents the 'do nothing' case.

Proposed Scenario

1.5.32 This scenario represents the situation with the proposed Relevant Action in place. It assumes that the North Runway becomes operational but the airport is not constrained by the restrictions on night-time use of the runway system at Dublin Airport, namely the restriction on the number of flights permitted between the hours of 23:00 and 07:00 which limits the number of flights to an average of 65 between these hours (i.e. conditions no. 3(d) and no. 5). Instead the Proposed Scenario involves use of North Runway in the shoulder hours 06:00 to 07:00 and 23:00 to 00:00 and the introduction of a noise Quota Count System to replace the 65 average number of flights restriction. The Proposed Scenario also assumes that the current 32 mppa Cap remains in place.

1.5.33 For clarity, note that neither scenario, Permitted or Proposed, imposes a limit on Air Traffic Movements in and out of Dublin Airport, although in practice the 32mppa Cap and the makeup of the aircraft fleet will provide such a ceiling.

Assessment Years

1.5.34 The Assessment Years are the points in time at which the likely significant effects of the proposed Relevant Action are assessed. The reasons for selecting these years are given below;

- 2022: the year when the North Runway is first expected to become operational;

- 2025: the first year of highest use of the runway system in the Proposed Scenario (i.e. when 32 million passengers per annum throughput is first expected to be reached but not exceeded). This is also the first year of predicted maximum environmental effects in the Proposed Scenario; and
- 2035: this year has been included in the assessment in response to a request from FCC for Further Information which sought assessment a longer-term scenario (i.e. 10 or 15 years post opening year scenario (2022).

1.5.35 The Permitted and Proposed Scenarios outlined above are the same in all the Assessment Years (2022, 2025 and 2035).

1.5.36 The Mott MacDonald Report Dublin Airport Operating Restrictions Quantification of Impacts on Future Growth, presented in Appendix 1A, sets out the predicted Air Traffic Movements (ATMs) and Annual Passengers (PAX) for the future Permitted and Proposed Scenarios. The PAX numbers and ATMs, taken from this report, and assessed in this EIAR are provided in Table 1-1. In addition, the forecast Busy Day ATMs for the 23:00 to 07:00 have been provided. These were developed using the Motts forecast and are based on runway times (not scheduled times).

Table 1-1: Assessment Years, Scenarios, PAX and ATMs

Assessment Years and Scenarios	Predicted Annual Passengers (PAX) (millions per annum)	Permitted vs Proposed Difference in PAX (millions)	Air Traffic Movements (ATMs) ('000s per annum)	Typical 'Busy Day' Night-Time ATMs (23:00-07:00)
2022 Permitted	19.6	n/a	166	51
2022 Proposed	21.0	1.4	176	82
2025 Permitted	30.4	n/a	227	60
2025 Proposed	32.0	1.6	236	98
2035 Permitted	32.0	n/a	236	65
2035 Proposed	32.0	0.0	236	98

1.5.37 It should be noted that these figures are different to those quoted in the December EIAR as the forecasts have been revised to take account of the fast-changing situation in the airline industry. The latest forecast schedules have a smaller share of foreign airline traffic, which tends to operate during the 07:00-23:00 daytime hours. Most notably, the UK carrier FlyBE and Norwegian Airlines have exited the Dublin market. Therefore, the latest view of traffic recovery is more dependent on Aer Lingus and Ryanair, which require departure slots in the 06:00-07:00 period of the night and often last arrivals after 23:00. This means that in the post Covid-19 recovery, more traffic is now impacted by the 65 average night-time limit and the impact of the night operating restrictions are now calculated to be approximately 1.6m passengers in 2025.

1.5.38 Although not apparent from Table 1-1, a key difference between the two scenarios is that the post-Covid-19 return to operations at the 32mppa Cap in the airport is delayed by around two years in the Permitted Scenario. This is achieved in 2025 in the Proposed Scenario, whereas in the Permitted Scenario the 32mppa Cap is reached in 2027. A total of around 7.1 million fewer passengers would pass through the airport by 2027 in the Permitted Scenario.

Current State of the Environment

1.5.39 The is the description of the current environmental conditions, as required by the EIA Directive 2011/92/EU (as amended by Directive 2014/52/EU). It is determined through desk-study and surveys undertaken between 2018 and 2021, as detailed in the technical chapters.

Future Receiving Environment

1.5.40 The Future Receiving Environment is the predicted state of the environment in the three Assessment Years (2022, 2025 and 2035) and represents the likely evolution of the Current State of the Environment without implementation of the proposed Relevant Action. It is also used as the baseline environment against which the assessment of effects of the Proposed Scenario is undertaken. It is derived from the Current State of the Environment, adjusted to reflect likely changes occurring between now and the Assessment Years (insofar as it is possible to determine these)[4].

1.6 Format of the Revised EIAR

1.6.1 This EIAR was prepared as part of the EIA process, which includes a baseline assessment to determine the Current State of the Environment, impact prediction and evaluation, and determining appropriate mitigation measures, including monitoring and reinstatement where appropriate.

1.6.2 This EIAR has been prepared according to the 'Grouped Format Structure' as outlined in the EPA's 'Guidelines on the information to be contained in Environmental Impact Statements' (EPA, 2002), and as evolved in 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' (EPA, 2017).

1.6.3 The EIAR is divided into 23 chapters as follows:

- Chapter 1: Introduction
- Chapter 2: Characteristics of the Project
- Chapter 3: Background and Need for the Project
- Chapter 4: Examination of Alternatives
- Chapter 5: Consultation
- Chapter 6: Planning and Development
- Chapter 7: Population and Human Health
- Chapter 8: Major Accidents and Disasters
- Chapter 9: Traffic and Transportation
- Chapter 10: Air Quality
- Chapter 11: Climate and Carbon
- Chapter 12: Water
- Chapter 13: Aircraft Noise and Vibration
- Chapter 14: Ground Noise and Vibration
- Chapter 15: Biodiversity (Terrestrial)
- Chapter 16: Biodiversity (Aquatic)
- Chapter 17: Landscape and Visual
- Chapter 18: Land and Soils
- Chapter 19: Material Assets
- Chapter 20: Cultural Heritage
- Chapter 21: Interactions and Cumulative Effects
- Chapter 22: Future Development Plans
- Chapter 23: Summary of Impacts and Mitigation

[4] The draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2017) explain that the predicted changing baseline may be referred to as the likely future receiving environment.

1.6.4 A Non-Technical Summary of this EIAR has also been prepared.

1.7 Difficulties Encountered

1.7.1 Preparation of this EIAR has been ongoing for many months. In March 2020 it became apparent that the Covid-19 pandemic was having a significant impact on global aviation. The immediate impacts were severe and in the short-medium term these impacts will continue to manifest themselves in reduced air traffic demand in Ireland and globally.

1.7.2 After the severe disruption to air travel in 2020 and anticipated partial recovery in 2021, demand is forecast to recover to about 60% of 2019 levels by 2022 and grow to 32 million annual passengers by 2025. There is uncertainty with any forecast at this time, however, it is reasonable to plan for a return to pre-Covid-19 air traffic levels by 2025. This is discussed further in *Chapter 3: Need for the Project*.

1.8 The Project Team

1.8.1 This EIAR has been prepared by an EIA team appointed by the Applicant and led by AECOM Ireland.

1.8.2 AECOM is one of the largest environmental consultancies in Europe, with extensive knowledge of EIA, and is one of eight founding members of the EIA Quality Mark scheme, helping the Institute of Environmental Management and Assessment (IEMA) to pilot the scheme prior to its launch in 2011 and maintaining membership ever since. The EIA Quality Mark is a voluntary scheme through which AECOM's EIA activity is reviewed annually by IEMA.

1.8.3 The Quality Mark demonstrates that AECOM EIAs are of high quality, technically sound, independently audited and regularly monitored to high standards. It also underlines AECOM's commitment to continuous improvement of EIA practice across the UK and Ireland.

1.8.4 The EIA process requires a multi-disciplinary approach due to the varied environment topics that could be affected by the proposed Relevant Action. Specialists within each relevant field have contributed to the assessment as set out in Table 1-2 below. Each has expertise in their field and is competent to undertake the assessments in the EIAR and have liaised with one another as necessary to ensure a uniform approach to the EIA.

Table 1-2: The Project Team

Role	Organisation	Years of Experience
EIAR co-ordination and preparation		
• Peta Donkin BSc (Hons) AIEMA	**AECOM Ireland Limited**	**20**
• Colin Bush BA (Hons), MSc, MIEMA, CEnv		**17**
Environmental topic specialists:		
• Alternatives (Peta Donkin BSc (Hons)) AIEMA	**AECOM Ireland Limited**	**20**
• Population and Human Health (David Widger BSc (Hons) MSc (Econ))		**21**
• Traffic and Transport (Colin Acton BEng CEng MIEI MCIHT)		**35**
• Air Quality (Gareth Hodgkiss BSc MSc MIEnvSc MIAQM)		**15**
• Climate and Carbon (Ian Davies BA (Hons))		**18**
• Landscape and Visual (Jorge Schulze Dipl.- Ing. (FH) LA, MILI)		**18**
• Land and Soils (Edel O'Hannelly BA (Mod.) (Natural Science), MSc (Hydrogeology))		**23**

Role	Organisation	Years of Experience
• Biodiversity, Flora and Fauna (Terrestrial) Tony Marshall BSc (Hons), MCIEEM		**11**
• Biodiversity (Aquatic) Tony Marshall BSc (Hons), MCIEEM		**11**
• Water (Drainage) (Anthony Dale BSc (Eng) Dip Eng CEng MIEI)		**28**
• Water (Edel O'Hannelly BA (Mod.) (Natural Science), MSc (Hydrogeology))		**23**
• Material Assets (Peta Donkin BSc (Hons) AIEMA)		**20**
• Cultural Heritage (David Kilner BA (Hons), PG Dip, MSc, MIAI)		**21**
• Interaction and Cumulative Impact Dr Sheila Banks		**17**
Planning Consultants (Gavin Lawlor BSs MRUP MIPI)	**Tom Phillips + Associates (TPA)**	**25**
Air Quality & Odour (Stephen Moorcroft BSc (Hons), MSc, DIC, MIES, MIAQM, CEnv (AQC) and Gareth Hodgkiss BSc, MSc MIEnvSc, MIAQM (AECOM))	**AECOM Ireland Limited and Air Quality Consultants Ltd. (AQC)**	**40 and 15**
Hazard and Risk (Dr Mark Eddowes MA DPhil (Oxon))	**Eddowes Aviation Safety Ltd.**	**28**
Aircraft Noise and Vibration Ground Noise and Vibration (Nick Williams BSc (Hons) MSc MIOA and David Charles BSc (Hons) Pg Dip MIOA	**Bickerdike Allen Partners LLP**	**12 and 27**
Regulation 598 Assessment and Cost Effectiveness Analysis (Paul D. Hanly BEng, MBA and Stephen C. Smith BA)	**Ricondo**	**26 and 25**
Impact on Future Growth (James Cole BASc MSc)	**Mott MacDonald**	**28**
Economic Impact (Ian Kincaid BSc, MSc)	**InterVISTAS**	**25**
Annual Night Quota System proposals (Andy Knowles BEng (Hons) PgDip)	**Anderson Acoustics**	**26**

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information from Fingal County Council dated 19/02/2021. As well as several minor corrections, including minor removals from and additions to the earlier text, the chapter has been revised to:

- Address additional assessment years requested by the Council;
- Set out more clearly the scenarios for assessment in the EIAR;
- Respond to the latest passenger growth forecasts at Dublin Airport; and
- Reflect the revised content of the subsequent EIAR chapters.

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action

2. Characteristics of the Project

2.1 Project Description

Introduction

2.1.1 The proposed Relevant Action is to be taken in accordance with Section 34C(1)(a) of the Planning and Development Act (2000), as amended (PDA), to amend condition no. 3(d) and replace condition no. 5 of the North Runway Planning Permission, which limit access or reduces the operational capacity of Dublin Airport.

The Balanced Approach

2.1.2 The proposed Relevant Action will seek to amend condition no. 3(d) and replace condition no. 5 of the North Runway Planning Permission. An assessment of the International Civil Aviation Organisation (ICAO) Balanced Approach is therefore required under the Aircraft Noise Act. The principle of the "balanced approach" to aircraft noise management was adopted by the ICAO Assembly in 2011. The Balanced Approach recognises the importance of achieving a careful balance between the interests of developing airport growth as well as managing noise levels; operating restrictions are only considered when all other elements of the Balanced Approach have been assessed.

2.1.3 The Balanced Approach consists of identifying any noise problem that may exist at a specific airport and analysing various measures available to reduce noise through the exploration of various measures which can be classified into four principal elements, described in Plate 2-1 below. When required, the process of identifying if a noise problem exists and developing a NAO under the Aircraft Noise Act will be undertaken by the competent authority (ANCA) in due course.

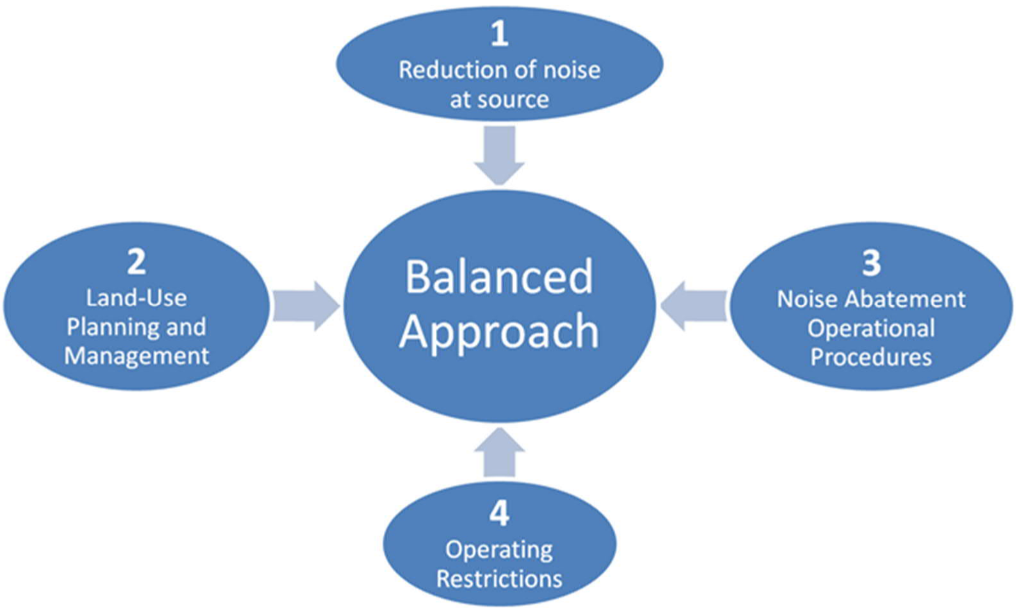


Plate 2-1: Four Principal Elements of the Balanced Approach to Aircraft Noise Management

Noise Abatement Objective

2.1.4 The Aircraft Noise Act implements European Union (EU) Regulation 598/2014 on the establishment of rules and procedures with regard to the introduction of noise related operating restrictions at EU Airports within the Balanced Approach. The Aircraft Noise Act amends the PDA to cater for revoking, amending or replacing operating restrictions at Dublin Airport.

2.1.5 The Aircraft Noise Act also sets out a process of aircraft noise regulation whereby the Aircraft Noise Competent Authority (ANCA) shall ensure that the Balanced Approach is adopted where a noise problem at the airport has been identified and requires the identification of a Noise Abatement Objective (NAO) as appropriate.

2.1.6 Prior to the submission of the Relevant Action application Dublin Airport did not have an established defined noise problem and related NAO, both are to be considered in due course by ANCA. In order to allow ANCA to carry out their assessment, the Applicant has developed a candidate NAO (cNAO) to provide a basis for assessment of the proposed aircraft noise reduction measures.

2.1.7 The summary objective of the cNAO states:

To limit and reduce the adverse effects of long-term exposure to aircraft noise, including health and quality of life, so that long-term noise exposure, particularly at night, does not exceed the situation in 2018. This should be achieved through the application of the Balanced Approach.

2.1.8 The year 2018 was chosen as it was the most recent year with full activity data available when this relevant action assessment process commenced. It is also the first year of the 2018-2023 Dublin Airport Noise Action Plan.

2.1.9 A "relevant action" is defined in section 34C of the PDA as inserted by Section 11 of the Aircraft Noise Act as:

a. "to revoke an operating restriction,

b. to amend the terms of an operating restriction in the manner specified in the application,

c. to replace an operating restriction with an alternative operating restriction specified in the application,

d. To take an action referred to in para (a), (b) or (c) together with introducing new noise mitigation measures or revoking, revoking and replacing, or amending the terms of, existing noise mitigation measures, or a combination thereof,

e. if the relevant application relates to 2 or more relevant operating restrictions, to take any combination of any of the actions referred to in paragraphs (a) to (d), or

f. *to take an action referred to in paragraph (a), (b), (c), (d) or (e) together with revoking, revoking and replacing, or amending the terms of, a condition of the relevant permission*."

2.1.10 The relevant noise related operating restrictions which currently apply to the North Runway Planning Permission by virtue of conditions no. 3(d) and 5 are set out in full below. In summary, they provide as follows:

- No use of North Runway at night (23:00 to 07:00). This is provided for in condition no. 3(d) of the North Runway Planning Permission;
- The Crosswind Runway can be only used for essential purposes. This is provided for in condition no. 4 of the North Runway Planning Permission; and
- A limit on the number of aircraft movements at the airport at night (23:00 to 07:00) to an average of 65/night when measured over the 92-day period. This is provided for in condition no. 5 of the North Parallel Runway Planning Permission.

2.1.11 Section 34C(1)(a) of the PDA provides that "*The person in whose favour a relevant permission operates may, by virtue of this subsection and notwithstanding any other provision of this Act (including section 34), make an application under section 34 to the planning authority where the application is only for a relevant action to be taken.*"

2.1.12 The proposed Relevant Action sought by the Applicant relates to the night-time use of the runway system at Dublin Airport. It involves the amendment of the operating restriction set out in condition no. 3(d) and the replacement of the operating restriction in condition no. 5 of the North Runway Planning Permission, as well as proposing new noise mitigation measures. Conditions no. 3(d) and no. 5 have not yet come into effect as the construction of the North Runway on foot of the North Runway Planning Permission is ongoing.

2.1.13 The proposed Relevant Action does not seek any amendment of conditions of the North Runway Planning Permission governing the general operation of the runway system (i.e., conditions which are not specific to night-time use, namely conditions no. 3(a), 3(b), 3(c) and 4 of the North Runway Planning Permission) or any amendment of permitted annual passenger capacity of the Terminals at Dublin Airport. Condition no. 3 of the Terminal 2 Planning Permission and condition no. 2 of the Terminal 1 Extension Planning Permission provide that the combined capacity of Terminal 1 and Terminal 2 together shall not exceed 32 million passengers per annum.

2.1.14 The result of the Permitted Scenario coming into effect when North Runway becomes operational, is a loss of air traffic movements and associated loss of 1.4m passengers[1] in 2022 and 1.6m passengers in 2025, and a cumulative loss over the 5-year period 2022 to 2027 of 7.1m passengers. The net effect of the proposed Relevant Action would be to facilitate recovery in the number of flights permitted to take off from, or land at, Dublin Airport at night, which would enable the lost passengers to be regained more quickly in the post-Covid-19 recovery period.

Proposed Relevant Action in Detail

2.1.15 The proposed Relevant Action, if permitted, would remove the numerical cap (an average of 65/night measured over the 92-day modelling period) on the number of flights permitted between 23:00 and 07:00. Instead an annual night-time noise quota would come into effect between 23:30 and 06:00. The proposed Relevant Action would also allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours (i.e. 23:00 to 00:00 and 06:00 to 07:00) as required. Overall, the effect would be to allow an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 within the parameters of a new night-time noise quota system.

2.1.16 The amendment to condition no. 3(d), described in further detail below, to enable the potential future use of the North Runway during the period 23:00 to 00:00 and 06:00 to 07:00, facilitate recovery back to pre-Covid-19 levels up to 32 mppa whilst ensuring that the Balanced Approach introduced by the Aircraft Noise Act will be applied when the use of the North Runway during this period is required.

Condition 3(d) of the North Runway Planning Permission

2.1.17 The proposed Relevant Action pursuant to Section 34C(1)(a) is to amend condition no. 3(d) of the North Runway Planning Permission. Condition no. 3(d) and the exceptions at the end of condition no. 3 state the following:

‘3(d). Runway 10L-28R shall not be used for take-off or landing between 2300 hours and 0700 hours.

except in cases of safety, maintenance considerations, exceptional air traffic conditions, adverse weather, technical faults in air traffic control systems or declared emergencies at other airports.’

Permission is being sought to amend the above condition so that it reads:

‘Runway 10L-28R shall not be used for take-off or landing between 0000 hours and 0559 hours.

except in cases of safety, maintenance considerations, exceptional air traffic conditions, adverse weather, technical faults in air traffic control systems or declared emergencies at other airports or where Runway 10L-28R length is required for a specific aircraft type.’

2.1.18 The net effect of the proposed change, if permitted, would change the normal operating hours of the North Runway from the 07:00 to 23:00 (16 hours/day) to 06:00 to 00:00 (18 hours/day).

Condition 5 of the North Runway Planning Permission

2.1.19 The proposed Relevant Action also proposes to replace condition no. 5 of the North Runway Planning Permission which provides as follows:

‘5. On completion of construction of the runway hereby permitted, the average number of night time aircraft movements at the airport shall not exceed 65/night (between 2300 hours and 0700 hours)

[1] This figure was quoted as 1.1m in the December EIAR. The latest forecast schedules have a smaller share of foreign airline traffic, which tends to operate during the 07:00 – 23:00 daytime hours. Most notably, the UK carrier FlyBE and Norwegian Airlines have exited the Dublin market. Therefore, the latest view of traffic recovery is more dependent on Aer Lingus and Ryanair, which require departure slots in the 06:00 - 07:00 period of the night and often last arrivals after 23:00. This means that in the post-Covid-19 recovery more traffic is now impacted by the 65 average night-time limit and the annualised impact of the night operating restrictions are now calculated to be around 1.6m passengers by 2025.

when measured over the 92 day modelling period as set out in the reply to the further information request received by An Bord Pleanála on the 5th day of March, 2007.

***Reason**: To control the frequency of night flights at the airport so as to protect residential amenity having regard to the information submitted concerning future night time use of the existing parallel runway.'*

2.1.20 It is proposed to replace condition no. 5 of the North Runway Planning Permission with a Noise Quota System in respect of night-time noise at the airport. The airport shall be subject to an Annual Noise Quota of 7,990 quota count points between 23:30 and 06:00.

2.1.21 In addition to the proposed night-time noise quota, the proposed Relevant Action also entails the following noise mitigation measures:

- A noise insulation grant scheme for eligible dwellings within specific night noise contours; and
- A detailed Noise Monitoring Framework to monitor the noise performance with results to be reported annually to ANCA, in compliance with the Aircraft Noise Act.

Use of the Runways

2.1.22 The proposed Relevant Action relates to the night-time use of the runway system at Dublin Airport, with no changes to the permitted infrastructure of North Runway which is under construction. The proposed Relevant Action is therefore best considered within the focus of the use of the runway system and in particular the use of the runways during the night period of 23:00 to 07:00.

2.1.23 During the operational phase, it is intended that the Crosswind Runway (16/34) will predominantly be used as a taxiway. The existing 'Dual Runway Operations' (i.e. departures from both the existing main runway (10/28) and the Crosswind Runway (16/34) when weather conditions allow during the hours of 06:30 to 08:00) will cease. The use of Crosswind Runway (16/34) for take-offs and landings will be for essential use only, as specified by condition no. 4 of the North Runway Planning Permission. There is no intention to review this operating restriction or to amend condition no. 4, in the proposed Relevant Action application.

The Proposed Quota Count System

2.1.24 A Quota Count (QC) system is designed to limit the overall amount of noise produced by aircraft using an airport, based on an allowable Annual Noise Quota (ANQ) for a given time period. A QC value is assigned to each individual aircraft movement based on the certified noise level of that aircraft. Lower QC values are attributed to aircraft with lower noise levels, higher values to noisier aircraft. The QC accumulates for each Air Traffic Movement (ATM) against the allowable ANQ across the chosen time period. As such, the system allows a greater number of quieter aircraft movements within a given quota thereby encouraging the use of quieter aircraft at the airport.

2.1.25 An ANQ has been developed for the period 23:30 hrs to 06:00 hrs (known as the Night Quota Period (NQP)) consistent with airports operating similar QC based systems. An ANQ of 7,990 quota count points is proposed to apply for each year from the opening of the North Runway to 2025 to facilitate recovery back to pre-Covid-19 levels up to 32 mppa. This ANQ has been derived using a target QC value of 0.49 per ATM calculated from 2018 movement data and the 2025 forecast used in the Application of December 2020. This represents a target for reduction in QC value per ATM from 2018.

2.1.26 Details of the ANQ calculations and methodology are provided in the document, Dublin Airport: Developing a Proposed Night Quota System by Anderson Acoustics, which forms part of the December 2020 planning application package. The proposal for an ANQ of 7,990 quota count points remains unchanged with the revised forecasts used for this revised EIAR. It is the ANQ that provides a limit, the QC per ATM is a target – if that target is not achieved then fewer movements would be possible within the proposed ANQ. Further information relating to performance of the revised forecasts with respect to this ANQ is provided in Anderson Acoustics report Night Quota System – RFI Update of June 2021, presented in Appendix 2A.

2.1.27 The proposed change from the average night-time aircraft movement cap of 65 movements per night provided for in condition no. 5 of the North Runway Planning Permission to the ANQ, will allow air traffic movements at night whilst ensuring that the overall effects of aircraft noise do not exceed those in 2018 in accordance with the cNAO. This is the result of airlines updating the fleet operating at Dublin Airport to comprise quieter aircraft.

2.1.28 In addition to the above, it is proposed that a Noise Monitoring Framework will be put in place at the airport to monitor, assess and report across a number of key noise metrics and to monitor ongoing compliance with the NAO for the airport once it has been defined by ANCA. Details of the monitoring framework are provided below, and in *Chapter 13: Aircraft Noise and Vibration*.

Proposed Noise Mitigation

2.1.29 A separate Regulation 598, Balanced Approach assessment for the proposed Relevant Action has been undertaken on behalf of the Applicant by Ricondo[2]. This assessment is submitted as part of the planning application.

2.1.30 The Regulation 598 assessment is used to inform the noise mitigation measures for the proposed Relevant Action. The Applicant proposes to introduce a Night Noise Insulation Scheme with an Insulation Grant of €20,000 for dwellings:

- Forecasted to be exposed to night-time noise levels of at least 55 dB L_{night} in 2025, or
- Exposed to noise levels greater than 50 dB L_{night} in the first year of operation of the North Runway at night, accompanied by an increase of at least 9 dB when compared to the previous year. For the purpose of this assessment a comparison of the 2022 Permitted and Proposed Scenarios has been used to estimate which dwellings would be eligible. Details of proposed noise contours and likely eligibility is presented in the Dublin Airport, Residential Sound Insulation Grant Scheme (RSIGS) overview, Anderson Acoustics, July 2021.

2.1.31 Eligibility within the 55 dB Lnight contour will be reviewed every 2 years.

2.1.32 The night-noise insulation scheme is considered additional to the existing daytime noise insulation scheme currently provided in accordance with condition no. 7 of North Runway planning permission.

2.1.33 A detailed framework for monitoring the noise performance with respect to any NAO that may be set for Dublin Airport, will be implemented. Performance will be reported annually to ANCA, in compliance with the Aircraft Noise Act.

2.2 Construction Phase

2.2.1 The proposed Relevant Action comprises a change in operating restrictions and will involve no construction works or changes to the consented physical infrastructure of North Runway or any other areas of the airport. This application for the proposed Relevant Action has no construction phase element for assessment.

2.3 Operational Phase

2.3.1 The proposed Relevant Action involves the amendment of the operating restriction set out in condition no. 3(d) and the replacement of the operating restriction in condition no. 5 of the North Runway Planning Permission, which would result in additional night flights above the number permitted under condition no. 5 of the North Runway Planning Permission. The use of the runway system during the daytime will be as per condition no. 3(a) – (c) of the North Runway Planning Permission.

Description of Operations

2.3.2 Future runway usage is determined by conditions no. 3 (a-d), 4 and 5 of the North Runway Planning Permission, which dictates the usage of runway system. These conditions state:

Condition 3 *- On completion of construction of the runway hereby permitted, the runways at the airport shall be operated in accordance with the mode of operation Option 7b as detailed in the Environmental Impact Statement Addendum, Section 16 as received by the planning authority on the 9th day of August, 2004 and shall provide that:*

[2] Ricondo: Dublin Airport North Runway, Regulation 598/2014 (Aircraft Noise Regulation) Cost Effectiveness Analysis Report (Revision 2 – September 2021)

- *(a) the parallel runways (10R -28L and 10L-28R) shall be used in preference to the cross runway, 16-34,*
- *(b) when winds are westerly, Runway 28L shall be preferred for arriving aircraft. Either Runway 28L or 28R shall be used for departing aircraft as determined by air traffic control,*
- *(c) when winds are easterly, either Runway 10L or 10R as determined by air traffic control shall be preferred for arriving aircraft. Runway 10R shall be preferred for departing aircraft, and*
- *(d) Runway 10L-28R shall not be used for take-off or landing between 2300 hours and 0700 hours, except in cases of safety, maintenance considerations, exceptional air traffic conditions, adverse weather, technical faults in air traffic control systems or declared emergencies at other airports.*

Reason: *In the interest of clarity and to ensure the operation of the runways in accordance with the mitigation measures set out in the Environmental Impact Statement in the interest of the protection of the amenities of the surrounding area.*

Condition 4 *- The crosswind runway (16-34) shall be restricted to essential occasional use on completion of the new runway in accordance with Objective DA03 of the Fingal County Development Plan, 2005-2011 - international regulations for safety reasons.*

Reason: *In the interest of public safety, residential amenity and the proper planning and sustainable development of the area*

Condition 5 *- On completion of construction of the runway hereby permitted, the average number of night time aircraft movements at the airport shall not exceed 65/night (between 2300 hours and 0700 hours) when measured over the 92 day modelling period as set out in the reply to the further information request received by An Bord Pleanála on the 5th day of March, 2007.*

Reason: *To control the frequency of night flights at the airport so as to protect residential amenity having regard to the information submitted concerning future night-time use of the existing parallel runway.*

2.3.3 Two of these planning conditions (conditions no. 3(d) and no. 5) relate to operating restrictions on the use of the runways and overall airport operations at night. Condition no. 4 of the permission introduces a restriction on the use of the Crosswind Runway (16/34). For avoidance of doubt there is no intention to apply to amend or replace condition no. 4.

2.3.4 Once the North Runway is operational, the Crosswind Runway (16/34) will be used only when essential. For the purposes of this EIAR it was assumed to be in use for 1% of aircraft movements, based on the percentage of time when the crosswind component requires its use[3]. The assumed future runway usage over a given year is summarised in Table 2-1, based on the average runway usage over the last 10 years allowing for the expected reduction in cross runway usage.

Table 2-1: Future Runway Usage

Runway	Arrivals	Departures
10L/10R (North Runway/South Runway)	29.0%	29.0%
28L/28R (South Runway/North Runway)	70.0%	70.0%
16 (Crosswind Runway)	0.75%	0.75%
34 (Crosswind Runway)	0.25%	0.25%

2.3.5 Once North Runway is operational the parallel runways will predominately be operated in segregated mode, i.e. one runway for all arrivals, the other for all departures. However, in peak periods, the runways will operate in semi-mixed mode, i.e. one runway used for both arrivals and departures simultaneously and the other runway for arrivals or departures depending on the wind direction. In the revised EIAR,

[3] Ricondo: Crosswind Runway Information Requested by ANCA RFI, May 2021

this is the forecast situation in 2025 and 2035 where both runways are used for departures in the peak departure wave in the morning. It is not expected that full mixed mode would be required in the assessment years of 2022, 2025 and 2035 i.e. both runways used for arrivals and departure at the same time.

2.3.6 A series of options for the use of the runways was investigated by Ricondo, Option 7b is the preferred option and is the options modelled as the Proposed Scenario in this EIAR. It is illustrated in Plate 2-2

- When winds are westerly (approximately 70% of the time), Runway 28L (South Runway) shall be preferred for arriving aircraft. Runway 28R (North Runway) shall be used for departing aircraft; and
- When winds are easterly (approximately 30% of the time), Runway 10R (South Runway) shall be preferred for departing aircraft. Runway 10L (North Runway) shall be used for arriving aircraft.

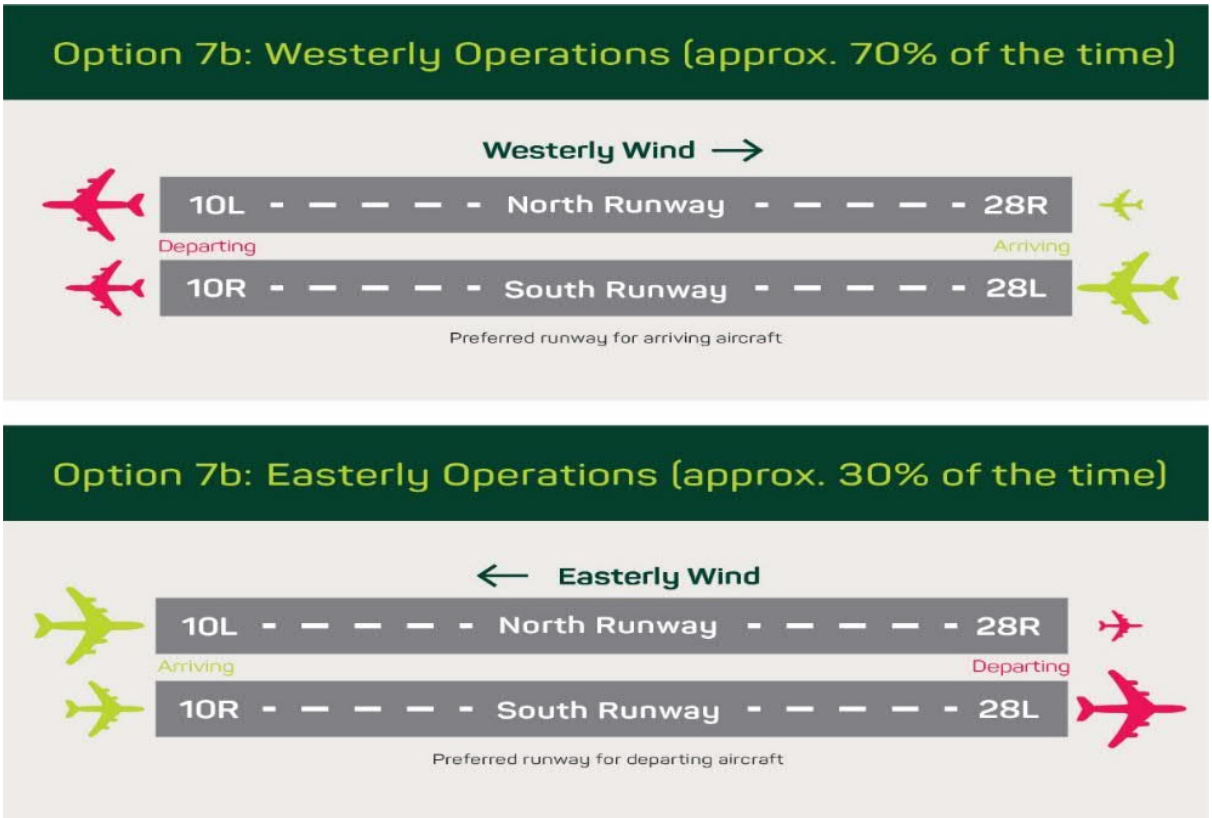


Plate 2-2: Operating Mode 7b (Source: Mott MacDonald, Dublin Airport Operating Restrictions, Quantification of Impacts on Future Growth, Updated Analysis in Response to ANCA RFI, June 2021)

2.4 Potential Environmental Effects of the Proposed Relevant Action

2.4.1 As explained above, the proposed Relevant Action is a purely operational change, which would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00, in accordance with the annual night-time noise quota. A faster post-Covid-19 recovery to 32mppa is forecast in the Proposed Scenario. A passenger throughput of 32mppa is reached in the 2025 in the Proposed Scenario, whereas in the Permitted Scenario this is delayed until 2027, with correspondingly fewer passengers passing through the airport, as shown in Plate 2-3.

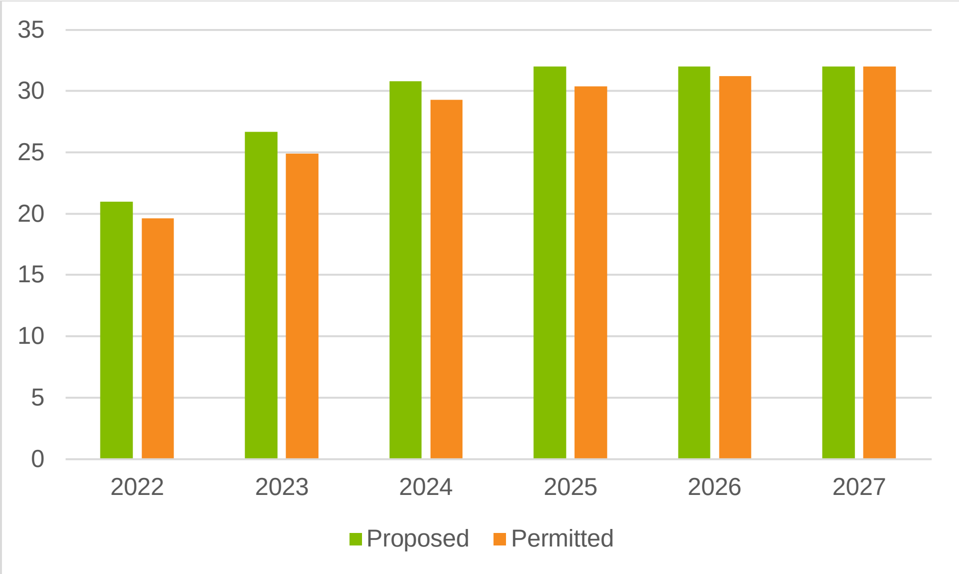


Plate 2-2: Forecast Post-Covid-19 Recovery (Millions of Passengers per Annum)

(Source: Mott MacDonald Dublin Airport Operating Restrictions, Quantification of Impacts on Future Growth, Updated Analysis in Response to ANCA RFI, June 2021)

2.4.2 In the Proposed Scenario therefore an additional 7.1 million passengers will have used Dublin Airport by 2027, compared with the Permitted Scenario. On an annual basis, the environmental impact of 32 million passengers would be similar to that experienced in 2018, when the airport was operating at close to 32mppa, and for some environmental matters this provides a useful comparator to judge whether or not the resulting environmental effects would be significant.

2.4.3 The EIA Directive requires, *inter alia*, that the project description in the EIAR provides:

> *"…a description of the main characteristics of the operational phase of the project (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used…"*

2.4.4 For clarity, the operational change that would be brought about by the proposed Relevant Action will not require any such changes to processes or use of natural resources at the airport. There will however be indirect impacts on the environment and the use of energy or water usage brought about by the forecast differences in passenger throughput.

2.4.5 The environmental context of Dublin Airport is illustrated in Figure 2.1 (*EIAR Volume 3: Figures*). In environmental terms the key differences between the Proposed Scenario and the Permitted Scenario, or doing nothing, would be:

- More night-time flights, as set out in *Chapter 1: Introduction*, Table 1-1;
- Night-time flights using North Runway in the shoulder hours (23:00 to 00:00 and 06:00 to 07:00);
- A resulting change in the distribution of flights throughout the day;
- Additional lighting of the North Runway landing lights in the hours of darkness (up to two hours per day);
- More passengers using the airport annually for about five years (2022-2027), after which the numbers are the same; and
- Corresponding differences in the number of vehicles on the roads around Dublin Airport and the times at which these vehicles use the roads.

Potential Permanent Impacts

2.4.6 The environmental impacts of these differences relate primarily to aircraft noise, discussed in *Chapter 13: Aircraft Noise and Vibration*, and the indirect effects that this would have on people's health, explained in *Chapter 7: Population and Health*.

2.4.7 There will also be impacts from ground noise (aircraft movements on the ground and traffic) which can add to the aviation noise impact, and which are discussed in *Chapter 14: Ground Noise and Vibration*.

2.4.8 There will also be a slightly different aviation accident risk profile, as explained in *Chapter 8: Major Accidents and Disasters*.

Potential Temporary Impacts

2.4.9 There will be imperceptible differences in air quality between the Proposed and Permitted Scenarios, as explained in *Chapter 10: Air Quality*, with the health effects also being examined in *Chapter 7: Population and Health*.

2.4.10 Greenhouse Gas emissions would be slightly higher in the Proposed Scenario during the years 2022-2027, as discussed in *Chapter 11: Climate and Carbon*.

2.4.11 The potential impact on material assets would be slightly higher in the Proposed Scenario during the years 2022-2027, as discussed in *Chapter 19: Material Assets*.

Other Potential Impacts

2.4.12 As set out in the relevant chapters, there will be imperceptible impacts on Water, Ecology, Land and Soils, Cultural Heritage or Landscape and Visual receptors.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information from Fingal County Council dated 19/02/2021:

- Make several minor clarifications and corrections;
- Respond to the latest passenger growth forecasts at Dublin Airport; and
- Identify the potential environmental effects of the proposed Relevant Action.

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action

3. Need for the Project

3.1 Background

3.1.1 This chapter considers the need for the proposed Relevant Action. It identifies the impacts of the Permitted Scenario coming into effect and compares these with the Proposed Scenario, where the Relevant Action is approved in accordance with Section 34C(1)(a) of the PDA, to amend condition 3(d) and replace condition 5 of the North Runway Planning Permission), as described in *Chapter 2: Characteristics of the Project*.

3.1.2 The chapter also considers the resulting effect of these impacts on Irish aviation policy and calculates the forgone economic benefits in the Permitted Scenario versus the Proposed Scenario.

3.1.3 Mott MacDonald was appointed by the Applicant to assess and quantify the air traffic impacts of operating in the Permitted Scenario. Since submission of the EIAR in December 2020, Mott MacDonald have updated the assessment and quantification of the air traffic with post-Covid-19 recovery and longer-term forecast scenarios. The resulting report 'Airport Operating Restrictions, Quantification of Impacts on Future Growth, Updated analysis in response to the ANCA RFI', was prepared in June 2021 and informs the following sections of this chapter. The full report is included as Appendix 1A of this EIAR and is referred to in this EIAR as the Mott MacDonald Report.

3.2 Key Findings from the Mott MacDonald Report

3.2.1 Since March 2020, the global aviation industry has been impacted by the Covid-19 pandemic and associated air travel restrictions, leading to large reductions in passenger throughput at Dublin Airport in 2020, with only partial recovery expected in 2021.

3.2.2 Dublin Airport has two main airlines providing the majority of flights: Ryanair (35% share) and Aer Lingus (29% share), based on the summer 2019 schedule. The airport serves mostly short haul services (90% of flights) to points in the UK and Europe. Long haul services are mainly to North America, plus some services to the Middle East, Asia and Africa.

3.2.3 Demand for night flights between 23:00 and 07:00 is driven mainly by short haul services operated by aircraft based at Dublin. In order to achieve the high levels of aircraft utilisation necessary for airline competitiveness, Dublin-based aircraft such as those operated by Aer Lingus and Ryanair tend to operate with first departure between 06:00 and 07:00 and last arrival after 23:00. Other 23:00 to 07:00 period flights are long haul arrivals in the early morning, and a small number of cargo flights mainly operated by the time-critical package delivery integrators (e.g. FedEx, DHL, TNT and UPS).

3.2.4 The one-hour time difference between Ireland and mainland Europe means that flights need to leave early (before 07:00) to arrive in time for business passengers to have a full working day at their destination. The geographical position of Dublin Airport means that there are longer distances to many European destinations than from other European hubs. This means that Dublin Airport requires longer operating days than competing European hubs. Similarly, Dublin Airport's shorter flight time to North America compared to the rest of Europe means that transatlantic flights arrive earlier in Dublin than at other European airports.

3.2.5 According to the Mott MacDonald Report (page 3), Dublin Airport is also unusual in that the operating restrictions of the North Runway Planning Permission include a peak hour of demand for departures at the airport: 06:00-07:00.

3.2.6 Pre-Covid-19 levels of demand for night flights (23:00 to 07:00) was over 100/night, with 116/night associated with regularly scheduled services on a typical busy day in summer 2019. This is far in excess of the average of 65/night (measured as an average over the 92-day modelling period used in the analysis) that is provided for in condition no. 5 of the North Runway Planning Permission.

3.2.7 Demand for 23:00 to 07:00 night flights is not expected to reduce significantly during the post Covid-19 recovery. The forecast schedules analysed for the Mott MacDonald Report indicate 108/night movements in 2022/23, rising to 116/night when the airport returns to 32 million passengers per annum (mppa) traffic levels in around 2025.

3.2.8 The need for night flights at Dublin Airport – driven by the need for airlines to achieve competitive levels of aircraft utilisation, flight connection connectivity, and to support timely air freight services into Ireland – is not diminished for the post Covid-19 air transport scenario.

3.2.9 The Mott MacDonald Report simulated the slot coordination process to create busy day aircraft movement schedules for the years 2022 (when the North Runway is expected to become operational), 2025 (when the 32mppa Cap is expected to be reached), 2030, 2035 and 2040 (to provide an assessment over a longer timeframe). It modelled the impact of the Dublin Airport runway system operating in line with the Permitted Scenario and the impact on overall runway capacity and on airline schedules, taking into account the impacts on aircraft rotations throughout the day.

3.2.10 Table 3-1 presents the assessed impact of the Permitted Scenario is a cumulative loss over the 4-year period 2022-2025 of 6.3m passengers when compared with the Proposed Scenario.

Table 3-1: Annual Traffic Impact Summary (millions of passengers)

	2022	2023	2024	2025	2022-2025 Total
Proposed	21.0	26.7	30.8	32.0	110.5
Permitted	19.6	24.9	29.3	30.4	104.2
Difference	-1.4	-1.8	-1.6	-1.6	-6.3[1]

Source: Quantification of Impacts on Future Growth, Update 2022 - 2025 Period (Mott MacDonald, 2021)

3.2.11 Operating as per conditions no. 3(d) and 5 of the North Runway Planning Permission impacts on the recovery and growth of the Dublin-based Irish carriers Aer Lingus and Ryanair. The Dublin-based carriers require early morning departures and late evening arrivals for their short haul operations, and Aer Lingus requires early morning arrivals for its transatlantic operations. Non-Irish carriers are less affected by the restrictions as they have proportionately fewer operations in the restricted 23:00 hrs to 07:00 hrs period.

3.2.12 Conditions no. 3 (d) and 5 also constrain the number of short haul operations throughout the day, as the lack of night slots limits the number of Dublin based aircraft that can be accommodated, given the efficient way the carriers operate aircraft rotations with each aircraft performing multiple flights during the operating day.

3.2.13 To assess the impact of operating resections, the study analysed the impacts of operating restrictions. An input schedule (Scenario A) was produced by daa. This schedule was used to produce a number of scenarios including the Permitted (Scenario E) and Proposed (Scenario D). The remaining scenarios and assessment years in the Mott MacDonald Report were produced in order to assist with responses to the ANCA Direction of 24th February 2021 which sought various passenger and ATM forecasts for the years 2030, 2035 and 2040. Full details of these are provided in the Mott MacDonald Report. The scenarios used in the Relevant Action EIAR are:

- **Proposed Scenario, Scenario D which** applies the 32m annual passenger cap to the runway capacity coordinated schedules but does not apply the night operating restrictions (conditions no. 3d and 5)

The 32mppa passenger level is reached in 2025. The 32mppa Cap begins to have an impact from 2024 as traffic growth approaches the 32m capped level asymptotically.

- **Permitted Scenario, Scenario E** which applies the 32m Cap and the night operating restrictions (conditions no. 3d and 5)

The 32m passenger level is reached around 2027.

[1] Total differs from the sum of individual years owing to rounding.

3.2.14 The ATM and passenger forecasts of Scenario D and E in the relevant EIAR Assessment Years is set out in Table 3-1 above. For Scenarios D and E it is assumed that the 32m passenger cap remains in place.

3.2.15 The ATM and passenger forecasts for a number of other scenarios are set out in the Mott MacDonald Report along with a summary explaining how these scenarios forecasts were produced.

3.3 Need for the Project

Passenger and Aircraft Growth (Pre-Covid-19)

3.3.1 Following a long period of growth between 2000 and 2008, with an average growth rate of 6.9%, Dublin Airport experienced significant declines in air travel in 2009 and 2010 due to the global economic downturn. However, between 2010 and 2018, traffic growth averaged 6.9% per annum, reaching 31.5 million in 2018 (Plate 3-1). When the Relevant Action process was commenced in 2019, 2018 was the most recent full year of information available.

3.3.2 Passenger traffic at Dublin Airport can be broken down into five categories:

- Domestic;
- United Kingdom;
- Continental Europe;
- Transatlantic; and
- Other International.

3.3.3 The total passenger traffic at Dublin Airport has seen an increase of nearly 53.6% since 2010. As shown in Plate 3-1, of the five areas, the region which has seen the largest growth in passenger traffic since 2010 is Other International - this includes traffic to China, the rest of Asia, Middle East and Africa. Between 2010 and 2018 (i.e. before the Covid-19 pandemic), the passenger traffic on these routes increased by over 359%, from a small base. Transatlantic traffic saw growth of 155% from increased service to the United States and Canada. European and United Kingdom passenger traffic both increased by 70% and 50% respectively. Domestic traffic, which makes up less than 1% of traffic, saw a decrease in volume by 83%. This drop was attributable to the fact that the road network within Ireland saw significant improvement during this period.

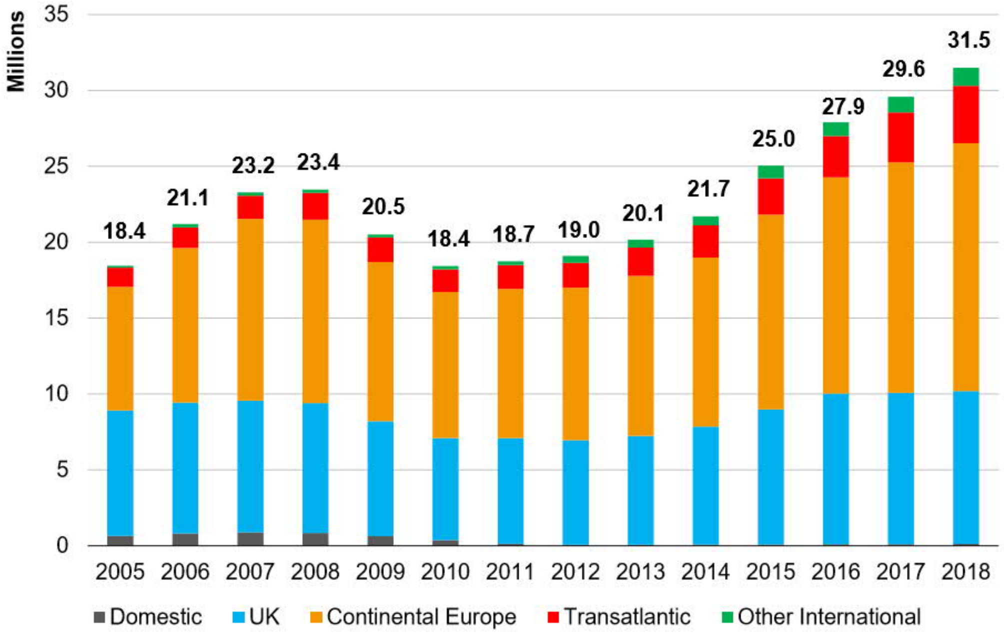


Plate 3-1: Annual Passenger Movements at Dublin International Airport, 2005-2018 (Source 'Dublin Airport Economic Impact of Operating Restrictions', InterVISTAS, 2019)

3.3.4 Plate 3-2 below shows the percentage share of passenger traffic by global region in 2018. In terms of the share of passenger traffic by world region, Continental European traffic comprised 52% of all passengers in 2018. The United Kingdom represented 36% of total passengers, followed by Transatlantic at 12%, Other International at 4% and Domestic passenger traffic at less than 1%. Long haul passengers accounted for 15.8% of traffic in 2018 compared with 6.9% in 2015, reflecting the increasing range of destinations served from Dublin Airport.

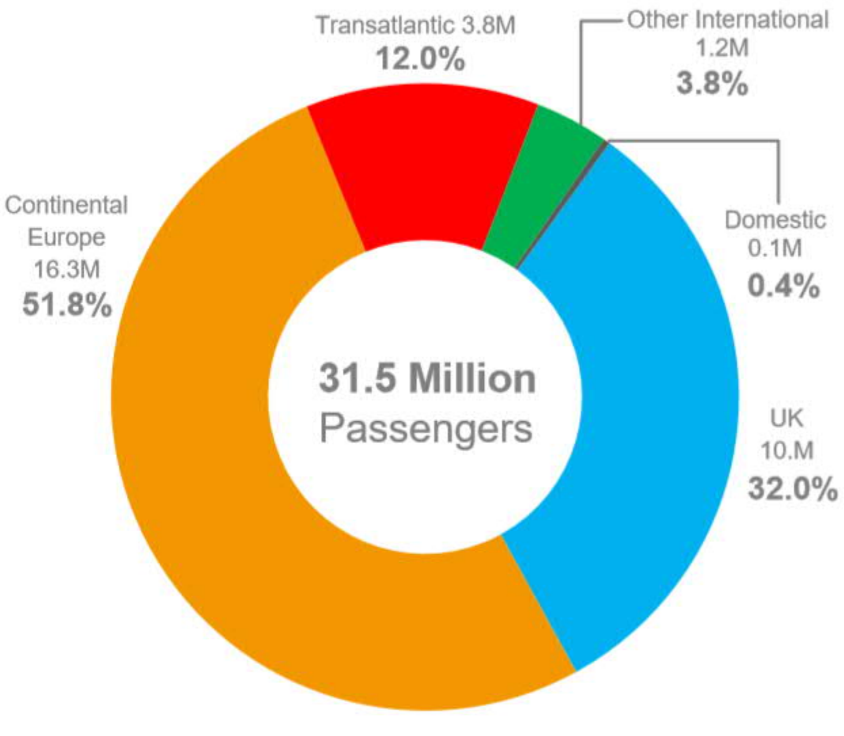


Plate 3-2: Passenger Movements by Region at Dublin Airport, 2018 (Source 'Dublin Airport Economic Impact of Operating Restrictions', 2019 InterVISTAS)

3.3.5 Dublin Airport is the busiest airport in the Republic of Ireland. In 2018, the airport welcomed 44 airlines which offered scheduled and charter service to over 180 destinations in 40 countries on four continents. In 2019 the airport welcomed 47 airlines and flights to over 200 destinations. The airport has two main airlines providing the majority of flights: Ryanair (35% share) and Aer Lingus (29% share), based on the summer 2019 schedule. The airport serves mostly short haul services (90% of flights) to points in the UK and Europe. Long haul services are mainly to North America, plus some services to the Middle East, Asia and Africa.

Impacts of Restrictions

3.3.6 In March 2020, it became apparent that the Covid-19 pandemic was having a significant impact on global aviation. The immediate impacts were severe, and in the short-medium term these impacts will continue to manifest themselves in reduced air traffic demand in Ireland and globally.

3.3.7 The anticipated negative implications of conditions no. 3(d) and 5 of the North Runway Planning Permission being implemented fall into the following categories:

- Constrained air traffic impacts at Dublin Airport;
- Implications for achieving the objectives set in the National Aviation Policy, 2015 (the NAP); and
- Forgone economic impacts for the airport and the regional and national economies.

Permitted Scenario Traffic Impacts at Dublin Airport

3.3.8 As set out in Section 3.2, the Mott MacDonald Report simulated the slot coordination process (take-off and landing during a specific time period) to create the Permitted Scenario busy day schedules from 2022 (when the North Runway is expected to become operational), 2025 (when the 32mppa Cap is expected to be reached), 2030, 2035 and 2040 (to provide an assessment over a longer timeframe and in response to specific requests from ANCA as part of Direction 01 of 24th February 2021)). It modelled the impact of the North Runway operating as per conditions no. 3(d) and 5 of the North Runway Planning Permission on airline schedules, taking into account the impacts on aircraft rotations throughout the day.

3.3.9 The assessed impact is a loss of air traffic movements and a cumulative loss over the 4-year period 2022-2025 of 6.3m passengers.

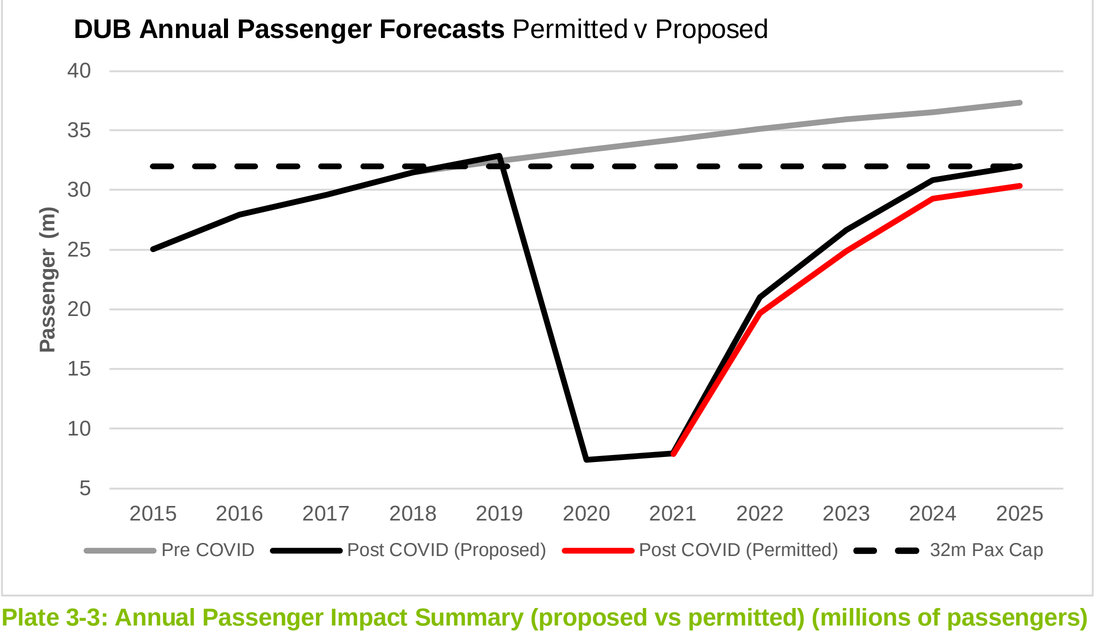


Plate 3-3: Annual Passenger Impact Summary (proposed vs permitted) (millions of passengers) (Mott McDonald, 2021)

3.3.10 Conditions no. 3(d) and 5 of the North Runway Planning Permission would slow growth in long haul services for two reasons:

- Many long-haul routes require early morning arrivals in the night restrictions period; and

- Retiming of flights to avoid the night restrictions period would reduce flight connection possibilities, making some new long-haul services unviable without enough connecting feed traffic.

Implications for Irish National Aviation Policy

3.3.11 The Department of Transport, Tourism and Sport (DTTAS) published the NAP for Ireland in August 2015. The principal goals of the NAP (as set out on page 7 of the NAP) are:

- Enhance Ireland's connectivity – respond to the needs of businesses, tourism and consumers through safe, secure and competitive access;
- Foster growth of aviation enterprise – support employment in the sector and maintain Ireland's strong tradition and reputation in aviation; and
- Maximise economic contribution of aviation sector – commit to maximising the benefits of aviation to Ireland's economic growth and development.

3.3.12 With regard to the second runway at Dublin Airport (North Runway), the NAP specifically states that:

> *"The process to develop the second runway at Dublin Airport will commence, to ensure the infrastructure necessary for the airport's position as a secondary hub and operate to global markets without weight restrictions is available when needed".*
>
> (A National Aviation Policy for Ireland, August 2015, Action 4.5.1, page 50).

3.3.13 Chapter 6 of the Project Ireland 2040: National Planning Framework (NPF) identifies 'High Quality International Connectivity' as a primary National Strategic Outcome "*crucial for overall international competitiveness*".

3.3.14 Results from the assessment carried out by InterVISTAS (discussed in Section 0) found the imposition of conditions no. 3(d) and 5 of the North Runway Planning Permission on passenger traffic and air services at Dublin Airport, will contradict the aims and commitments of the NAP. The negative effects on both long haul and short haul flights in the Permitted Scenario will reduce the connectivity and competitiveness of Dublin Airport.

3.3.15 The assessment concluded that, consequently, the decreased air traffic and air services result in a reduced economic contribution to the national economy, as documented in Section 0 below.

Forgone Economic Impacts

3.3.16 The Applicant appointed InterVISTAS to conduct a study (June 2021) on the overall economic impact of the restrictions on the Permitted Scenario, building on work completed by Mott MacDonald to assess and quantify the overall air traffic impacts of the operating restrictions at Dublin Airport. The full InterVISTAS report is included in Appendix 3A of this EIAR.

3.3.17 In its analysis, InterVISTAS considered four distinct categories:

- Direct Economic Impact. The employment, income and economic output associated with the operation and management of activities at the airport including firms on-site at the airport and airport-related businesses located elsewhere near the airport;
- Indirect Economic Impact. The employment, income and economic output generated by industries that supply and support the activities at the airport, such as food wholesalers, fuel refiners, etc.;
- Induced Economic Impact. This captures the economic activity generated by the employees of firms directly or indirectly connected to the airport spending their income in the national economy; and
- Catalytic Impacts. These capture the way in which the airport facilitates the business of other sectors of the economy. As such, air transportation facilitates employment and economic development in the national economy by facilitating trade, tourism, investment and productivity growth.

3.3.18 The forgone economic impact of the Permitted Scenario in 2022 and 2025 are presented in Table 3-2. The analysis suggests that as a result of conditions no. 3(d) and 5, the Irish economy could forgo an economic impact peaking at 5,170 jobs and €392 million in GVA in 2023, relative to Proposed Scenario. The majority of this forgone economic impact is expected to occur outside of the aviation sector: 62% of the total impact is catalytic impacts (tourism, trade, investment, etc.) and another 21% are indirect and induced impacts (supplier and spending in the wider economy).

Table 3-2: Foregone Economic Impacts of the Permitted Scenario

Impact	Number of Jobs	Full-Time Equivalents	Wages (€ millions)	GVA (€ millions)
2022				
Direct	630	560	26	52
Indirect	360	320	15	29
Induced	440	390	15	31
Catalytic	3,130	2,760	119	234
Total	**4,560**	**4,030**	**175**	**345**
2023				
Direct	820	730	34	68
Indirect	480	420	20	38
Induced	580	510	20	40
Catalytic	3,290	2,910	126	246
Total	**5,170**	**4,570**	**199**	**392**
2024				
Direct	740	660	30	61
Indirect	430	380	18	34
Induced	520	460	18	36
Catalytic	2,850	2,520	109	213
Total	**4,540**	**4,020**	**175**	**345**
2025				
Direct	760	680	31	63
Indirect	440	390	18	35
Induced	530	470	19	37
Catalytic	2,930	2,110	91	179
Total	**4,120**	**3,650**	**159**	**314**

Source: InterVISTAS Dublin Airport Economic Impact of Operating Restrictions (2021)

3.4 Patterns of Demand

3.4.1 The analyses of the Mott MacDonald Report (page 10) are based on the Proposed Scenario forecast busy day schedules. The forecast schedules represent expected traffic in 2022 (when the North Runway is expected to become operational) and in each year to 2025, when traffic is expected to reach 32mppa again after the Covid-19 air traffic disruption.

3.4.2 This pattern of demand provides improved connectivity compared with the Permitted Scenario for the development of Dublin Airport, as well as providing for efficient point-to-point short haul services. The general pattern of demand is expected to develop along similar patterns to current demand, with a large peak of departures demand in the 06:00 hour, representing first-wave departures on Dublin based aircraft. Arrivals is less, but there is a peak of arrivals in the late evening (22:00 onwards) corresponding to the return of Dublin based aircraft. Long haul arrivals are concentrated in the early morning period, particularly in the 05:00 hour. Further details are provided in the Mott MacDonald Report, Appendix 1A.

3.4.3 Schedules are restricted by the airport's single runway capacity. With the opening of the North Runway, a greater pattern of demand is expected in the peak 06:00 departures hour (reflecting airlines' commercially and operationally ideal operating times).

3.4.4 Meeting this level of departures demand in the 06:00 hour requires use of the North Runway in the 06:00 – 06:59 hrs period. The use of the Crosswind Runway (16-34) for dual operations in the 06:30 to 08:00 period (as was the case historically) is no longer possible with North Runway operational. A summary of the historic use of Runway 16-34 has been undertaken by Ricondo and is provided as Appendix 3B.

3.4.5 The above description of the pattern of demand is supported by the Irish Aviation Authority (IAA) Air Navigation Service Provider (ANSP) in their submission to the Planning Authority in response to the December 2020 application: *"It is considered essential to use both runways for departure between the hours of 06:00 to 08:00 (local time), due to the demand for the first wave of departures to take off from Dublin during this period. The simultaneous use of runways for departures within this period serves a number of reasons, including, to the extent possible, the objective of disconnecting this high departure demand from the first peak of arrivals into Dublin which typically begins around 07:30 (local). As Dublin Airport became ever busier in the years prior to 2020, failure to achieve this objective frequently resulted in holding/delays both on the ground and in the air, as the capacity of a single runway was not sufficient to accommodate continuous consecutive departure or arrival demand. The availability of both runways for departure would alleviate this problem into the foreseeable future."*

Night Movements Prior to the Covid-19 Pandemic

3.4.6 In summer 2019, prior to the impact of Covid-19, there were 113 regularly scheduled flights during the 23:00 – 07:00 period. Short haul scheduled services make up the bulk of these night flights, with departures between 06:00 and 07:00 and arrivals after 23:00. There are 17 long haul night arrivals in the early morning. The night cargo operations are primarily flights by the cargo integrators DHL, FedEx, TNT and UPS operating to their main sortation hubs. These operations are time-critical in order to connect at these hubs and to achieve an overnight package delivery service.

Future Night Movement Demand

3.4.7 Busy day night movements are expected to decrease slightly with the post-Covid-19 air traffic downturn but recover to pre-Covid-19 levels by the time Dublin is forecast to reach 32mppa in 2025. Please refer to Table 3.1 for annual passenger and ATM forecast details. These forecasts are a best estimate with the available information at the time of writing as the Covid-19 pandemic has increased the uncertainty around forecasting.

3.5 Summary

3.5.1 Dublin Airport has shown strong traffic growth during 2009-2018 period, with 31.5 passengers in 2018. Forecast scenarios as presented in the Mott Macdonald Report (Appendix 1A) show that operating in the Permitted Scenario, limits traffic growth, delaying post-Covid-19 recovery to 2018 traffic levels by around 2 years from 2025 to 2027. It also indicates that if the Permitted Scenario was to come into effect in 2022, there could be a cumulative loss over the 4-year period 2022-2025 of 6.3m passengers and an additional 800,000 passenger is 2026.

3.5.2 Demand for 23:00 to 00:00 and 06:00 to 07:00 flights is not expected to reduce significantly during the post-Covid-19 recovery. As traffic recovers to pre-Covid-19 levels by 2025, the forecast schedules analysed for this study require 116/night movements for regularly scheduled services.

Forecasts

3.5.3 The September 2020 Operating Restrictions analysis and report by Mott McDonald was based on pre-Covid-19 baseline schedules (summer 2019 base day) and early views on the impact of Covid-19 and traffic recovery. The latest update to the Operating Restrictions analysis leading to the Mott MacDonald Report is based on new forecasts and the latest schedules available at the time of writing.

3.5.4 One key difference is that the latest forecast schedules have a smaller share of foreign airline traffic, which tend to operate during the 07:00 – 23:00 daytime hours. Most notably, the UK carrier FlyBE and Norwegian Airlines have exited the Dublin market due to financial difficulties / bankruptcies in the Covid-19 pandemic. As a consequence, the latest view of traffic recovery is more dependent on based-carrier flying by Aer Lingus and Ryanair, which require departure slots in the 06:00-07:00 period of the night and often last arrivals after 23:00.

3.5.5 This means that in the post-Covid-19 recovery more traffic is now impacted by the average 65 night-time limit and the annualised impact of the night operating restrictions are now calculated to be around 1.6m passengers in 2025. The economic impact analysis suggests that as a result of operating as per conditions no. 3(d) and 5 of the North Runway Planning Permission, at the peak the Irish economy could forgo an additional 5,170 jobs and €345 million in GVA in 2023, relative to the Proposed Scenario. The majority of this forgone economic impact is expected to occur outside of the aviation sector: 62% of the total impact is catalytic impacts (tourism, trade, investment, etc.) and another 21% are indirect and induced impacts (supplier and spending in the wider economy).

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information from Fingal County Council dated 19/02/2021. As well as several minor corrections and additions, the chapter has been revised to:

- Respond to the latest passenger growth forecasts at Dublin Airport;
- Reflect updates to the source material upon which this chapter is based; and
- Further analysis on the economic impact of operating restrictions (InterVISTAS report Appendix 3A).

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

4. Examination of Alternatives

4.1 Introduction

4.1.1 Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 which amends Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment states an EIAR should contain:

"*A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."*

4.1.2 This chapter outlines the alternatives considered for the proposed Relevant Action to meet the identified needs outlined in EIAR *Chapter 3: Need for the Project*. It then gives an assessment of the environmental effects and the main reasons why the final proposal was chosen.

4.1.3 It is important to note that the proposed Relevant Action application relates only to an operational change, to remove the numerical cap on the average number of flights permitted between the hours of 23:00 and 07:00 in the Permitted Scenario, replacing it with an annual night-time noise quota, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00. Therefore, this EIAR chapter only considers reasonable alternatives to the operation of the North Runway and wider runway system.

4.2 Legislative Context

4.2.1 The 2014 EIA Directive was transposed into domestic Irish law on the 1st September 2018 in the form of the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (hereafter referred to as 'the EIA Regulations').

4.3 Methodology

Types of Alternatives

4.3.1 An EIAR should provide an assessment of the reasonable alternatives considered. The EPA's Draft 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' (2017) (hereafter referred to as 'the EPA Draft Guidelines') outlines different types of alternative that should be studied in an EIAR. These include:

- Do Nothing scenario;
- Alternative locations;
- Alternative layouts;
- Alternative designs;
- Alternative processes; and
- Alternative mitigation measures.

4.3.2 The different types of alternatives stated in the EPA Draft Guidelines are used within this chapter and discussed below.

4.3.3 The reasonable alternatives considered by the developer depend on the nature and extent of the project and the objective which the project seeks to achieve, as a result not all of the different types of alternative are considered relevant to the proposed Relevant Action, their relevance and further consideration is detailed in Section 4.5.

Scope of Alternatives to be Studied

Do Nothing Scenario

4.3.4 The 'do nothing' scenario is the current North Runway Planning Permission, or the Permitted Scenario. The North Runway Planning Permission contains 31 planning conditions. Two of these planning conditions, no. 3(d) and 5, relate to operating restrictions on the use of the runways and overall number of permitted flights at night, and these are due to come into force once the North Runway is operational in 2022. The Permitted Scenario is therefore, in effect, the 'do nothing' scenario. The key differences between the Permitted Scenario and the Proposed Scenario, as discussed in *Chapter 2: Characteristics of the Project*, are that there is a slower return to the 32mppa Cap in the Permitted Scenario (2027, versus 2025 in the Proposed Scenario) and that there would be fewer flights during night-time in the Permitted Scenario.

Reasonable Alternative Locations

4.3.5 As the proposed Relevant Action relates only to a change in operating restrictions and does not comprise the delivery of any physical infrastructure or construction works, it is not relevant to study reasonable alternative locations. The study of alternative locations is not considered appropriate as the need for the proposed Relevant Action is related to Dublin Airport itself and no other alternative locations.

Reasonable Alternative Layouts

4.3.6 As the proposed Relevant Action relates only to a change in operating restrictions and does not comprise the delivery of any physical infrastructure or construction works, it is not relevant to study reasonable alternative layouts.

Reasonable Alternative Designs

4.3.7 As the proposed Relevant Action relates only to a change in operating restrictions and does not comprise the delivery of any physical infrastructure or construction works it is not relevant to study reasonable alternative designs.

Reasonable Alternative Processes

4.3.8 For alternative processes, the EPA Draft Guidelines, *Section 3.4.6 Alternative processes* state:

"Within each design solution there can be several different options as to how the processes or activities of the project can be carried out."

4.3.9 The following options have been considered by the Applicant under the Regulation 598 Assessment[1] process:

- **Permitted mode of operation:** Alternative modes of operation considered are described further in this EIAR chapter; and
- **Alternatives to hours of operation**: Variations to the permitted hours of operation once the North Runway is operational.

Alternative Mitigation Measures

4.3.10 Section 3.4.7 of the EPA Draft Guidelines also notes that: *'it may be possible to mitigate environmental effects in different ways'*. The proposed Relevant Action relates only to a change in operating restrictions at night-time and does not comprise the delivery of any physical infrastructure or construction works.

4.3.11 This EIAR identifies the night-time noise insulation grant scheme as mitigation for noise impacts (and, indirectly, health impacts) and no alternative night noise mitigation measures were considered by the Applicant. There already exists a daytime noise insulation scheme for residential properties (condition no. 7) and schools (condition no. 6) as well as a property purchase scheme (condition no. 9) of the North Runway Planning Permission so no further mitigation for daytime noise impacts was considered. Noise mitigation based on a 60dB daytime contour was considered as part of early consultation in 2016. However, based on the proposed extent of the relevant action application which does not seek to go beyond the 32mppa Cap, additional daytime mitigation (in addition to the existing mitigation schemes)

[1] *Dublin Airport North Runway, Regulation 598/2014 (Aircraft Noise Regulation) Forecast Without New Measures and Additional Measures Assessment Report*, Ricondo (2021)

was not considered necessary. There are no other significant environmental effects of the proposed Relevant Action and there is no requirement for mitigation to be implemented.

4.4 Limitations

4.4.1 As noted above, the proposed Relevant Action relates only to amending and replacing operating restrictions. There is no requirement for additional or relocated physical infrastructure or for construction works.

4.4.2 In addition to the above, aviation policy, specific aircraft noise regulation (such as the Aircraft Noise Act), aviation industry requirements and national economics can affect the consideration and viability of alternatives.

4.5 Reasonable Alternatives Considered

Regulation 598/2014 (Aircraft Noise Regulation) Assessment

4.5.1 Under the Aircraft Noise Act the Competent Authority (ANCA), is required to ensure that the Balanced Approach is adopted and shall ensure that the noise abatement objective is defined and measures available to reduce noise impacts are identified and the likely cost-effectiveness of the identified noise mitigation measures and operating restrictions (if any) is thoroughly evaluated. These noise mitigation measures and operating restrictions (if any) are those within the pillars of ICAO Balanced Approach. The Balanced Approach is discussed in more detail in *Chapter 2: Characteristics of the Project*.

4.5.2 ANCA defined a number of terms for use in the Regulation 598 Assessment[2] in their Guidance document *Aircraft Noise Information Reporting under The Airport Noise (Dublin Airport) Regulation Act 2019, Draft Version 2, May 2020* (see Appendix 4A), which differ from terms used in the EIAR. For clarity, these terms are:

- A 'situation' to represent the historic, current and future noise conditions that would prevail in the absence of changes to the existing consents (i.e. the Permitted Scenario);
- A 'forecast without new measures' to represent the situation which would prevail as a result of operation without any noise abatement measures, representative of a unrestrictive operation (i.e. Scenario 06, which was used as a benchmark in the Regulation 598 Assessment to measure the effectiveness of mitigation measures); and
- A 'forecast including additional measures' to represent the noise conditions that would arise from any operation proposals inclusive of specific or combinations of noise mitigation measures. Most of the alternatives considered included additional noise measures: in other words, sound insulation. The main variable that changed was the use of the North Runway in different modes or at different times. One such scenario – Scenario 02 – represents the Proposed Scenario.

4.5.3 The Regulation 598 Assessment identified eight feasible preferential runway use measures (Scenarios 03 - 05 and Scenarios 07 - 10). As the proposed Relevant Action does not alter the operation of the runway system during the daytime, all the measures share a common runway use configuration between 07:00 and 22:59, which includes the following:

- When winds are westerly, South Runway (28L) shall be preferred for arriving aircraft. Either the South or North Runway (28L or 28R) shall be used for departing aircraft as determined by air traffic control;
- When winds are easterly, either the North or South Runway (10L or 10R) as determined by air traffic control shall be preferred for arriving aircraft. South Runway (10R) shall be preferred for departing aircraft; and
- The South and North Runways (10R-28L and 10L-28R) shall be used in preference to the Crosswind Runway.

[2] Dublin Airport North Runway, Regulation 598/2014 (Aircraft Noise Regulation) Forecast Without New Measures and Additional Measures Assessment Report

4.5.4 This use pattern was defined by condition no. 3(b) and condition no. 3(c) of the North Runway Planning Permission.

4.5.5 The brief for the Regulation 598 Assessment was to identify a cost-effective alternative that ensured noise impact was no greater than in 2018 and that also met the candidate Noise Abatement Objective (cNAO) (the cNAO is discussed in detail in *Chapter 2: Characteristics of the Project*).

Summary of Alternatives Considered

4.5.6 The following provides a summary each of the Scenarios 01 - 10. In all scenarios, the day operation is the same as outlined above so only night-time operations are detailed below. The differentiating factor for alternative runway operation is the use of the North Runway at night-time.

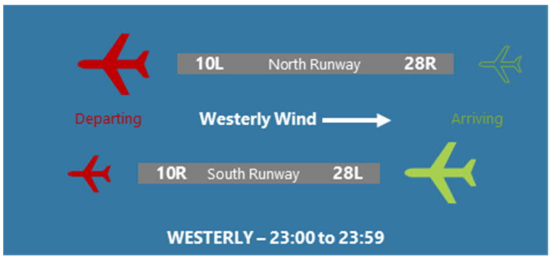
4.5.7 In the diagrams below the large solid aircraft indicates the primary runway to be used. The small solid aircraft indicates secondary use, if needed. Green indicates arrivals and red departures. A small aircraft with outline only indicates possible use, but not preferred.

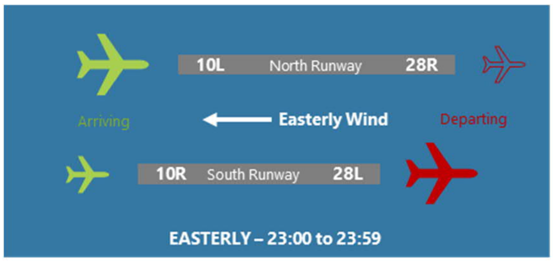
Scenario 01

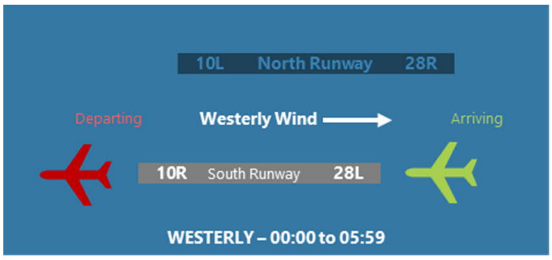
4.5.8 This is the Permitted Scenario or 'Do Nothing' scenario. There is no use of the North Runway at night and only the South Runway is used.

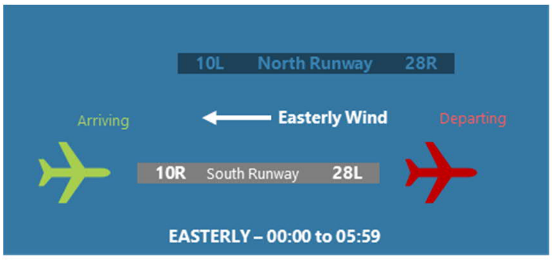
Scenario 02

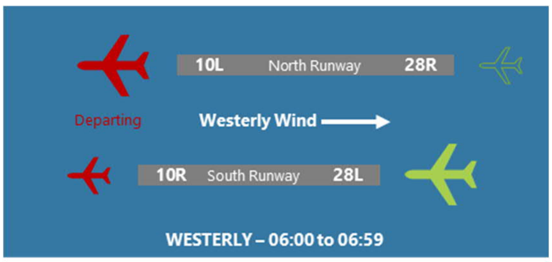
4.5.9 This is equivalent to the Proposed Scenario examined throughout this EIAR.

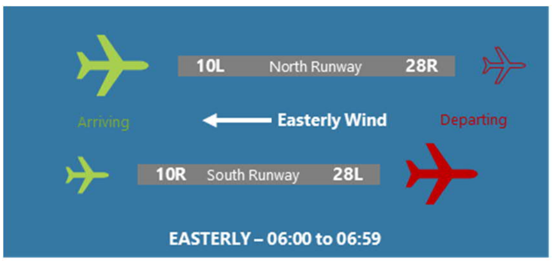








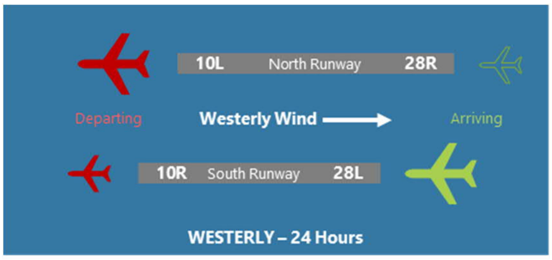


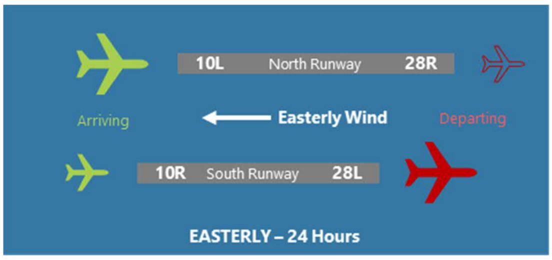


Time	Preferential Runway Use Measures
23:00 to 23:59	When winds are westerly, the South Runway is preferred for arriving aircraft. Either runway used for departing aircraft as determined by air traffic control. When winds are easterly, either runway used as determined by air traffic control for arriving aircraft. The South Runway shall be preferred for departing aircraft.
00:00 to 05:59	Movements on the South Runway only.
06:00 to 06:59	When winds are westerly, the South Runway is preferred for arriving aircraft. Either runway used for departing aircraft as determined by air traffic control. When winds are easterly, either runway used as determined by air traffic control for arriving aircraft. The South Runway is preferred for departing aircraft.

Scenario 03

4.5.10 In this scenario, the permitted daytime use of the runways continues at night.

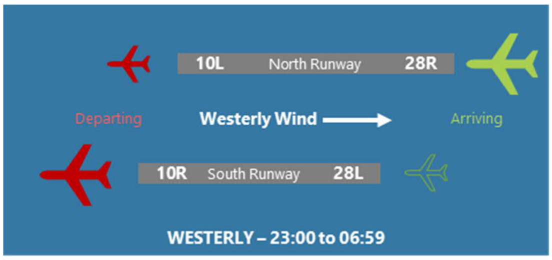


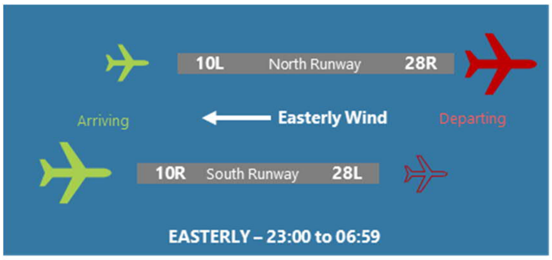


Time	Preferential Runway Use Measures
23:00 to 06:59	When winds are westerly, South Runway is preferred for arriving aircraft. Either runway is used for departing aircraft as determined by air traffic control. When winds are easterly, either runway as determined by air traffic control for arriving aircraft. The North Runway is preferred for departing aircraft.

Scenario 04

4.5.11 In this scenario, daytime use of the runways is reversed at night-time.

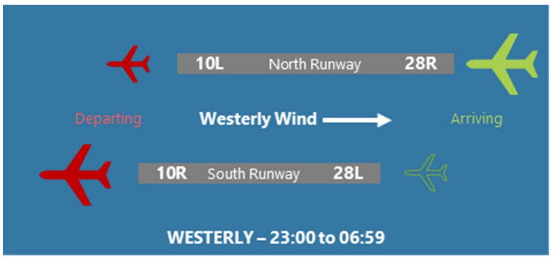


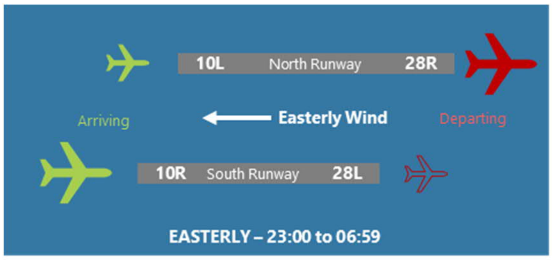


Time	Preferential Runway Use Measures
23:00 to 06:59	When winds are westerly, the North Runway shall be preferred for arriving aircraft. Either runway shall be used for departing aircraft as determined by air traffic control. When winds are easterly, either runway as determined by air traffic control shall be preferred for arriving aircraft. The North Runway shall be preferred for departing aircraft.

Scenario 05

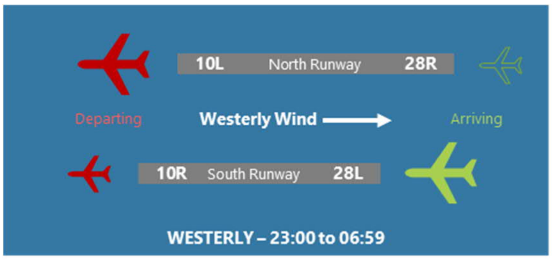
4.5.12 In this scenario, the preferred arrivals runway will alternate between the North Runway and the South Runway.

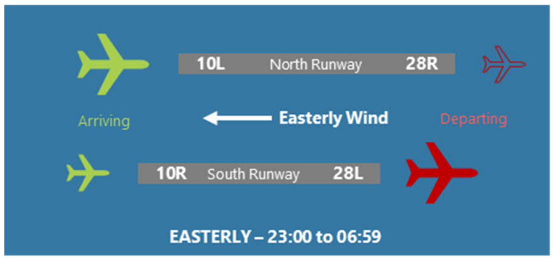




OR

OR





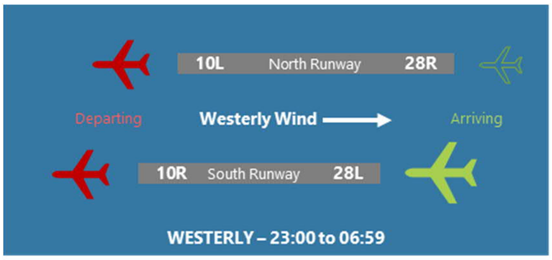
Time	Preferential Runway Use Measures
23:00 to 06:59	When winds are westerly, the preferred arrival runway will alternate between North and South Runways while either runway shall be used for departing aircraft as determined by air traffic control. When winds are easterly, the preferred departure runway will alternate between North and South Runways while either runway as determined by air traffic control shall be preferred for arriving aircraft.

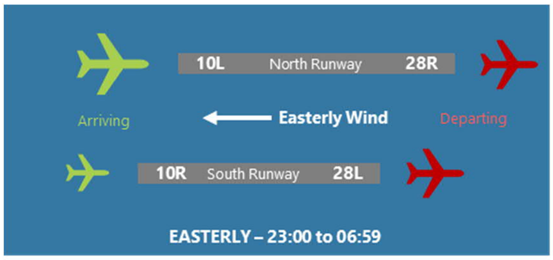
Scenario 06

4.5.13 This is a benchmark scenario and not considered as a viable alternative.

Scenario 07

4.5.14 In this scenario, Semi-Mixed Mode – Mixed Mode applies for departures and with daytime use for arrivals between 23:00 and 06:59.

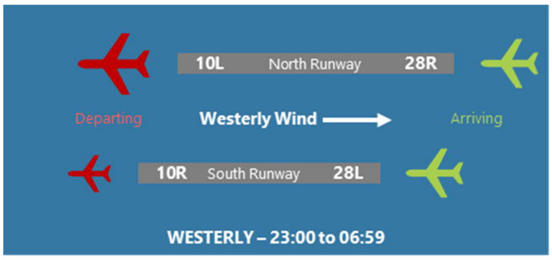


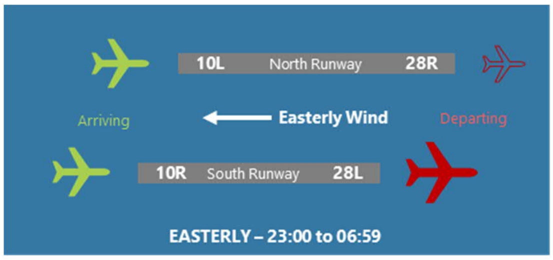


Time	Preferential Runway Use Measures
23:00 to 06:59	Both North and South Runways available for departures (runway used depends on whether turn to the north or south is required based on destination); prefer arrivals landing on the South Runway in westerly conditions and the North Runway in easterly conditions unless this exceeds the single-runway capacity for a given hour. If single-runway capacity is exceeded, then arrivals are moved to the other runway.

Scenario 08

4.5.15 In this scenario, Semi-Mixed Mode – Mixed Mode applies for arrivals and daytime use for departures between 23:00 and 06:59.

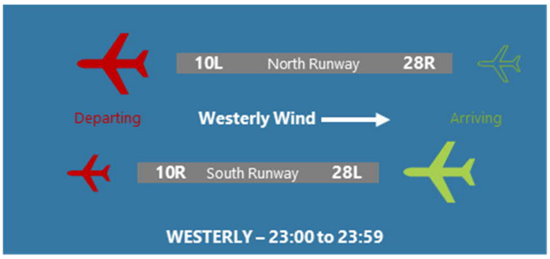


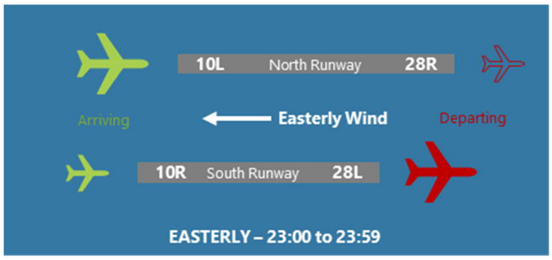


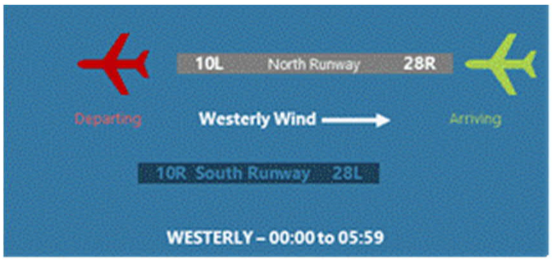
Time	Preferential Runway Use Measures
23:00 to 06:59	Both North and South Runways available for arrivals (assumed 50/50 split); prefer departures take off on the North Runway in westerly conditions and the South Runway in easterly conditions.

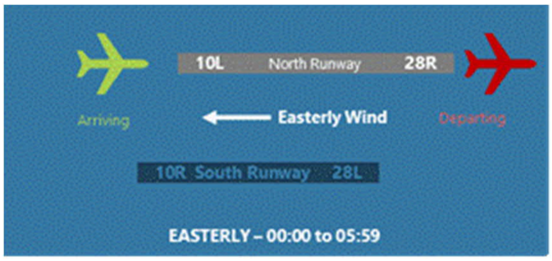
Scenario 09

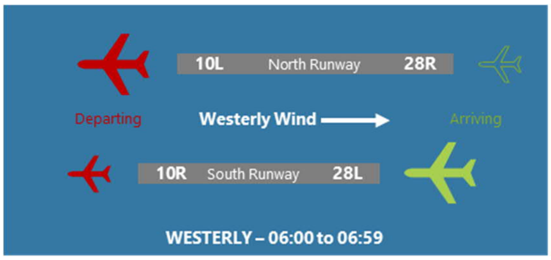
4.5.16 In this scenario, the North Runway only is used between 00:00 and 05:59.

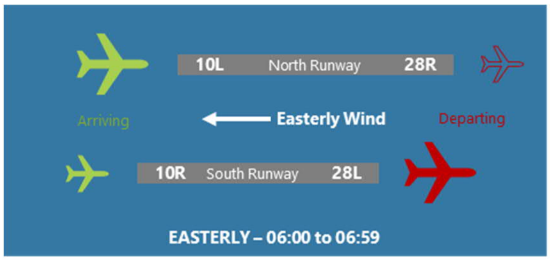








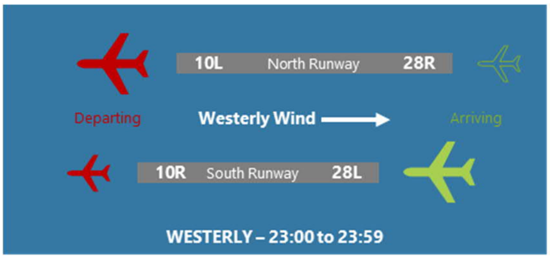


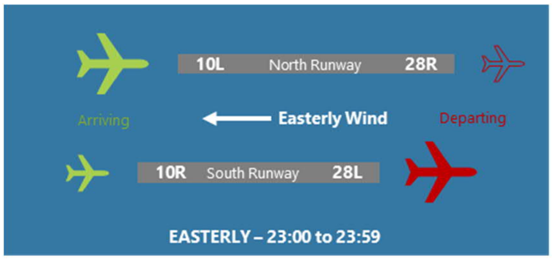


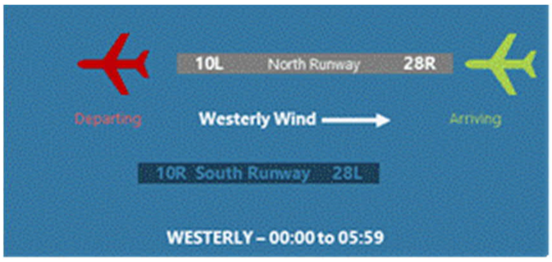
Time	Preferential Runway Use Measures
23:00 to 23:59	When winds are westerly, the South Runway shall be preferred for arriving aircraft. Either runway shall be used for departing aircraft as determined by air traffic control. When winds are easterly, either runway as determined by air traffic control shall be preferred for arriving aircraft. The South Runway shall be preferred for departing aircraft.
00:00 to 05:59	Movements preferred on the North Runway only (single runway).
06:00 to 06:59	When winds are westerly, the South Runway shall be preferred for arriving aircraft. Either runway shall be used for departing aircraft as determined by air traffic control. When winds are easterly, either runway as determined by air traffic control shall be preferred for arriving aircraft. The South Runway shall be preferred for departing aircraft.

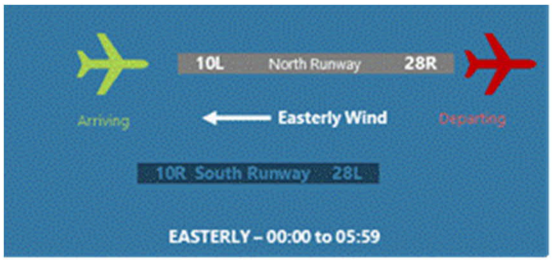
Scenario 10

4.5.17 In this scenario, there is alternate use of the North Runway and South Runway between 00:00 and 05:59.

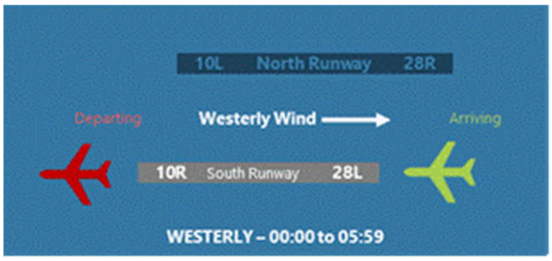


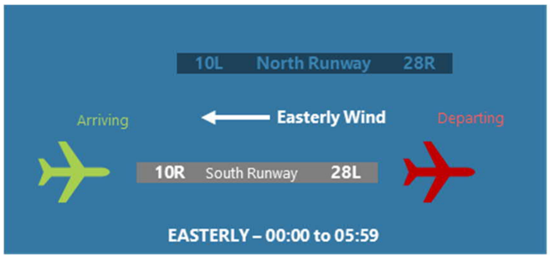


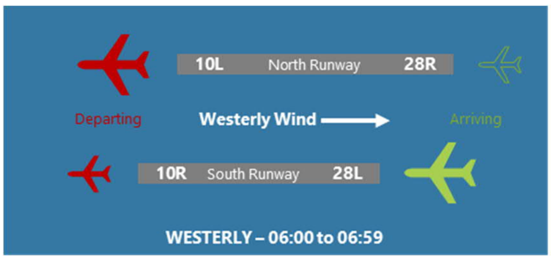


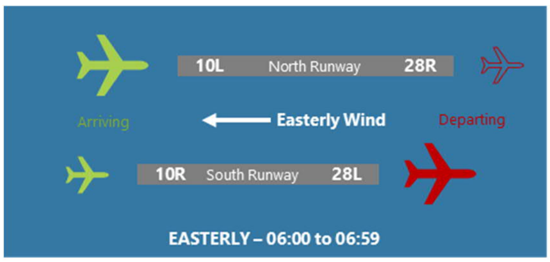


OR **OR**









Time	Preferential Runway Use Measures
23:00 to 23:59	When winds are westerly, the South Runway shall be preferred for arriving aircraft. Either runway shall be used for departing aircraft as determined by air traffic control. When winds are easterly, either runway as determined by air traffic control shall be preferred for arriving aircraft. The South Runway shall be preferred for departing aircraft.
00:00 to 05:59	Alternate each night between movements on the North Runway only and the South Runway only.
06:00 to 06:59	When winds are westerly, the South Runway shall be preferred for arriving aircraft. Either runway shall be used for departing aircraft as determined by air traffic control. When winds are easterly, either runway as determined by air traffic control shall be preferred for arriving aircraft. The South Runway shall be preferred for departing aircraft.

4.5.18 All scenarios have the existing 32mppa Cap in place and have been modelled for 2025 using the latest forecasts. As part of this, and to allow for the Irish Aviation Authority (IAA) advice that it is important to use both runways for departures in the first wave of morning departures[3] (06:00 to 08:00), in all except Scenario 01 both runways are used for departures during that period.

4.5.19 Scenario 06 does not seek any amendment of the Terminal 1 and 2 passenger capacity conditions (32mppa Cap) or the conditions in the North Runway Planning Permission document governing the general operation of the runway system. However, it revokes the two operating restrictions 3(d) and 5 (rather than amending or replacing the conditions as in the Proposed Scenario), while meeting the cNAO

4.5.20 The Crosswind Runway is only used when wind direction dictates.

Analysis of Alternatives

4.5.21 The EPA Draft EIA Guidelines state that "*it is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required."*

4.5.22 The Aircraft Noise Regulation 598 Assessment concludes that Scenario 06 (forecast without new measures) meets the cNAO but causes a potential for significant adverse effects due to increases in noise levels, specifically at night, compared to the 2018 noise situation.

4.5.23 Based on the effectiveness analysis among the eight preferential runway use measure scenarios, Scenario 02, the Proposed Scenario, was found to be the most effective because it not only meets the cNAO related to reducing noise exposure levels compared to 2018, but also causes the lowest number of people exposed to increases in noise that could cause a significant adverse effect; in Scenario 02 there is the lowest number of people exposed to changes that potentially cause significant adverse effects caused by the change in noise levels for both L_{night} and L_{den} levels. When compared to the forecast without new measure scenario, Scenario 02 results in the lowest number of people exposed to significant adverse changes in L_{night} and L_{den} levels.

4.5.24 Scenario 02 maintains the preferential runway use as described in the North Runway Planning Permission conditions no. 3(b) and 3(c) between 07:00 and 22:59, extends this mode of operation into the shoulder hours of the night period between 23:00 and 23:59 and 06:00 and 06:59, and limits use of North Runway between 00:00 and 05:59.

4.5.25 It is important to note that none of the reasonable alternatives studied would require any amendment of conditions of the North Runway Planning Permission governing the daytime operation of the runway system (i.e., conditions which are not specific to night-time use, namely conditions no. 3 (a), 3(b), 3(c) and 4 of the North Runway Planning Permission) or any amendment of the 32mppa Cap.

[3] See *Chapter 3: Need for the Project* and *Chapter 5: Consultation* for more information

4.5.26 All of the preferential runway use alternatives appraised relate to the operation of the airport at night-time only, and do not require the development of any physical or other infrastructure. All of the scenarios comprise the same number of Air Traffic Movements (ATMs), the same use of the flight paths and do not require the amendment of the permitted annual passenger capacity of the terminals at Dublin Airport.

4.5.27 Table 4-1 presents the assessed differences between the alternatives considered versus Scenario 02 (the Proposed Scenario) in all scenarios across the different environmental topic areas. Except for aircraft noise which is seen as the key differentiator and so is considered in detail within the Aircraft Noise Regulation 598 Assessment and within *Chapter 13: Aircraft Noise and Vibration* and *Chapter 14: Ground Noise and Vibration,* as, along with health (considered in *Chapter 7: Population and Human Health*), it is the only aspect of the proposed Relevant Action with the likelihood of potential significant effects.

4.5.28 For all other environmental factors, it is considered that the variations in preferential runway use scenarios would not result in a material difference or a new significant effect arising. The numbers or times of aircraft taking off during the day or night would not change the concentrations of pollutants in the air or the amounts of greenhouse gases emitted since the numbers of ATMs are the same. Biodiversity, cultural heritage, water, land and soils are all similarly not sensitive to the differences in runway usage. It is possible that changes in runway usage could lead to slightly different accident risk profiles, but changes would be imperceptible. Variations in the times of night-time runway usage might affect the volumes of traffic on the road network but this would occur outside the peak times and not likely be a perceptible change. Visual impacts at night-time are not likely to differ materially between the scenarios, although approach lighting of the North Runway would vary, with the times of its use. Therefore, the reasonable alternatives studied would give rise to largely imperceptible effects upon all environment factors, except for noise and health.

Alternative Mitigation Measures

4.5.29 In arriving at the preferred alternative, Scenario 02, mitigation measures were not considered. It was identified as the best performing of the alternatives in terms of noise and then examined further to see if its performance could be enhanced with an additional noise abatement measure. The measure selected, night-time noise insulation offered to the owners of properties experiencing high levels of night-time noise disturbance, is discussed in more detail in *Chapter 13: Aircraft Noise and Vibration*. It is considered that this measure would have beneficial impacts on noise and human health only, with other environmental factors being unaffected. The night-time noise insulation mitigation measure is listed in Table 4-2, along with the existing measures in use at Dublin Airport.

Table 4-1: Comparison of Environmental Effects

Anticipated Order of Magnitude of Effect Between Reasonable Alternatives Considered vs the Proposed Scenario

Scenario	Population and Human Health	Major Accidents and Disasters	Transport and Transportation	Air Quality	Climate and Carbon	Water	Air and Ground Noise and Vibration	Biodiversity (Terrestrial & Aquatic)	Landscape and Visual	Land and Soils	Material Assets	Cultural Heritage
Scenario 01	Beneficial	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Potential for significant beneficial effects	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Scenario 03	Adverse	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Potential for significant adverse effects	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Scenario 04	Adverse	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Potential for significant adverse effects	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Scenario 05	Adverse	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Potential for significant adverse effects	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Scenario 06	Adverse	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Potential for significant adverse effects	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Scenario 07	Adverse	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Potential for significant adverse effects	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Scenario 08	Adverse	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Potential for significant adverse effects	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible

			Anticipated Order of Magnitude of Effect Between Reasonable Alternatives Considered vs the Proposed Scenario									
Scenario	**Population and Human Health**	**Major Accidents and Disasters**	**Transport and Transportation**	**Air Quality**	**Climate and Carbon**	**Water**	**Air and Ground Noise and Vibration**	**Biodiversity (Terrestrial & Aquatic)**	**Landscape and Visual**	**Land and Soils**	**Material Assets**	**Cultural Heritage**
Scenario 09	Adverse	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Potential for significant adverse effects	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Scenario 10	Adverse	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Potential for significant adverse effects	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible

Table 4-2: Existing, Planned and Recommended Noise Management Measures for Scenario 02

Regulation 598 Assessment Measure ID	Source	Measure Description	Measure in Place in 2018?	Measure in Place in 2025?[4]	New Measure in Proposed Relevant Action
		Reduction of Noise at Source (NS)			
NS-1	FCC Noise Action Plan (NAP)	Promote quieter aircraft through incentives such as FlyQuiet programmes. This programme is expected to be in place by 2022.	×	✓	×
NS-2	FCC NAP	Work with airline partners to introduce quieter aircraft, particularly at night, including consideration of incentives. Approaches to incentives under development and expected to be in place by 2022.	×	✓	×
		Noise Abatement (NA) Operating Procedures			
NA-1	FCC NAP; daa Noise Management Plan (NMP);	*Two-Runway Preferential Runway Programme* – Intent of measure is to utilise whenever possible the runways that enable aircraft to avoid noise-sensitive areas during the initial departure and final approach phases of flight. Runway 10 or Runway 28 is the required runway between 0600 and 2300 local time when the crosswind component is 20 knots or less. Runway 28 will be the preferential runway when the tailwind component is 10 knots or less and	✓	✓	×

[4] If in place this is also part of the proposed Relevant Action.

Regulation 598 Assessment Measure ID	Source	Measure Description	Measure in Place in 2018?	Measure in Place in 2025? [4]	New Measure in Proposed Relevant Action
	Dublin Airport Aeronautical Information Publication	braking action is assessed as good. Aircraft will be required to use these runways except when operational reasons dictate otherwise. If the crosswind component on Runway 10 or Runway 28 is greater than 20KT, Runway 16 or Runway 34 may become the active runway. If the forecast crosswind component on Runway 10 or 28 is greater than 20KT, Runway 16 or 34 may become the active runway. The use of Runway 16/34 will be kept to an absolute minimum subject to operational conditions. Runways will be prioritised for noise abatement purposes between 2300 and 0600 local time, subject to the same wind calculation method and values as used between 0600 and 2300HR local time (see Section 5). When weather conditions and flight movements permit, runway usage will be prioritised as follows: Arrivals: #1 (Runway 10), #2 (Runway 16), #3 (Runway 28), #4 (Runway 34); Departures: #1 (Runway 28), #2 (Runway 34), #3 (Runway 10), #4 (Runway 16).			
NA-2	FCC NAP; daa NMP; Dublin Airport Aeronautical Information Publication	*Two-Runway Noise Preferential Routes (NPRs) or Environmental Noise Corridors and Track Keeping* – Intent is to minimise disruption by routing aircraft away from built-up areas, where possible. Unless directed otherwise by IAA-Air Navigation Service Provider (ANSP) all aircraft taking off from Dublin Airport are required to follow specific NPRs. To minimise impact, NPRs are designed to avoid overflight of built-up areas, where possible. An NPR is a path or corridor (1.8 kilometres at its widest point) that aircraft follow from take-off until being directed by IAA- ANSP onto their main air traffic routes, typically at 3,000 feet altitude above mean sea level. Aircraft flying inside the NPR corridor are flying on-track. Departures from all runways (except easterly departures on the existing Runway 10/28 must maintain course straight out for 5 nautical miles (1 nautical mile = 1,852 metres) after take-off before commencing a turn, unless otherwise cleared by IAA- ANSP. Easterly departures on the existing southern runway must maintain course straight out for 5 nautical miles before commencing a turn to the north, or to 6 nautical miles before commencing turn to the south. Once an aircraft reaches the end of the NPR, or at an altitude of 3,000 feet, IAA- ANSP will turn it onto a more direct heading to its destination. IAA- ANSP can turn aircraft off NPRs below 3,000 feet for safety reasons, for example to avoid storms.	✓	✓	×
NA-3	FCC NAP; daa NMP; Dublin Airport Aeronautical Information Publication	*Noise Abatement Departure Procedures (NADP) Climb Profile* – Based on noise-abatement departure climb guidance contained in the ICAO's Procedures for Air Navigation Services Aircraft Operations Document 8168 Volume 1, Flight Procedures Appendix to Chapter 3 – NADP2, with thrust cutback at 1,500 feet.	✓	✓	×

Regulation 598 Assessment Measure ID	Source	Measure Description	Measure in Place in 2018?	Measure in Place in 2025? [4]	New Measure in Proposed Relevant Action
NA-4	Dublin Airport Aeronautical Information Publication	*Visual Approach* – Jet aircraft (Cat C/D) on visual approach to Runways 28, 10, 16, and 34 must join final approach no closer than 6 nautical miles from touchdown. Aircraft must follow a descent path that will not result in being at any time lower than the approach path, which would otherwise be followed using the ILS glide path.	✓	✓	×
NA-5	FCC NAP	*Continuous Decent Approach (CDA)* – Operates a CDA that reduces the noise experienced on the ground by reducing the overall thrust required during the initial descent and keeping aircraft at higher altitudes for a longer period.	✓	✓	×
NA-6	IAA ATC	*Continuous Climb Operations* - continuous climb operation along a standard departure procedure is intended to limit interruption of the climb profile to cruise altitude and reduces the noise experienced on the ground caused by thrust levels required to keep aircraft level and increases distance from noise-sensitive areas between an aircraft and receptor as soon as possible.	✓	✓	×
NA-7	FCC NAP; daa NMP; Dublin Airport Aeronautical Information Publication	*Reverse Thrust* – Reverse thrust is used to aid the deceleration of aircraft on landing using the aircraft's engines. This should not be used at night, unless required for safety reasons.	✓	✓	×
NA-8	FCC NAP; daa NMP	*Engine Ground Running* – Engine test runs are not permitted between 2000HRs and 0700HRs. All aircraft types may undertake testing between 0900 and 2000HRs, and only aircraft up to Code C may undertake engine testing between 0700 and 0900HRs.	✓	✓	×
NA-9	FCC NAP; daa NMP	*Monitor and Report* – Sustain noise operating procedures through monitoring.	**Partial**	✓	×
NA-10	Accepted NPR for North Runway	*Three-Runway Noise Preferential Routes (NPRs) or Environmental Corridors (ECs) and Track Keeping* – Intent is to minimise disruption by routing aircraft away from built-up areas, where possible. Unless directed otherwise by IAA-ANSP, all aircraft taking off from Dublin Airport are required to follow specific NPRs. To minimise impact, NPRs are designed to avoid overflight of built-up areas, where possible. An NPR is a path or corridor (1.8 kilometres at its widest point) that aircraft follow from take-off until being directed by IAA- ANSP onto their main air traffic routes, typically at 3,000 feet altitude above mean sea level. Aircraft flying inside the NPR corridor are flying on-track. The preferred departure flight path NPR is straight out on the South Runway and divergence paths of 30-degrees and	×	✓	×

Regulation 598 Assessment Measure ID	Source	Measure Description	Measure in Place in 2018?	Measure in Place in 2025?[4]	New Measure in Proposed Relevant Action
		75-degrees for the North Runway for westerly flow and straight out on the South Runway and a divergent path of 15-degreesd for easterly flow.			
NA-11		*Three-Runway Preferential Runway Programme* – Intent of measure is to utilise whenever possible the runways that enable aircraft to avoid noise-sensitive areas during the initial departure and final approach phases of flight. From 0700 to 2259, 2300 to 2359 and 0600 to 0659: When winds are westerly, Runway 28L shall be preferred for arriving aircraft. Either Runway 28L or 28R shall be used for departing aircraft as determined by air traffic control. When winds are easterly, either Runway 10L or 10R as determined by air traffic control shall be preferred for arriving aircraft. Runway 10R shall be preferred for departing aircraft. From 0000 to 0559: Limit take-off or landings to South Runway (Runway 10L-28R) except in cases of safety, maintenance considerations, exceptional air traffic conditions, adverse weather, technical faults in air traffic control systems or declared emergencies at other airports or where Runway 10R-28L length is required for a specific aircraft type.	×	✓	✓
		Land Use (LU) Planning and Management			
LU-1	FCC NAP; daa NMP; FCC County Development Plan; Dublin Airport LAP	*Land Use Compatibility Management Framework* – The land use and planning frameworks include the FCC's County Development Plan 2017–2023 (Variation No. 1) and the Dublin Airport 2020 Local Area Plan (LAP); which defines four airport noise zones and the associated objective of each zone along with an indication of the potential noise exposure from movements at Dublin Airport. The zones are based on potential noise exposure levels ($L_{Aeq,16hr}$ and L_{night} levels) due to Dublin Airport using either the new northern or existing southern runway for arrivals or departures. The noise zoning system has been developed with the overarching objective to balance the potential impact of aircraft noise from Dublin Airport on both external and internal noise amenity. This allows larger development which may be brought forward in the vicinity of Dublin Airport's flight paths to be identified and considered as part of the planning process. The focus of the noise zones is to ensure compatibility of residential development and ensuring compatibility with pertinent standards and guidance in relation to planning and noise	✓	✓	×
LU-2	FCC NAP	*Land Use Compatibility Management Review* – 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.	✓	✓	×
LU-3	FCC NAP	Encroachment Management – Monitor noise encroachment associated with Dublin Airport to ensure airport noise policy is appropriately informed through land-use planning frameworks in so far as they relate to Dublin Airport.	✓	✓	×

Regulation 598 Assessment Measure ID	Source	Measure Description	Measure in Place in 2018?	Measure in Place in 2025? [4]	New Measure in Proposed Relevant Action
LU-4	FCC NAP; daa NMP	*Sound Insulation (HSIP)* – Voluntary to households that qualify by being located within the 2016 63 dB $L_{Aeq,16hr}$ noise contour.	✓	×	×
LU-5	North Runway Planning Permission Condition 7	*Sound Insulation (RNIS)* – Voluntary to households that qualify by being located within the 2022 63 dB $L_{Aeq,16hr}$ noise contour. All properties to be completed by the time North Runway is operational.	×	✓	×
LU-6	North Runway Planning Permission Condition 9	*Voluntary Dwelling Purchase Scheme* – Approved in 2016, this measure provides voluntary acquisition of eligible dwellings. Eligibility for the scheme is based on the predicted 69dB $L_{Aeq,16hr}$ contour. This is the noise threshold for participation in the voluntary scheme. The scheme is completely voluntary and places no obligation on any resident to participate. Offers to purchase will include a 30 percent premium on the current market value of the residence. Property valuations will be based on current movements at Dublin Airport and accordingly valuations will not be affected by the new runway. The scheme will remain available for three years after North Runway is operational (2025).	✓	✓	×
LU-7	North Runway Planning Permission Condition 6	*Voluntary School Sound Insulation* - voluntary noise insulation of schools for all schools and registered pre-schools predicted to fall within the contour of 60 dB $L_{Aeq,16hr}$. The scheme is designed to ensure that maximum noise limits within the classrooms and school buildings generally shall not exceed 45 dB $L_{Aeq,8hr}$ (a typical school day).	×	✓	×
LU-8		*Night-time Sound Insulation Grant Programme* – A grant programme for households that qualify by being located between the 2025 forecast L_{night} 55 dB and higher noise contours.	×	✓	✓
		Operating Restrictions (OR)			
OR-1	North Runway Planning Permission Condition 4	Crosswind runway (16-34) shall be restricted 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 shall be interpreted as use when required by international regulations for safety reasons.	×	✓	✓
OR-2		Runway 10L-28R "No Use" Limit: This measure is intended to ensure that noise levels forecast to occur in 2025 meet the cNAO Runway 10L-28R shall not be used for take-off or landing between 0000 hours and 0559 hours (except in cases of safety, maintenance considerations, exceptional air traffic conditions, adverse weather, technical faults in air traffic control systems or declared emergencies at other airports or where Runway 10R-28L length is	×	×	✓

Regulation 598 Assessment Measure ID	Source	Measure Description	Measure in Place in 2018?	Measure in Place in 2025?[4]	New Measure in Proposed Relevant Action
		required for a specific aircraft type). Due to historic and forecast low demand, this restriction is not expected to impact Dublin Airport capacity and efficiency, the European aviation system, and the economy.			
OR-3		Quota Count: This measure is intended to ensure that noise levels forecast to occur in 2025 meet the cNAO. The proposed quota count is based on an Annual Night Quota (ANQ) count of 7,990 between 2330 to 0600 (Night Quota Period) to be applied for each year from the opening of the North Runway to 2025	×	×	✓
		Monitoring and Community Engagement (CE)			
CE-1	FCC NAP; daa NMP	*Stakeholder Engagement* – Participate in regular meetings with the Dublin Airport Environment Working Group and Community Liaison Group.	✓	✓	×
CE-2	FCC NAP; daa NMP	*Community Engagement Programme* – Includes newsletters and various programmes that support the local community in the form of initiatives and funds.	✓	✓	×
CE-3	FCC NAP; daa NMP	*Noise and Flight Track Monitoring System* – 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 several key locations. This information is used by daa to respond to any complaints relating to aircraft noise. Continue to promote enhancements of the system to include near live-flight reporting and appropriate additional fixed and/or mobile noise monitoring terminals.	✓	✓	×
CE-4	FCC NAP; daa NMP	*Noise Complaint Management Systems* – Process and respond to all aviation-related noise complaints in a timely manner.	✓	✓	×
CE-5		*Relevant Action Noise Reporting Framework* – Noise reporting associated with compliance with NAO and measures proposed	×	×	✓

4.6 Conclusions

4.6.1 It has been determined that consideration of reasonable alternative locations, alternative layouts and alternative designs of the proposed Relevant Action are not relevant as the application only relates to a change in operating restrictions, and does not comprise the delivery of any physical infrastructure or construction works.

4.6.2 In terms of consideration of alternative operations, Scenario 02, which is the proposed Relevant Action in terms of runway operation, was assessed as the preferential runway use scenario with the lowest number of people exposed to changes that potentially result in significant adverse effects caused by the change in noise levels for both L_{night} and L_{den} levels. For all environmental factors, with the exception of noise and health, the difference between each of the alternative scenarios and Scenario 02 is imperceptible.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections and additions, the chapter has been revised to provide:

- Address additional assessment years as requested by the Council;
- Set out more clearly the reasonable alternatives that have been studied within the 598 Assessment, and those that have been rejected;
- Outline the environmental effects of the reasonable alternatives considered; and
- Respond to the latest passenger growth forecasts at Dublin Airport.

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

5. Consultation

5.1 Introduction

5.1.1 As set out in *Chapter 1: Introduction*, North Runway Planning Permission was granted in 2007. In 2016 the Applicant commenced a process of consultation relating to proposals to review conditions no. 3(d) and 5. This was in anticipation of a planning process that would for such a review of these conditions. Consultation undertaken encompassed both the construction of the North Runway and proposed changes to the operation of the runway system at night.

5.1.2 The Applicant had always indicated its intent to seek a review of condition no. 3(d) and 5 when the legislation enabling such a review was enacted. The early consultation on the proposed Relevant Action was in anticipation of such legislation. However, there was a significant delay in the introduction of the legislation giving effect to Regulation 598/2014 in national law, designating the Aircraft Noise Competent Authority (ANCA), and amending planning legislation. This legislation, the Aircraft Noise (Dublin Airport) Regulation Act 2019, allows for the airport to apply for a Relevant Action to amend, revoke or replace operating restrictions.

5.2 Request for Further Information

5.2.1 Item 1 f) of the FCC request for further information (RFI) states that: "*While details of consultations are outlined out in Chapter 5, there is little information on the timings of the various consultations and no information has been provided in relation to the issues raised in the consultations and how these have informed the assessments in the EIAR. Information should be provided on timings of consultations, issues arising and how these have informed / been assessed in the EIAR*".

5.2.2 The following paragraphs provide a summary of the approach to consultation and the timelines involved.

5.2.3 Consultation on proposals that the Applicant would plan to make seeking changes to condition no. 3(d) and 5 of the North Runway planning permission was undertaken in June and December 2016. Below is a summary of the principal consultation approach with greater detail provided in the *Consultation on Flight Paths and Change to Permitted Operations, February 2017* report appended to this chapter (Appendix 5A). The overall consultation was underpinned by two specific phases of public consultation:

Consultation Phase 1 - Introduction to the project and EIAR scoping (16 June 2016 – 22 July 2016)

5.2.4 Following the publication of the *North Runway Proposal to Change Permitted Operations EIS Scoping Report in June 2016* this first phase ran from 16 June 2016 – 22 July 2016 with the closing date for submissions being 5 August 2016. As part of this consultation phase, feedback was sought from various stakeholder groups including local community, Elected Representatives and statutory consultees.

5.2.5 Consultation Phase 1 included five public consultation events held over a six week period, the provision of Information Services (including public information displays, a freephone helpline and webpage), liaison through the Community Liaison Team and publication of communication materials including brochures and display boards, leaflet drops, social media updates and communication with elected representatives. A number of newspaper notices were also issued publicising the consultation in local publications.

5.2.6 Feedback from Consultation Phase 1 included a total of 217 submissions from individuals, schools, community resident's groups, elected representatives, etc. Whilst submissions related to numerous issues beyond the proposal to change the permitted operations, the key issues in relation to the proposal and its scoping were as follows:

- Impacts on population and human heath;
- Potential hazard increases;

- Impacts on traffic and transportation;
- Air quality;
- Climate impacts;
- Aircraft noise and vibration;
- Visual impact of flights on surrounding area;
- Impacts on biodiversity;
- Potential for increased flooding; and
- Impact on agricultural land use.

5.2.7 Additional Feedback was also provided in relation to the proposed removal of the existing restrictions (i.e. condition no. 3(d) & 5). The key issues raised are summarised as follows:

- Sleep and general disturbance at night as a result of changed restrictions;
- It was noted that other airports have restrictions on flights at night;
- More detail on night curfews required;
- More detail on mitigation measures required;
- The existing planning conditions safeguard the local community and should not be removed;
- A compromise on restrictions should be achieved;
- Removal of night restrictions would impact on new home purchases within noise zones;
- Early morning/late night flights failed to respect residents' rights and favoured airlines;
- More information required in relation to increased intensity/frequency if night restrictions removed;
- Concerns with the process to remove restrictions and what legal mechanism will govern the request; and
- Concerns with the scope of the consultation.

5.2.8 Refer to the *North Runway Proposal to Change Permitted Operations - EIS Scoping Consultation Feedback*, appended to this Chapter (Appendix 5B) for further detail on the nature and extent of the consultation undertaken and feedback received during Consultation Phase 1.

Consultation Phase 2 - Consultation on flight paths and change to permitted operations (24 October 2016 – 19 December 2016)

5.2.9 The second consultation phase sought to provide further details on the proposed change to permitted operations.

5.2.10 Consultation Phase 2 included three public consultation events held between 24 October 2016 – 26 October 2016, the provision of information services (including public information displays, a freephone helpline and webpage), liaison through the Community Liaison Team and publication of communication materials including brochures and display boards, leaflet drops, social media updates and communication with elected representatives. A number of newspaper notices were also issued publicising the consultation in local publications. The Phase 2 Consultation also included the display of 12 no. maps at both the public consultation events and the project website. The maps provided information in relation to the scenario's being investigated both for the Permitted Scenario and Proposed Scenario summer day and night contours in 2022. These maps were also distributed to stakeholders upon request.

5.2.11 A separate, independent consultation survey was also administered between 24 October 2016 – 19 December 2016 and analysed by Red C Research as part of this phase. A total of 261 responses were received through this survey, with an additional 23 further submissions being sent via email to the Applicant. Whilst the survey also related to a number of other matters, the key points in relation to the proposed change to permitted operations was that the detailed analysis of additional comments provided by respondents indicated that most were concerned about noise and in particular night time noise. Further, and in relation to potential mitigation measures, the majority of respondents thought it was "extremely important" to consider insulation for dwellings within the 55dB night contour and 60dB day contour.

5.2.12 Refer to the *Consultation on Flight Paths and Change to Permitted Operations, February 2017*, appended to this Chapter for further detail on the nature and extent of the consultation undertaken and feedback received during Consultation Phase 2.

5.2.13 In preparing the proposed Relevant Action application, elements of the Phase 1 & 2 consultation have been incorporated into the project and in particular the outcomes from consultation which focussed on the proposed flight paths and noise mitigation proposals associated with proposals to change condition no. 3(d) and 5.

5.2.14 The 2016 consultations made clear that the Applicant would seek a review of condition no. 3(d) and 5. The main focus of the consultations at that time was related to scoping of the Environmental Impact Statement (EIS) and operation of the runway system and related effects (including noise) and mitigation measures. The feedback from these consultations, where relevant, has been considered when developing this proposed Relevant Action application.

5.2.15 Consultation on proposals that the Applicant would seek on changes to condition no. 3(d) and 5 of the North Runway Permission were undertaken in June, July and October 2016. While consultations held in June, July and October 2016 did not relate directly to the proposed Relevant Action, there were key similarities, in that the consultations made clear that the Applicant would not seek amendment to day time runway operations, but that there would be an application in due course to amend conditions relating to the runway system at night. The similarities also relate to the eligibility threshold for any future night-time insulation offers that might be incorporated into the final planning application, in this case, the proposed Relevant Action.

5.2.16 A range of stakeholder views and submissions were received during the 2016 Consultation phase. Key concerns raised related to the proposed unrestricted use of the runway system through the removal of the operating restrictions and increases in night-time noise, the results of which can be found at https://www.dublinairport.com/docs/default-source/north-runway-downloads/public-consultation-report--flight-paths-and-change-to-permitted-operations.pdf?sfvrsn=b06d628_2. These submissions assisted in informing the proposed Relevant Action which seeks to deliver a balanced approach that serve the needs of a developing international airport (by amending and replacing the operating restrictions prescribed in the North Runway Planning Permission). This is done whilst respecting local communities through proposing appropriate mitigations, safeguards and monitoring relating to additional night control (quota count system) and not seeking to use North Runway throughout the full night period.

5.2.17 During that time, the Applicant's established community engagement team worked closely with the wider Dublin Airport business to provide information of interest to local residents and other parties (as set out below). In addition, a Community Liaison Group (CLG) was established in accordance with condition no. 28 of the An Bord Pleanála Decision to Grant Permission (PL06F.217429) with representation from Fingal County Council, the Applicant and the St. Margaret's Community. Briefings and updates on the North Runway project, and other issues of interest, were provided to these groups. Advance briefings to the CLG and the Dublin Airport Environmental Working Group (DAEWG) were conducted prior to the submission of the application for the proposed Relevant Action. These briefings were formal in nature and focused on information sharing with stakeholders.

5.2.18 Following the introduction of the legislation giving effect to Regulation 598/2014 in Irish law and the establishment of ANCA, it became apparent that the mechanism to amend and replace the operating restrictions would require the setting of a Noise Abatement Objective (NAO) by ANCA and a proposed Relevant Action by the Applicant. This process also legislates for a 14-week consultation period with interested parties following the issue of ANCA's draft regulatory decision and report on the proposed Relevant Action.

5.2.19 It is noted that advance briefings to the CLG and the DAEWG were conducted prior to the submission of the application for the proposed Relevant Action. These briefings were formal in nature and focused on information sharing with stakeholders.

5.2.20 The proposed Relevant Action was submitted to FCC on 18th December 2020 and a number of statutory submissions and observations have been received by FCC in relation to the application. The submissions and observations have been reviewed and grouped into a number of key themes as part of this chapter. Where the revised EIAR includes information relating to these key themes, it is noted accordingly below in Section 5.8.

5.2.21 Under the requirement "to consult and coordinate such further information with both the Planning Authority and the Aircraft Noise Competent Authority", the Applicant's team requested a meeting to consult the Planning Authority on the submission of FI in May 2021 but this meeting did not go ahead. Therefore, no further consultation could occur with the Planning Authority. The Applicant thereafter submitted five tranches of information to ANCA during the period June – August 2021 in response to ANCA's Direction 01. Copies of all such information was provided to both ANCA and the Planning Authority in hard and soft copy and are provided in the proposed Relevant Application revised submission.

5.3 Context of Public and Stakeholder Engagement

5.3.1 In compliance with Articles 6, 7 and 8 of the Aarhus Convention, there is a high degree of public participation in environmental decision making in the State provided through the Irish planning system. In this respect, public participation has been a part of the North Runway project through three planning processes – the original grant of planning permission, the application to amend the physical layout of the North Runway and through the current proposed Relevant Action to change the runway operating conditions. Consultation will continue to form part of the proposed Relevant Action as it is mandated by the ANCA's process when issuing the draft determination. A guide to the requirements of the Aarhus Convention was published by UNECE in 2014 entitled The Aarhus Convention: An Implementation Guide.

5.3.2 The Aarhus Convention sets down basic rules to promote the involvement of the public in environmental matters and to improve access to justice in environmental matters. The European Union has been a party to the Aarhus Convention since May 2005 and the Aarhus Convention is now an integral part of the European Union legal order. Ireland ratified the Aarhus Convention in June 2012.

5.3.3 The provisions of the Aarhus Convention are divided into three pillars as follows:

- **Access to Environmental Information**: the right of members of the public to request environmental information that is held by public bodies and these bodies are obliged to maintain this information. The Access to Information pillar has been implemented in EU Directive 2003/4/EC on Public Access to Environmental Information and in Ireland by the European Communities (Access to Information on the Environment) Regulations 2007-2014;
- **Public Participation in Environmental Decision-Making**: the right of the public to participate in decision-making on environmental matters and for public authorities to enable the public to comment on proposals which affect the environment. Article 6 of the Aarhus Convention sets out detailed rules governing public participation in decision making involving the activities listed in Annex I to the Convention and activities that are not listed in the Annex but may have a significant effect on the environment. In the European Union, this part of the Aarhus Convention has been implemented by Directive 2003/35/EC on public participation (Directive, inter alia, the Consolidated EIA Directive 2011/92/EU). The requirements of the Public Participation Directive have been transposed into Irish law, including the integration of its requirements into the Planning and Development Act 2000, as amended; and
- **Access to Justice**: including the right of members of the public to review procedures to challenge decisions relating to the environment, made by public bodies or private persons that have been made without regard to the two aforementioned pillars of the Convention.

5.3.4 The consultation approach was drawn up to ensure that the public participation activities devised for the proposed Relevant Action were accessible, meaningful and accountable. To achieve this the Applicant adopted a wide variety of communications methods and tools and further details on these are outlined in Section 5.4 and 5.5 below.

5.4 Consultation Approach

5.4.1 Consultation on proposals to review condition no. 3(d) and condition no. 5 of the North Runway Permission was undertaken in June, July and October 2016. Below is a summary of this consultation with greater detail provided in the *Consultation on Flight Paths and Change to Permitted Operations, February 2017* report (appended to this chapter).

5.4.2 The key outcome of this consultation was to amend and replace the current operating restrictions as set out in *Chapter 2: Characteristics of the Project* in place of seeking unrestricted use of the runway system, as envisaged at the time consultations were carried out.

5.4.3 The consultation approach included a combined strategy involving direct face-to-face events with members of the public and other relevant stakeholders, a feedback facility to provide comments on the proposal, an independently administered survey regarding flightpath preferences and community funding, as well as a broader social media base to promote engagement, provide information and keep communities informed.

5.4.4 The overall consultation was underpinned by two specific phases of public consultation: Phase 1 introduction to the project and EIAR Scoping (June and July 2016) and Phase 2 consultation on flight paths and change to permitted operations (October 2016), as described above.

Recent and Ongoing Engagement

5.4.5 Since the Phase 1 and Phase 2 consultations, there has been ongoing communication with local communities via established regular CLG and DAEWG meetings, in addition to drop-in clinics at local venues, during which information and updates on North Runway were shared. The Applicant gave advance briefings specific to the Application to the CLG (15 December 2020) and DAEWG (16 December 2020) (refer to Appendix 5C) prior to the lodgement of the proposed Relevant Action application. These briefings were conducted to provide an overview of the proposed Relevant Action and to highlight where concerns raised at 2016 Phase 2 consultation had been addressed and incorporated into the proposed Relevant Action. These included seeking to amend condition no. 3(d) and replace condition no. 5 rather than seeking unrestricted use of runway system (i.e. no operating restrictions). The advanced briefings were also used to provide information to stakeholders in relation to the statutory planning process, such as the dates for public submissions to be sent to the Planning Authority and to raise awareness to attendees of the opportunity to submit into the process. A Virtual Reality Platform was also set up to explain the proposed Relevant Action in non-technical terms and provide access to high-resolution interactive mapping amongst other relevant information.

5.4.6 Whilst the recent engagement was undertaken in an informal manner, feedback from these advanced briefings was received by the Applicant both during the briefings and afterwards by emails and phone calls, and related to the following:

- Concerns about short time provided between briefings and before the formal lodgement;
- Technical aspects of the proposal being difficult to understand, including the Night Quota Count;
- The Virtual Reality Platform was well received as was the interactive mapping;
- It was welcomed that the original proposal of unrestricted use of North Runway was now changed to limit use between midnight and 6am;
- The requirement for further information regarding a scenario when the 32mppa passenger cap is exceeded;
- Request for the terms of the existing house buyout scheme to be extended/improved; and
- Greater clarification as to who is eligible for the proposed insulation grant.

5.4.7 It is also noted that given the nature of the North Runway project in general, the Applicant undertakes regular and ongoing community engagement. Since the above referenced advance briefings, there have been three further meetings between the Applicant and the CLG (with a further three meetings scheduled for later in 2021). The DAEWG has met twice since the proposed Relevant Action application was lodged in December 2020, with another two meetings scheduled.

5.5 Consultation Tools

5.5.1 A range of communications tools were employed throughout the consultation process in order to raise levels of awareness of the proposed Relevant Action and to facilitate participation in the consultation process. Key components of that consultation are:

- Public consultation events;
- Meetings with a range of resident groups and individuals;
- Regular meetings with DAEWG, CLG, residents' associations, airport staff, airlines and businesses;
- Bimonthly drop-in clinics at various community locations at which local residents and interested parties can seek information regarding North Runway and other airport operations;
- Home visits to those local residents who are unable to attend consultations or drop-in clinics;
- A series of dedicated meetings and home visits with participants in the noise mitigation schemes;
- In collaboration with a local social services agency, the Applicant undertook a roadshow in various North Dublin locations to promote the proposed Relevant Action's Local Employment Initiative. This was followed by a *Meet the Contractor* event in November 2018 during which 250 unemployed local residents met with the main contractor. Over 100 candidates were put forward, and over half secured employment, with many of these at Dublin Airport. The initiative won the Fingal Chamber Best Community Involvement award in 2019;
- Fully-manned dedicated project freephone and email channels;
- A dedicated project webpage hosted on the Dublin Airport website, https://www.dublinairport.com/corporate/north-runway
- Up-to-date project information via a subscriber-based Project Update to which there are over 1,000 subscribers;
- Press releases and media coverage;
- Social media;
- Communication materials including leaflets, posters, brochures and display materials for consultation events;
- Mail-outs and briefings to Elected Representatives of Fingal County Council, Dublin City Council, Dáil Eireann and Seanad Éireann;
- Mail-outs to key environmental stakeholders; and
- Dedicated Red C Survey on flightpaths options and community funding as part of the consultation on Change to Permitted Operations and Flightpaths https://www.dublinairport.com/docs/default-source/resources/view-red-c-research-report.pdf?sfvrsn=2ab85915_2.

5.5.2 The bespoke Virtual Reality Platform which provides virtual materials and information as would appear at a public event was devised as a means of informing the public about this proposed Relevant Action application. This was developed in order to continue meaningful engagement with local residents despite the impacts of the Covid-19 pandemic (https://northrunway.exhibition.app).

5.6 Consultation Summary

5.6.1 The proposed Relevant Action application relates to proposals to amend and replace condition no. 3(d) and 5 of the North Runway Permission. The focus of the Phase 2 Consultation in 2016 was relevant and showed the effectiveness of the non-statutory pre-application consultation process in that it materially changed and improved the proposals being brought forward. In this respect, the Applicant revised the proposed Relevant Action to address the key concern of unrestricted night-time flights, replacing it instead with the Noise Quota Count System and only seeking to use the North Runway in the night shoulder hours and not the full night period as previously envisaged.

5.6.2 Since the above referenced 2016 consultation occurred there has been more recent and ongoing engagement between the Applicant and specific stakeholders through the CLG, DAEWG, drop-in clinics and other established channels, with engagement set to continue through 2021 and beyond.

5.6.3 Further to the above, during the preparation of this revised EIAR, the statutory submissions and observations received by the Planning Authority have been reviewed with items addressed, where practicable, as presented in Section 5.8.

5.6.4 It is noted that statutory public consultation, which in and of itself satisfies Aarhus requirement for public participation, will continue to form part of both the planning application and any subsequent appeal. Further participation is guaranteed through, the proposed Relevant Action as it is mandated by ANCA's process when setting the NAO and issue of their draft regulatory decision at which stage a 14-week public consultation process will be undertaken by ANCA. This process is parallel to the statutory planning process, and the Planning Authority is precluded from deciding to grant or refuse the proposed Relevant Action until this process has been completed.

5.7 Stakeholder Engagement

5.7.1 The Applicant has and continues to effectively engage with a variety of stakeholders. Successful delivery of the proposed Relevant Action requires constructive consultation with several statutory and non-statutory bodies which include:

- ANCA;
- FCC and all its relevant departments, officers, and representatives among which:
  - Planning department
  - Transportation department
  - Water Service department
  - Conservation department
  - Architecture department
  - Parks department
  - Environmental services department
  - FCC chief executive
  - FCC heritage officer
  - FCC Director of Planning and Strategic Infrastructure
- Airport Stakeholders:
  - Irish Aviation Authority (IAA)
  - Commission for Aviation Regulation (CAR)
  - Airline operators
- Public:
  - The local community
  - Elected representatives

5.8 Statutory Submissions and Observations

5.8.1 Following the lodgement of the application and public notice period, there was a total of 205 valid submissions and observations received by FCC in relation to the proposed Relevant Action, refer to Table 5-1 below. Approximately 80% of these submission and observations opposed the proposed Relevant Action as submitted with 20% being supportive.

5.8.2 Supportive submissions, focused mainly around the connectivity gains and economic benefits that the proposed Relevant Action would bring, were received from *inter alia* Stobart Air, Ryanair, Aer Lingus, Blue Air, Ethiopian Airlines, the Irish Exporters Association, Tourism Ireland, the Irish-US Council, Asia Matters, Chambers Ireland, Dublin Chamber and Enterprise Ireland.

5.8.3 A further supportive submission was made by the Irish Aviation Authority which highlighted the need for the use of both runways in the morning peak to alleviate delays which were occurring prior to 2020 as the capacity of the single runway was insufficient. This submission was important in defining the scope of the noise assessment and alternatives considered.

5.8.4 Submissions opposed to the proposed Relevant Action have been summarised in Table 5.1. The majority of submissions opposing the proposed Relevant Action included similar themes of concern and have been grouped in the table below. Where the EIAR deals with the issue raised it is noted in the table below. This table is not intended to represent an exhaustive list of all items of concerns raised but to provide a summary of the nature of concerns raised and detail where the key themes are addressed in the EIAR.

Table 5-1: Submission and observation Themes and Response

Submission/Observation Theme	Response
General EIAR	
EIAR lacks sufficient detail in relation to the experts who prepared the modelling data	Additional details included in this revised EIAR (Chapter 1 Introduction)
Use of 2018 as a baseline inappropriate	The Permitted Scenario is used in this EIAR in the context of the Future Receiving Environment in the Assessment Years 2022, 2025 and 2035
No information about future mitigation when 40 million passengers per annum (mppa) is reached or exceeded	Dublin Airport currently has a terminal passenger cap of 32mppa. The proposed Relevant Action does not raise this cap and a new application would be required for this to happen. Mitigation, if required, would form part of that application. Additional noise information as requested by ANCA has been provided in the revised submission, and further information is available in *Chapter 22: Future Development Plans*
No future predictions beyond 2025 have been provided	An assessment year in 2035 has been added in the revised EIAR.
No future predictions beyond 32mppa have been provided	As discussed above, the proposed Relevant Action does not seek to raise the annual terminal passenger cap beyond 32mppa and a new application would be required for this to happen.
No details on passenger numbers	Passenger numbers passing through the terminals at Dublin Airport are capped at 32mppa. Forecasts of the post-Covid-19 passenger growth are provided in *Chapter 1: Introduction*.
The EIAR does not sufficiently describe the direct or indirect significant effects on the environment of the proposal	This EIAR is a revision which takes account of Requests for Information from Fingal County Council.
A new EIAR should be prepared	This EIAR is a revision which takes account of Requests for Information from Fingal County Council.
EIAR Modelling	
The EIAR does not include modelling reports in raw data	Additional information included in the revised EIAR (Appendices 11A, 13A-E, 14A-F)
Insufficient explanation for the parameters for modelling noise and odour	Included in the revised EIAR (Appendices 11A-C, 13A-E, 14A-F)
Unclear who will be impacted by the Relevant Action. General public may not be able to read contour maps	VR platform provided which shows contours in more detail

Submission/Observation Theme	Response
Human Health	
The EIAR fails to suitably consider the health impacts of the proposed Relevant Action	Included in the revised EIAR (*Chapter 7: Population and Human Health*)
Consultation	
Consultation and time for review inadequate	Refer to *Chapter 5: Consultation*
Consultation not carried out in accordance with condition no. 28 of the parent permission	Advance briefings and VR platform demonstrate the Applicant's commitment to engaging with the local community. Condition no. 28 has been discharged and the CLG continues to operate as required under Condition 28.
The residents affected by future operations at Dublin Airport request a full public consultation as per Dublin Airport LAP and EIAR legislation	ANCA, as Noise Regulator, will undertake full public consultation with respect to their draft determination and the Noise Abatement Objective process.
Noise	
Noise impacts, health impacts and sleep disturbance as a result of the proposal	Refer to *Chapter 7: Population and Human Health*
The EIAR does not include information on noise statistics	Refer to *Chapter 13: Air Noise and Vibration and Chapter 14: Ground Noise and Vibration*
Lack of clarity about how the Night Quota Count (NQC) system will be operated and how the proposed NQC of 7990 has been calculated	Refer to revised Anderson Acoustics, Annual Noise Quota Report submitted as part of the Response to Further Information Request to ANCA
Greater information and wider scope for the noise insulation scheme required	Further information on the noise insulation grant scheme is provided in the Response to Further Information to ANCA
More clarity required in relation to the buy-out scheme	No new buy-out scheme is proposed. The existing buy-out scheme is unchanged and remains available to qualifying applicants.
No impact of Noise on SACs or SPAs assessed	The revised Appropriate Assessment Screening Report demonstrates that the proposed Relevant Action does not adversely affect the integrity of any SACs and SPAs in light of their conservation objectives, and *Chapter 15: Biodiversity* concludes that the Future Receiving Environment is assumed to be unchanged in 2025 and 2035, therefore no detailed assessment of effects is required.
Traffic & Transport	
All transportation noise to be considered collectively including road noise by movements	A cumulative traffic and aircraft noise assessment is provided in the revised EIAR (*Chapter 14: Ground Noise and Vibration*).
Proposal will result in increased traffic impacts	Refer to revised *Chapter 9: Traffic and Transport*.
Use of the Runway System Lack of clarity regarding the proposed use of the North Runway for aircraft needing to use the longer runway	This exemption is included only for the very unlikely event that the longer length is required for a specific aircraft type. At present in the forecasts there are no such aircraft scheduled to use the North Runway at night and as such the exemption is purely to safeguard in the event that such an aircraft in the future would require the extra length. However, the Applicant does not envisage such a need within the proposed Relevant Action timeline and hence it is only included as an exception (i.e. not proposed as a regular or scheduled occurrence).

Submission/Observation Theme	Response
Predictions for future Runway use not properly analysed	Details of the passenger growth forecasts are given in *Chapter 1: Introduction*. The implications for use of the runway system are discussed in *Chapter 3: Need for the Project*, and the appended operating restrictions report by Mott MacDonald. Additional information on future runway use (as requested by ANCA) has been provided in the Response to further Information Request to ANCA
Appropriate Assessment & Ecology	
A full Appropriate Assessment under the Habitats Directive should be carried out	The revised Appropriate Assessment Screening Report demonstrates that the requirement for full Appropriate Assessment is not triggered having regard to the fact that there is no probability or risk of significant effects on any Natura Site
A full Appropriate Assessment has never been carried out	Appropriate Assessment Screening precedes the full assessment and the latter is only required if the Screening Report indicates that there is a probability or risk of significant effects to a Natura Site – which have been ruled out.
No impact of Noise on SACs or SPAs assessed	As discussed above, the revised Appropriate Assessment Screening Report demonstrates that aircraft noise does not adversely affect species in the SACs and SPAs
Cumulative Assessment	
The proposal does not include a full cumulative assessment with recent building projects	The revised EIAR includes an assessment of the cumulation of the impact of the proposed Relevant Action with the impact of other existing and/or approved projects (*Chapter 21: Interactions and Cumulative Effects*)
Climate & Air Quality	
The proposed Relevant Action is contrary to Ireland's emissions targets	Refer to revised *Chapter 11: Climate and Carbon*
The climate impact of the proposal requires greater assessment	Refer to revised *Chapter 11: Climate and Carbon*
The proposal will result in increases gaseous emissions	Refer to revised *Chapter 11: Climate and Carbon*
The EIAR does not properly assess the climate impact of the proposed Relevant Action	An assessment of climate change impacts has been included in the revised EIAR (*Chapter 11: Climate and Carbon*)
Other	
Insufficient rationale for the proposed Relevant Action	Refer to revised *Chapter 3: Need for the Project*
The current single runway caters for 2025 needs without the North Runway (32m) and without extending flight times. The Applicant's stats show they can grow passenger numbers even with operating restrictions.	Further details on the proposed need for the amendment and replacement of the operating restrictions are presented in response to the detailed request for further Information where appropriate. Refer to revised *Chapter 3: Need for the Project*. In addition please see RFI responses submitted to ANCA with respect to historic use of the cross wind runway and the need for departures in the morning peak to use both runways
Critical of the legal framework established to deal with the application.	This is not within the Applicant's control to change as it is the established legal framework for addressing this type of application.

5.8.5 In addition to the above submissions and observations, submissions have been received from two of the Prescribed Bodies the Health Service Executive (HSE) and An Taisce. Each of the submissions from the prescribed bodies have been reviewed and considered in the preparation of this revised EIAR.

Table 5-2: Prescribed Body Observations

Submission/Observation Theme	Response
Health Service Executive The HSE was satisfied with the conclusions of the air quality and water assessments and welcomed the significant reduction in the number of people exposed to aircraft noise compared with the 2018/19 baseline. However, the they were concerned that a significant proportion of people would still be exposed to aircraft noise levels above the World Health Organisation (WHO) recommended level of 45dB Lden. The HSE considered that the ground noise assessment should also have used the WHO guidelines including the 45dB Lden threshold.	A new air noise assessment has been prepared for the revised EIAR which continues to use the WHO methodology for the assessment. Refer to *Chapter 13: Air Noise and Vibration and Chapter 14: Ground Noise and Vibration.*
Health Service Executive The HSE recommended that 45dB Lden and 40dB Lnight should be used for the assessment of eligibility for schemes such as sound insulation improvements.	Justification for the levels chosen is given in *Chapter 13: Air noise and Vibration*: The basis for 55 dB Lnight as a criterion is that it is the level at which a high impact arises. This follows from the 2009 WHO Night Noise Guidelines which describe it as the threshold at which “Adverse health effects occur frequently” and “a sizeable proportion of the population is highly annoyed and sleep-disturbed”. The noise level is also comparable with the level of 55 dB LAeq,8h commonly used at airports in the UK for eligibility for sound insulation schemes. The basis for the 50 dB Lnight with a change of at least 9 dB criterion is that these are the people who are not exposed to a level of 55 dB Lnight but who will, without mitigation, experience a very significant effect in the year that the North Runway opens.
An Taisce An Taisce was opposed on two key grounds: the effect on health and the effect on climate change.	Noted, although An Taisce does not appear to dispute the conclusions of the EIAR in health terms and, indeed, quotes the EIAR in support of its objection on health grounds.
An Taisce “Submits that the Environmental Impact Assessment (EIA) Report on which the proposed amendments rely is crucially flawed and inadequate, and this application is therefore procedurally invalid.”	A revised EIAR has been prepared as part of the additional information submission.
An Taisce Claimed: “there is strong evidence to suggest that incorporating contrail considerations into routing and scheduling significantly reduces climate impacts. Night flights have been shown to impact the climate in a much broader manner than merely the additional CO_2 emissions in question.”	The scientific community has not yet reached a consensus on how to account for the impacts of radiative forcing when calculating aviation emissions due to a large number of uncertainties in the current understanding of the science. It has been excluded from the calculations as there is no agreed methodology. This is in line with the guidance provided by the UK Committee on Climate Change and also in line with the methodology adopted by the International Civil Aviation Organization in the Carbon Emissions Calculator.

Submission/Observation Theme	Response
An Taisce The use of the National Emissions Inventory "is an unacceptably wide lens of analysis through which to consider the present proposal".	The use of the National Emissions Inventory places the proposed Relevant Action in the correct context and provides evidence that the scale of the emissions is very small by comparison with Ireland's total emissions. Nevertheless, the revised EIAR provides information, in the form of the Applicant's draft Carbon Reduction Strategy, on how these emissions will be reduced or offset on an airport-wide basis.
An Taisce Was concerned that the sleep disturbance metric was omitted from the Non-Technical Summary.	A full summary is provided in the revised Non-Technical Summary as part of the revised EIAR.
An Taisce Stated incorrectly: "The construction of a new runway, and the consequent increase in airport capacity once operational that runway entails, is in itself a matter of serious concern for the climate. The removal of conditions 3(d) and 5, further adding an additional 80,000 air traffic movements per annum."	The proposed Relevant Action does not lead to 80,000 new air traffic movements per annum. It allows a faster return (by about two years) to the 32mppa cap in the Proposed Scenario and additional flights at night-time, compared with the Permitted Scenario. In both scenarios the total number of air traffic movements per annum would be similar once the 32mppa Cap is reached. This is clarified in the revised EIAR.

5.9 Incorporation into EIAR

5.9.1 The information contained in this chapter, and the feedback from previous consultation exercises, has been considered by the wider project team and has been integrated, where relevant, into the current proposed Relevant Action application.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a RFI from Fingal County Council dated 19/02/2021. As well as several minor corrections and additions, the chapter has been revised to provide:

- Further details on timings of the various consultations and information provided; and
- Further information on issues arising from consultations and confirmation that these have been assessed in the EIAR.

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the proposed Relevant Action.

6. Planning and Development Context

6.1 Introduction

6.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) chapter sets out the legislative and planning policy context for the proposed Relevant Action. It includes reference to relevant national and local planning policies, including those that have been considered when determining the EIAR scope, method and mitigation. This chapter also addresses the potential impacts of the proposed Relevant Action on land use zonings around the airport.

6.2 Strategic Planning Context

6.2.1 The Applicant has a number of obligations to fulfil with regard to the management of Dublin Airport. Pursuant to Section 23(1) of the Air Navigation and Transport (Amendment) Act 1998, the principal objectives of the daa include:

- To own, either in whole or in part, or manage, alone or jointly with another person, airports whether within the State or not;
- To take all proper measures for the safety, security, management, control, regulation, operation, marketing and development of its airports;
- To provide such facilities, services, accommodation and lands at airports owned or managed by the company for aircraft, passengers, cargo and mail as it considers necessary;
- To promote investment at its airports;
- To engage in any business activity, either alone or in conjunction with other persons and either within or outside the State, that it considers to be advantageous to the development of the company; and
- To utilise, manage and develop the human and material resources available to it in a manner consistent with the objects aforesaid.

6.2.2 On 27th October 2009, pursuant to Section 10 of the Aviation Regulation Act 2001, the Minister for Transport issued a statutory direction to the Commission for Aviation Regulation (CAR) stating *"The desirability that Dublin Airport should have the terminal and runway facilities to promote direct international air links to key world markets, such as new and fast-developing markets in the Far East and the importance of ongoing and planned infrastructure development in this context."* In this regard it is considered that the runway system in its entirety forms part of the 'runway facilities' identified as being required to promote direct international air links.

6.2.3 In addition, the National Aviation Policy (2015) includes Action 4.5.1 which states the following:

"*The process to develop the second runway at Dublin Airport will commence, to ensure the infrastructure necessary for the airport's position as a secondary hub and operate to global markets without weight restrictions is available when needed.*"

6.2.4 It is considered that the strategic planning context is clear in providing overarching support for ongoing investment in Dublin Airport and that the runway system provides the necessary infrastructure to ensure that the airport can become a secondary hub.

Aircraft Noise (Dublin Airport) Regulation Act 2019

6.2.5 The Aircraft Noise is detailed in *Chapter 3: Need for the Development*.

6.2.6 The first part of the Aircraft Noise Act was enacted on 14th June 2019. The second part of the Act was commenced on 1st September 2019, which had the effect of removing airport infrastructure from the Seventh Schedule of the PDA and thus the Strategic Infrastructure Development planning process is no longer applicable to it.

6.2.7 Fingal County Council (FCC) has been designated as the competent authority for the purposes of aircraft noise regulation at Dublin Airport by Section 3(1) of the Aircraft Noise Act.

6.2.8 The Aircraft Noise Act amends the PDA by inserting a number of new sections in Part 3 of the PDA, which deals with control of development. These sections introduce a number of new measures for planning applications at Dublin Airport that may necessitate noise-related actions or that may require a new operating restriction.

6.2.9 Section 34C of the PDA permits an applicant who is currently subject to a planning permission for development at the airport that includes an operating restriction, to make an application under Section 34C of the PDA to revoke, amend, replace or take other action in respect of the operating restriction. Pursuant to Section 34C (23) of the PDA this is defined as a 'relevant action'. In this regard, the Applicant is enabled to make this application for a proposed Relevant Action as it seeks to make changes to the operating restrictions imposed by the North Runway Planning Permission.

6.2.10 A separate Regulation 598/2014 Assessment has been prepared and is submitted with the proposed Relevant Action application and this EIAR.

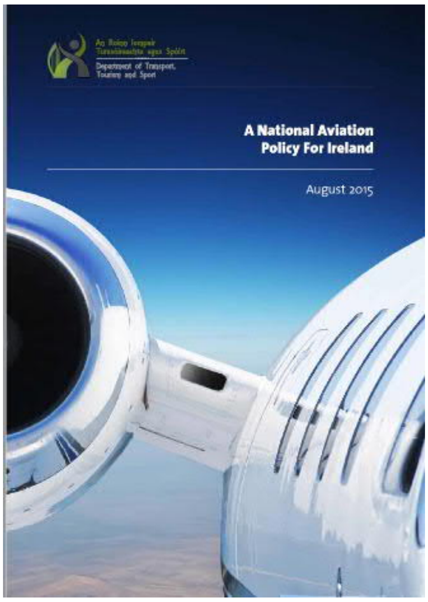
6.3 National and Regional Planning Policy

National Policy Context

6.3.1 Dublin Airport serves as a major transport hub for millions of business and leisure travellers, a gateway for tourism and foreign direct investment and a critical facilitator of connectivity for an island nation. Passenger traffic through Dublin Airport has grown exponentially since the economic recovery in 2010. In common with all other international airports, Dublin Airport has recently seen a substantial drop in air traffic movements and passenger numbers as a result of the Covid-19 pandemic. However, a strong, sustained rebound is expected to occur post pandemic and, it is imperative that Dublin Airport is provided with the necessary operating framework to support this post Covid-19 recovery.

National Aviation Policy 2015

6.3.2 The Department of Transport, Tourism and Sports published the National Aviation Policy for Ireland in August 2015 (NAP). The NAP acknowledges the importance of the aviation sector to the Irish economy and advocates the development of a secondary hub[1] at Dublin Airport. Section 4.3 of the NAP describes this as follows:



"*The size and location of Dublin Airport distinguishes it from the other State airports. Dublin Airport has seen a major increase in the numbers of transfer passengers in recent years with significant benefits to*

[1] Aviation term referred to in policy documentation and refers to hubs that act on a lesser level than larger international hub airports.

the broader economy. An opportunity now exists to develop Dublin as a vibrant secondary hub, competing effectively with the UK and other European airports for the expanding global aviation services market. A hub combines local passengers with transfer passengers enabling airlines to operate services to more destinations and more frequently than could be supported by local demand alone. This allows airport operators to utilise airport assets more efficiently, to exploit economies of scale and to drive down per passenger airport charges to the benefit of airport users and passengers. In this context, the support and promotion of Dublin as a hub airport is an important means of maximising air access for the Irish economy. Dublin Airport is currently (summer 2015) ranked fifth in Europe in terms of weekly transatlantic seats, and is therefore well placed for further development as a hub for global business."

6.3.3 In relation to the future capacity needs of the State airports, the plan states under section 4.5:

"It is recognised that European airports are currently facing capacity constraints and that this situation will worsen in the context of expanding aviation services markets. While existing capacity at Irish State airports is adequate for current demands, it is essential that Ireland is equipped to exploit emerging opportunities to expand air service connections for business, tourism, cultural and educational purposes, and thus to deliver economic benefits at the national level. These opportunities exist not just for new emerging markets in the Asia Pacific region, but also with our traditional trading partners in Europe and North America. Air transport requires a specific level of airport infrastructure, both in terms of quantity and quality, to facilitate the optimum level of air services for Ireland. This includes terminal and runway capacity as well as surface access to airports, and is particularly relevant to the development of Dublin Airport as a secondary hub.

To ensure future connectivity and to deliver growth, it will be important that the State airports, and Dublin Airport in particular, have sufficient capacity and runways of sufficient length to enable services to operate to global emerging markets without weight restriction. It is important that regular reviews are conducted to ensure that all of the main airports are well placed to accommodate passenger growth, changing passenger and air-cargo needs and carrier needs."

6.3.4 A review of capacity needs at Dublin Airport was carried out in August 2018 by the Department of Transport, Tourism and Sport entitled 'Review of Future Capacity Needs at Irelands State Airports'. The Review states on page 33:

'The 2015 National Aviation Policy highlights that Dublin will be promoted as a secondary hub airport to support services to global markets. If Dublin Airport can provide facilities to enable airlines to compete effectively with airlines operating at UK and other European hub airports, it may further increase the level of transfer business, which has already grown strongly in recent years. This could enable airlines operating at Dublin to run more frequent flights to existing destinations and offer direct flights to a larger number of destinations than would be possible if services at the airport were entirely reliant on travellers whose ultimate origin or destination was Ireland.'

6.3.5 Section 4.5 of the NAP concerns the future capacity needs of the State airports and states the following:

"Air transport requires a specific level of airport infrastructure, both in terms of quantity and quality, to facilitate the optimum level of air services for Ireland. This includes terminal and runway capacity as well as surface access to airports, and is particularly relevant to the development of Dublin Airport as a secondary hub."

6.3.6 The NAP's policy position on existing capacity at State airports is discussed in section 4.5 and highlights that:

'Existing capacity at State airports should be optimised in conjunction with timely planning to enable expansion of air service connections in all relevant markets delivering wider economic benefits for Ireland'.

6.3.7 In addition, the NAP includes Action 4.5.1, which states the following:

"The process to develop the second runway at Dublin Airport will commence, to ensure the infrastructure necessary for the airport's position as a secondary hub and [ability to][2] operate to global markets without weight restrictions is available when needed."

[2] Added by TPA

6.3.8 The proposed Relevant Action is consistent with the NAP in that it supports the post Covid recovery by ensuring a faster return to 32mppa as well as supporting the position of Dublin Airport as a secondary hub by ensuring the airport can meet demand for night time connectivity. In this regard the proposed Relevant Action to amend and replace the existing operating restrictions will optimise the ability of the airport to utilise its infrastructure, being the runway system, to support Dublin Airport's position as a secondary hub airport and its ability to cater for capacity demands.

Project Ireland 2040: National Planning Framework

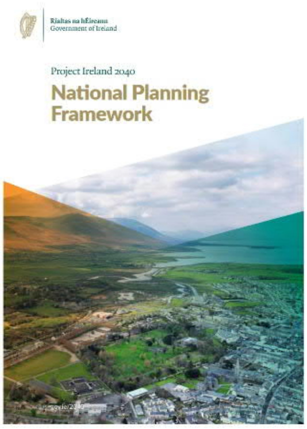
6.3.9 The Department of Housing, Planning and Local Government published Project Ireland 2040: National Planning Framework (NPF) in February 2018. The National Planning Framework (NPF) is:

"the Government's high-level strategic plan for shaping the future growth and development of our country out to the year 2040".

"It is a framework to guide public and private investment, to create and promote opportunities for the people of Ireland, and to protect and enhance the environment- from villages to cities and everything in between." (NPF p10)

6.3.10 The NPF replaces the previous National Spatial Strategy (NSS) as the primary national policy framework. Adopted in 2018, the NPF is designed to improve the effectiveness of public investment in infrastructure and other relevant services around the county, including the enhancement of regional and international connectivity.

6.3.11 Dublin Airport is identified as key infrastructure for national development in the NPF as follows:



"The main airports including Dublin, Cork, Shannon and Ireland West - Knock, together with smaller regional airports, are a key infrastructure for national and regional development." (NPF p145)

6.3.12 The NPF identifies 'High Quality International Connectivity' as a primary National Strategic Outcome of the NPF. Specifically, it states:

"*High-Quality International Connectivity is crucial for overall international competitiveness and addressing opportunities and challenges from Brexit through investment in our ports and airports in line with sectoral priorities already defined through National Ports Policy and National Aviation Policy and signature projects such as the second runway for Dublin Airport and the Port of Cork - Ringaskiddy Redevelopment."* (NPF p14)

6.3.13 The NPF also notes the following under National Strategic Outcome 6: High Quality International Connectivity:

"As an island, the effectiveness of our airport and port connections to our nearest neighbours in the UK, the EU and the wider global context is vital to our survival, our competitiveness and our future prospects." (NPF p145), and further states in relation to the North Runway:

"The development of additional runway and terminal facilities such as the second runway for Dublin Airport for which planning permission has been approved"

6.3.14 The NPF confirms the important role that Dublin Airport has in supporting the goals of the NPF. In this regard, it is considered that the proposed Relevant Action will enable the airport to maintain and enhance high-quality international connectivity by ensuring that the airport can appropriately utilise the runway system.

National Development Plan 2018-2027

6.3.15 The National Development Plan 2018 – 2027 (NDP) was published in conjunction with the NPF in February 2018. The NDP is the national plan setting out investment priorities to guide national, regional and local planning and investment decisions.

6.3.16 The NDP supports the implementation of the NPF and also the NAP. Under National Strategic Outcome 6, the NDP identifies the importance of high-quality international connectivity as:

"As an island, continued investment in our port and airport connections to the UK, the EU and the rest of the world, is integral to underpinning international competitiveness. It is also central to responding to the challenges as well as the opportunities arising from Brexit." (NDP p67)

6.3.17 The NDP further states the following under National Strategic Outcome 6:*"Significant investment in Ireland's airports and ports will play a major role in safeguarding and enhancing Ireland's international connectivity which is fundamental to Ireland's international competitiveness, trading performance in both goods and services and enhancing its attractiveness to foreign direct investment. The importance of this objective cannot be understated in the context of the UK's exit from the EU in 2019."*

6.3.18 Under National Strategic Outcome 6, the NDP identifies Dublin Airport as one of its strategic investment priorities, with North Runway as a major national infrastructure project for appraisal and delivery during the lifetime of the Plan (NDP, p67). The plan states:

"DAA is planning the delivery of a new runway for Dublin Airport by 2021 at an estimated cost of €320 million which will continue to be developed as an international hub" (NDP, p67)

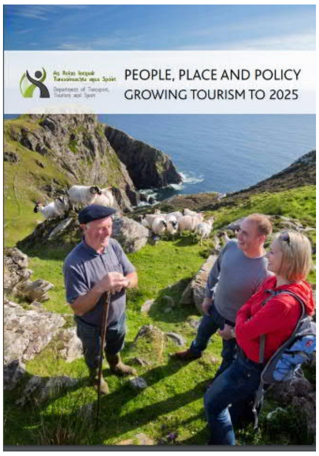
6.3.19 North Runway is identified as a crucial signature project for achieving Strategic Outcome 6 as part of the NDP 2018-2027. Whilst the delivery of North Runway is not affected by the proposed Relevant Action, the proposed Relevant Action will ensure this major national infrastructure will be more efficiently utilised and will support of Dublin Airport's role as an international hub by providing greater connectivity as well as an earlier return to the maximum permitted mppa in the post Covid-19 recovery. Amongst others, the proposed Relevant Action will enable the airport to; accommodate demand for night-time air traffic movements, achieve a quicker return to the combined permitted capacity of Terminal 1 and Terminal 2, to meet the demands of multi-trip passengers[3] which in turn requires early morning and late evening flights and to facilitate the ability to attract high-value transatlantic and long-haul services thereby supporting Ireland's international competitiveness and attractiveness to foreign direct investment.

[3] Passengers undertaking more than one trip on the same day.

National Tourism Policy 2015: 'People, Place and Policy: Growing Tourism to 2025

6.3.20 The Department of Transport, Tourism and Sport published a National Tourism Policy in March 2015 entitled 'People, Place and Policy: Growing Tourism To 2025'.

6.3.21 Section 5.2 of the National Tourism Policy notes the importance of a high quality of service at frontiers:



"In addition to the quality of physical infrastructure at airports and ports, the quality of service to visitors at frontier checks is important in creating a first impression of Ireland's welcome." (p67)

6.3.22 At page 68, the National Tourism Policy notes *"as an island, inbound tourism and the export earnings and employment supports are profoundly dependent on the volume, affordability and range of air access. Airports are core elements of the tourism infrastructure. In turn, tourism is an important source of traffic and customers for airports."*

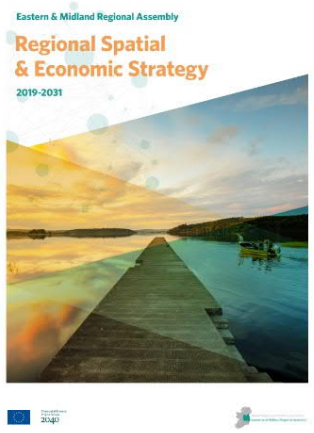
6.3.23 In addition to the above, Policy Proposal 5.2.2 in the National Tourism Policy states that:

"Air and sea port operators will be encouraged to ensure that visitor reception facilities are managed so that the visitor experience is optimised." (p70)

6.3.24 The proposed Relevant Action will enable Dublin Airport to continue to meet demand for airline arrivals and departures during night-time hours. This is particularly important for the mainly short haul services based at the airport, so they can maintain flight slots that provide connectivity with mainland Europe and also provide suitable transfer services to flights arriving from North America. The ability of the airport to maintain these flight slots will ensure that airline travel to/from Dublin is well serviced and remains affordable. As such, it is considered that the proposed Relevant Action is fully compliant with the policy provisions and will assist with the implementation of the National Tourism Policy.

Regional Spatial and Economic Strategy for the Eastern and Midland Region

6.3.25 The Eastern and Midland Regional Assembly's Regional Spatial and Economic Strategy, 2019 (RSES) sets out a long-term strategic planning and investment strategy for the Dublin area and surrounding counties and the Midlands to 2031. The RSES acknowledges Dublin Airport as a key national asset to Ireland's economic success which is linked with its global connectivity to trade and tourism markets, and requires support to ensure it continues as an economic driver. The RSES acknowledges that the Dublin region is the main global gateway to Ireland with Dublin Airport one of the fastest growing airports in Europe. Page 195 of the RSES states in relation to Dublin Airport:



"Dublin Airport accounted for 85% of all air passengers in the Country in 2016. The number of passengers has increased year on year to reach 29.5 million in 2017 and is forecast to increase again in 2018. Dublin Airport is a key national asset to Ireland's economic success which is linked with its global connectivity to trade and tourism markets and requires support to ensure it continues as an economic driver. The National Aviation Strategy for the first time supports the growth of the Airport to a secondary hub airport; Dublin Airport has a number of features which make it an attractive option for airlines, including the availability of full US Preclearance."

6.3.26 The main objective of the RSES is to determine at a regional scale how best to achieve the shared goals set out in the National Strategic Outcomes (NSOs) of the NPF. The Dublin Region is identified as the main global gateway to Ireland.

6.3.27 The international gateways of the Eastern and Midland region are noted as playing a critical economic role on both a national and regional level. Section 8.5 of the RSES outlines the regional policies for international connectivity relating to Dublin Airport as follows:

RPO 8.17: Support the National Aviation Policy for Ireland and the growth of movements and passengers at Dublin Airport to include its status as a secondary hub airport. In particular, support the provision of a second runway, improved terminal facilities and other infrastructure.

RPO 8.19: Spatial planning policies in the vicinity of the airport shall protect the operation of Dublin Airport in respect to its growth and the safe navigation of aircraft from non-compatible land uses. Policies shall recognise and reflect the airport noise zones associated with Dublin Airport. Within the Inner Airport Noise Zone, provision of new residential and/or other noise sensitive development shall be actively resisted. Within the Outer Noise Zone, provision of new residential and/or other noise sensitive development shall be strictly controlled and require appropriate levels of noise insulation in all cases.

RPO 8.20: Spatial planning policies for areas located within the Public Safety Zones shall reflect the guidance set out in the Department of Environment, Heritage and Local Government (DoEHLG) study on Public Safety Zones (ERM Public Safety Zones Main Report, February 2005 or any update thereof) in assessing proposals for development falling within Airport Public Safety Zones.

6.3.28 The proposed Relevant Action will be entirely consistent with the RSES Policy Objectives, outlined above, which support Dublin Airport as a key national asset to Ireland's economic success. The proposed Relevant Action will comply with the relevant spatial planning polices which seek to protect airport operations and manage sensitive development within the airport's noise zones (as defined in Variation 1 of the Fingal County Development Plan 2017-2023 – see Section 6.4.1 below). The proposed Relevant Action will enable greater early morning/late night flight connectivity and will ensure that the airport can return to its consented passenger throughput capacity of 32 mppa in a timely manner, therefore continuing to maximise its potential as a secondary hub airport.

6.4 Local Planning Policy

Fingal Development Plan 2017-2023

6.4.1 The site is subject to the Dublin Airport zoning objective under the Fingal Development Plan 2017-2023 (County Development Plan). This seeks to:

"Ensure the efficient and effective operation and development of the airport in accordance with an approved Local Area Plan." (page 238)

6.4.2 Chapter 6 of the County Development Plan states that:

"The Dublin Airport (DA) zoning is a unique economic development zoning within Fingal, comprising an extensive area of some 1,024 ha. The DA zoning covers all the operational buildings and lands associated with the airport and runways. Within the lifetime of the Development Plan, the Council will prepare a LAP for Dublin Airport that will outline the future vision for the airport, examine its operational requirements and the associated environmental effects."

6.4.3 FCC's strategic policy for Dublin Airport is to:

"Safeguard the current and future operational, safety, and technical requirements of Dublin Airport and provide for its ongoing development within a sustainable development framework of a Local Area Plan. The plan shall take account of any potential impact on local communities and shall have regard to any wider environmental issues." (Page 10)

6.4.4 The Vision for Dublin Airport zoned lands is to:

"Facilitate air transport infrastructure and airport related activity/uses only (i.e. those uses that need to be located at or near the airport). All development within the Airport Area should be of a high standard reflecting the status of an international airport and its role as a gateway to the country and region. Minor extensions or alterations to existing properties located within the Airport Area which are not essential to the operational efficiency and amenity of the airport may be permitted, where it can be demonstrated that these works will not result in material intensification of land use.

Air Transport Infrastructure includes: aircraft areas, air traffic control/tower, ancillary health, safety and security uses, aprons, cargo handling, maintenance hangers, meteorology, retail – airside/duty free, runways, taxiways, terminals and piers" (Page 368)

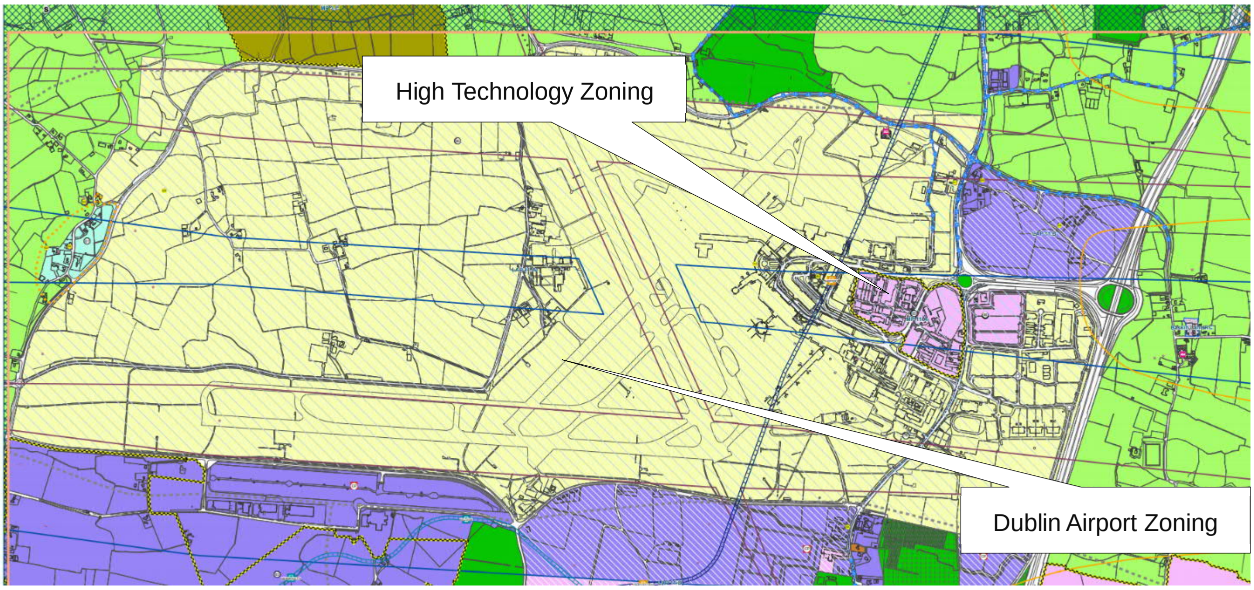


Plate 6-1: Extract from County Development Plan 2017-2023 – Sheet 11 Fingal South (annotated by TPA)

6.4.5 A portion of the Airport lands are also zoned High Technology (HT) and General Employment (GE) – under the land use zoning identified in the County Development Plan.

6.4.6 The Zoning Objective for the HT zoned lands seeks to:

"Provide for office, research and development and high technology/high technology manufacturing type employment in a high quality built and landscaped environment."

6.4.7 Chapter 6 of the County Development Plan states in relation to HT zoning:

"High Technology HT

The purpose of the High Technology (HT) zoning is to facilitate opportunities for major office, science and technology, and research and development-based employment within high quality, highly accessible, campus style settings. The HT zoning is one of the most important economic development zonings in Fingal with just over 685 ha of HT zoned lands located principally in Blanchardstown and Swords, supplemented with significant zonings at Dublin Airport and along the southern boundary of the County with Dublin City."

6.4.8 The County Development Plan further states on page 240 under the heading Dublin Airport Central Masterplan:

"Additionally, the Council, in collaboration with the DAA, will review where appropriate the Dublin Airport Central Masterplan for strategically located lands adjacent to the airport on HT zoned lands. The Masterplan will be a framework for the creation of a high-quality commercial development comprising predominantly office accommodation, supplemented with hotel and ancillary uses, to be delivered on a phased basis."

6.4.9 The Zoning Objective for the GE zoned lands seeks to:

"To provide opportunities for general enterprise and employment".

6.4.10 Chapter 6 of the County Development Plan states in relation to GE zoning

"GE General Employment

The purpose of the General Employment (GE) zoning is to facilitate opportunities for general employment uses and compatible forms of industry, logistics and warehousing. The GE zoning is the largest economic development zoning in Fingal with over 1,850 ha of GE zoned lands located principally in Blanchardstown and Balbriggan, with notable zonings in locations such as Dardistown, Cloghran, and Baldoyle".

6.4.11 The proposed Relevant Action supports the central function of the Dublin Airport zoning objective. The proposed Relevant Action will also provide for the efficient and effective operation of North Runway and the wider airport runway system.

Development Plan Objectives

6.4.12 In addition to the land use zoning associated with Dublin Airport, the County Development Plan also contains various objectives which are of relevance to the proposed Relevant Action:

Table 6-1: Dublin Airport Objectives, Chapter 7, County Development Plan 2017-2023

Objective	Description
DA01	*"Facilitate the operation and future development of Dublin Airport, in line with Government policy, recognising its role in the provision of air transport, both passenger and freight."*
DA03	*"Safeguard the current and future operational, safety, technical and developmental requirements of Dublin Airport and provide for its ongoing development within a sustainable development framework, having regard to both the environmental impact on local communities and the economic impact on businesses within the area."*
DA05	*"Facilitate the development of a second major east-west runway at Dublin Airport and the extension of the existing east-west runway 10/28."*
DA09	*"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."*
DA15	*"Take into account relevant publications issued by the Irish Aviation Authority in respect of the operations of and development in and around Dublin Airport."*
DA16	*"Continue to take account of the advice of the Irish Aviation Authority with regard to the effects of any development proposals on the safety of aircraft or the safe and efficient navigation thereof."*
DA18	*"Ensure that every development proposal in the environs of the Airport takes account of the current and predicted changes in air quality, greenhouse emissions and local environmental conditions."*
DA19	*"Ensure that every development proposal in the environs of the Airport takes into account the impact on water quality, water based-habitats and flooding of local streams and rivers and to provide mitigation of any negative impacts through avoidance or design and ensure compliance with the Eastern River Basin District Management Plan."*

6.4.13 In addition to the above policies, the County Development Plan also makes specific reference to the NAP as well as setting out the following objectives which directly support the proposed Relevant Action:

Objective ED31

"Ensure that the required infrastructure and facilities are provided at Dublin Airport so that the aviation sector can develop further and operate to its maximum sustainable potential, whilst taking into account the impact on local residential areas, and any negative impact such proposed developments may have on the sustainability of similar existing developments in the surrounding area, and the impact on the environment, including the climate." (Page 205)

Objective ED32

"Ensure an appropriate balance is achieved between developing the unique potential of Dublin Airport as an economic generator and major employer in the County and protecting its core operational function as the Country's main international airport."

6.4.14 The County Development Plan also sets out the following objectives of relevance to the proposed Relevant Action:

Objective AQ01
Implement the provisions of EU and National legislation on air, light and noise and other relevant legislative requirements, as appropriate and in conjunction with all relevant stakeholders.

Objective NP01
Implement the relevant spatial planning recommendations and actions of the Dublin Agglomeration Environmental Noise Action Plan 2013-2018 (or any subsequent plan), working in conjunction with relevant statutory agencies."

Objective NP02
Continue to promote appropriate land use patterns in the vicinity of Dublin Airport to minimise the number of residents exposed to undesirable noise levels.

Objective NP03
Require all developments to be designed and operated in a manner that will minimise and contain noise levels.

Objective DMS162
Ensure all development proposals include measures to protect and enhance biodiversity.

6.4.15 By supporting the efficient and secure operation of the Airport, the proposed Relevant Action will be consistent with the objectives set out above. In summary, the proposed Relevant Action is consistent with the County Development Plan in that it supports Dublin Airport to develop and operate to its potential and in so doing will contribute to international connectivity and the local economy.

6.4.16 It is noted that the runway system is covered by the Inner Public Safety Zone (PSZ) for Dublin Airport. The purpose of the PSZ is to restrict inappropriate land use within the environs of the runways at Dublin Airport.

6.4.17 The ERM Report *"Public Safety Zones, 2005"* sets out restrictions on development permitted within the inner and outer PSZs. The proposed Relevant Action does not constitute new development which may be restricted within this zone nor does the proposed Relevant Action necessitate a change to the current PSZ's and therefore the existing policy context in relation to land within the PSZ's remains unchanged as a result of the proposed Relevant Action.

6.4.18 Detailed consideration of the PSZs in relation to the proposed Relevant Action is set out in Chapter 8 of this EIAR

Variation No: 1 to Fingal Development Plan

6.4.19 The Development Plan was varied on 9th December 2019 (the Variation) to give effect to the new noise zones developed as part of the preparation of the Dublin Airport Local Area Plan (LAP) 2020, the provision of specific noise related policy concerning noise from aircraft, road and rail and the removal of the red approach area at the end of the airport's runways.

6.4.20 In addition to the introduction of new noise zones, the Variation to the County Development Plan included a number of new and updated objectives. In relation to the County Development Plan objectives listed above, the Variation deletes Objectives NP01 and replaces it with a new NP01 which states the following:

> **"Objective NP01**
> *Implement the relevant spatial planning recommendations and actions of the Dublin Agglomeration Environmental Noise Action Plan 2018-2023 and the Noise Action Plan for Dublin Airport 2019-2023 (or any subsequent plan), working in conjunction with relevant statutory agencies."*

6.4.21 In respect of noise, the variation provides for four noise zones at the airport, namely Zones A-D. The plan notes that:

"Three noise zones are shown in the Development Plan maps, Zones B and C within which the Council will continue to restrict inappropriate development, and Zone A within which new provisions for residential development and other noise sensitive uses will be actively resisted. An additional assessment zone, Zone D is also proposed to identify any larger residential developments in the vicinity

of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment."

6.4.22 Table 6-2 below represents the contents of Table 7.2 (within the County Development Plan) of the Variation which sets out the four aircraft noise zones and the associated objective of each zone along with an indication of the potential noise exposure from operations at Dublin Airport. The zones are based on potential noise exposure levels due to the airport using either North Runway or the South Runway for arrivals or departures.

6.4.23 The noise zones have been developed with the overarching objective to balance the potential impact of aircraft noise from the airport on both external and internal noise amenity and to avoid future conflicts between the community and the operation of the airport. The noise zones are a critical land use and development management tool which prevents incompatible development which may unduly impact on airport operations from encroaching on the airport. They also allow for noise impacts on compatible development, which may be brought forward in the vicinity of the airport's flight paths, to be identified and considered as part of the planning process. The focus of the noise zones is to ensure that the impact of noise on future residential development and other sensitive receptors including schools, hospitals and residential care facilities is appropriately considered during the planning stage and that new compatible development is appropriately designed to pertinent standards as well as guidance in relation to planning and noise, namely:

- National Planning Framework 2040, DHPLG, February 2018;
- Professional Practice Guidance on Planning & Noise (ProPG): Planning & Noise – New Residential Development, May 2017;
- British Standard BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'; and
- The International Civil Aviation Organization (ICAO) guidance on Land-use Planning and Management in Annex 16, Volume I, Part IV and in the ICAO Doc 9184, Airport Planning Manual, Part 2 —Land Use and Environmental Control.

Table 6-2: Variation to the Fingal County Development Plan (Table 7.2 within the County Development Plan) is as follows:

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
D	≥ 50 and < 54 dB LAeq, 16hr and ≥ 40 and < 48 dB Lnight	**To identify noise sensitive developments which could potentially be affected by aircraft noise and to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment.** *All noise sensitive development within this zone is likely to be acceptable from a noise perspective. An associated application would not normally be refused on noise grounds, however where the development is residential-led and comprises non- residential noise sensitive uses, or comprises 50 residential units or more, it may be necessary for the applicant to demonstrate that a good acoustic design has been followed.* *Applicants are* ***advised*** *to seek expert advice.*
C	≥ 54 and < 63 dB LAeq, 16hr and	**To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure, where appropriate, noise insulation is incorporated within the development** *Noise sensitive development in this zone is less suitable from a noise perspective than in Zone D. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed.*

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
	≥ 48 and < 55	
	dB L_{night}	*The noise assessment must demonstrate that relevant internal noise guidelines will be met. This **may** require noise insulation measures.* *An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels.* *Applicants are **strongly advised** to seek expert advice.*
B	≥ 54 and < 63 dB $L_{Aeq, 16hr}$ and ≥ 55 dB L_{night}	**To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure noise insulation is incorporated within the development.** *Noise sensitive development in this zone is less suitable from a noise perspective than in Zone C. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed.* *Appropriate well-designed noise insulation measures must be incorporated into the development in order to meet relevant internal noise guidelines.* *An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the developments design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels.* *Applicants **must** seek expert advice.*
A	≥ 63 dB $L_{Aeq, 16hr}$ and/or ≥ 55 dB L_{night}	**To resist new provision for residential development and other noise sensitive uses.** *All noise sensitive developments within this zone may potentially be exposed to high levels of aircraft noise, which may be harmful to health or otherwise unacceptable. The provision of new noise sensitive developments will be resisted.*

Notes:

'Good Acoustic Design' means following the principles of assessment and design as described in

ProPG: Planning & Noise – New Residential Development, May 2017).

Internal and External Amenity and the design of noise insulation measures should follow the guidance provided in British Standard BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

Dublin Airport Local Area Plan (LAP)

6.4.24 The LAP recognises that *"Dublin Airport has grown significantly in size and importance since the adoption of the last LAP in 2006"*. At page 2, the LAP also recognises that the airport is of *"vital importance to the Irish economy and acts as the principal international gateway for trade, inward investment and tourism*". The LAP also notes *that "the Airport facilitates Ireland's integration with Europe and aids in attracting foreign direct investment"*.

6.4.25 The LAP sets out the robust policy framework in place at national, regional and now local level supporting the continued growth of Dublin Airport including its development as a secondary hub airport.

6.4.26 The LAP sets out a number of Key Strategic Objectives and aims to guide the future development and growth of Dublin Airport. The Relevant Action aligns with these key strategic objectives as it will enable a quicker return and rebound to the permitted capacity of 32mppa. These key strategic objectives relate to the following:

- Support for airport safeguarding;
- Support the continued sustainable growth of Dublin Airport and connectivity as a hub airport whilst ensuring protection of the environment;
- Support the timely delivery of required infrastructure to facilitate airport growth;
- Support the growth of the Airport as a major economic driver for the region; and
- Support continued communication between the airport and neighbouring communities to protect community amenity and mitigate potential impact from airport growth in the interests of long-term sustainability.

6.4.27 The LAP recognises the NAP and notes that its states that:

"To ensure future connectivity and to deliver growth, it will be important that the State airports and Dublin Airport in particular, have sufficient capacity and runways of sufficient length to enable services to operate to global emerging markets without weight restriction"

and

"A specific level of airport infrastructure, including terminal and runway capacity as well as surface access is required to support the development of Dublin Airport as a secondary hub."

6.4.28 Section 7.2.2 of the LAP specifically relates to runways. This section states the following objective which supports the proposed Relevant Action

> *"OBJECTIVE RW01*
>
> *Facilitate the operation of runways at Dublin Airport in line with current operational procedures, as determined by way of existing planning permissions or as otherwise determined in line with the requirements of the Aircraft Noise (Dublin Airport) Regulation Act 2019."*

6.4.29 The LAP dedicates an entire Section (section 9.1) to noise. In this section it notes the following:

"The Dublin Airport LAP is a land use plan for the purposes of effective land-use planning and safeguarding the use of the Airport. Noise zones relating to Dublin Airport have been in place for many years to aid land use planning. Since the publication of previous noise zones in 2005, and over the last decade, further evidence has emerged that has updated understanding of how aircraft noise can affect health and quality of life. With the north runway set to become operational in 2022, updated information is available relating to aircraft noise performance and flight paths. For these reasons, it was considered appropriate to update the noise zones for Dublin Airport to allow for more effective land use planning for development within airport noise zones.

The updated noise zones are set out in Fig. 9.1. Dublin Airport Noise Zones and policies relating to development in Noise Zones are set out in Variation No. 1 to the Fingal Development Plan 2017 - 2023." (Fig 6.2 below).

6.4.30 The proposed Relevant Action will ensure that the airport is able to maintain its current flight services that provide connectivity to mainland Europe, in particular, the proposed Relevant Action will ensure that the airport can meet the early morning and late night demand for take-off and landing that is required to ensure that flights leaving Ireland in the early morning can land at their European destination at the start of the working day.

6.4.31 For the above-mentioned reasons, it is considered that the proposed Relevant Action is fully aligned with the LAP.

Noise Action Plan for Dublin Airport (2019 – 2023)

6.4.32 The Noise Action Plan for Dublin Airport 2019 -2023 (Noise Action Plan) prepared under the Environmental Noise Regulations 2006 was adopted by FCC in December 2018. The Noise Action Plan is designed to manage noise issues and effects associated with existing operations at Dublin Airport. The Noise Action Plan sets out proposed actions including the following relating to land use planning and management:

- Keep under review land-use policies in relation to aircraft noise through the review of existing land use planning policy in so far as it relates to Dublin Airport; and
- Monitor noise encroachment associated with Dublin Airport to ensure that land use planning policy is appropriately informed as it relates to Dublin Airport.

6.4.33 The LAP and the above-mentioned Variation to the County Development Plan provides the land use planning framework to achieve these actions.

6.4.34 The Noise Action Plan requires the impact of noise generated from other aviation related sources (for example ground engine testing, maintenance, etc.) within the Airport lands to also be considered with regard to adjoining land uses and amenities. Section 7.2 of the Noise Action Plan includes a list of actions to be taken over the duration of the Noise Action Plan.

6.4.35 The application material for the proposed Relevant Action has been prepared fully in line with the actions contained within the Noise Action Plan and the Regulation 598 Assessment submitted with this application identifies where application actions within the Noise Action Plan have been addressed.

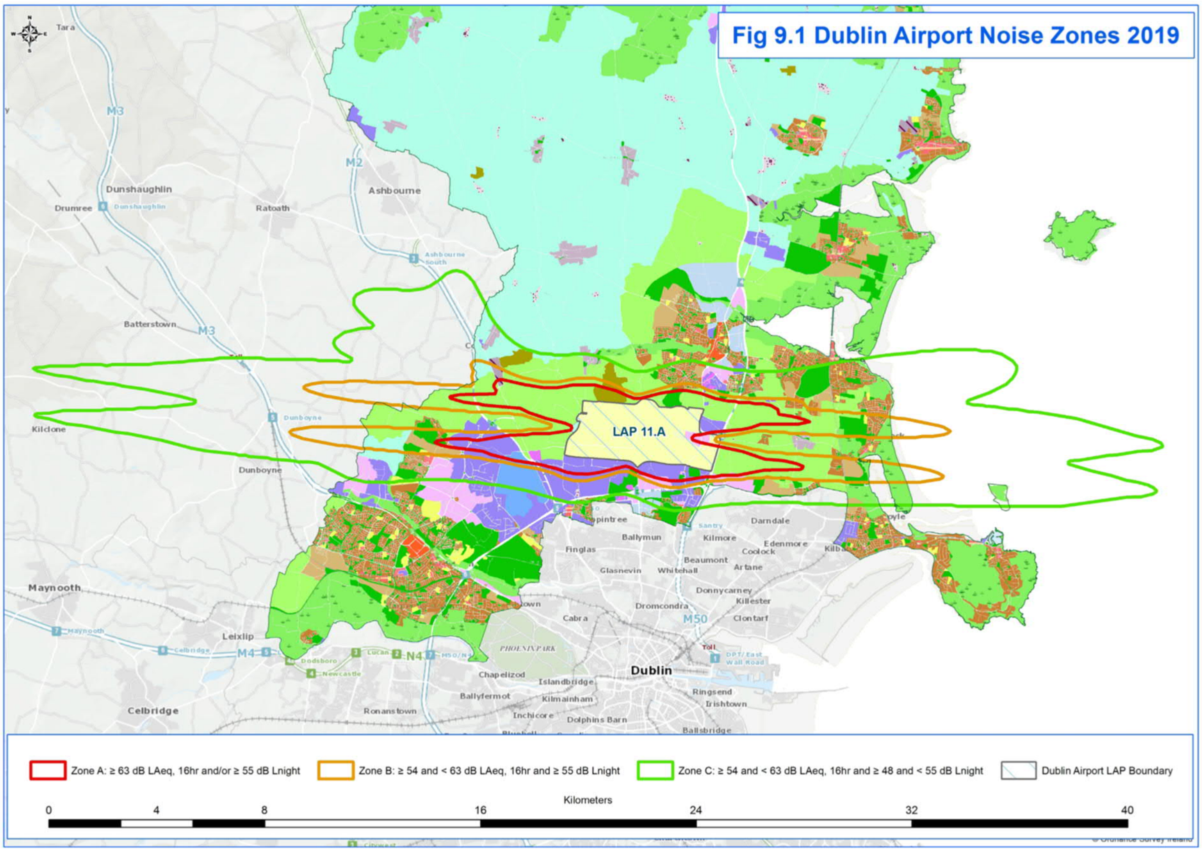


Plate 6-2: Extract of Figure 9.1 from Dublin Airport Local Area Plan

6.5 Impacts on Existing Land Use and Zoning

Introduction

6.5.1 In order to assess the potential for impacts from the proposed Relevant Action on existing land use and land use zoning it was first required to determine the appropriate study area i.e. lands surrounding Dublin Airport. As the potential for noise impacts from operations at Dublin Airport is already a measurable value used for assessment of impacts on land use within the County Development Plan, it was considered that the potential noise impacts of the proposed Relevant Action on existing land use and land use zoning within the airports surrounds should be clarified and assessed to determine the nature of impact if any. It is noted that *Chapter 11: Climate and Carbon* of this EIAR identifies and appropriately assesses the likely significant effects on greenhouse gas (GHG) emissions as a result of the proposed Relevant Action and therefore this chapter does not purport to review or detail the impacts of GHG on existing land use and land use zoning as a result of the proposal.

6.5.2 For the purpose of this assessment the land uses and land zoning within the 40dB Lnight noise contour is considered to form the appropriate study area. The use of the 40dB noise contour is supported by the 'Dublin Agglomeration Environmental Noise Action Plan December 2018 – July 2023' which states 'An Lnight value of 40dB is the limit suggested by the World Health Organisation to avoid negative health effects on humans'.

6.5.3 The land use zoning within the study area is set out in detail in Appendix 6A. The key objective of the assessment of potential impacts is to understand if the proposed Relevant Action has any significant impact on the existing planning policy which relates to the surrounding land use zones, including the ability of the relevant policy objectives to be achieved.

Surrounding Land Use Zones

6.5.4 The land use zoning surrounding the airport and wider area includes a mix of land use zones and zoning objectives. Whilst each land use zone may accommodate a range of land uses, some zones prohibit sensitive uses[4], being residential, hospitals, residential care facilities and schools. A detailed description of the land use zoning surrounding the airport and description on the sensitive uses which may be permitted within those zones is included in Appendix 6A.

Impact on Noise Zones

6.5.5 An assessment of the impact of the proposed Relevant Action on existing land use zoning has been prepared. The detail of this assessment is set out in Appendix 6A.

6.5.6 The assessment determines if any of the existing zoned land would be affected in a more onerous way than is currently the case in terms of the limitations and restriction placed on development in each of the relevant noise zones as noted in Table 6.2 above. To do this the assessment considered if the proposed Relevant Action (the Proposed Scenario) has any significant impact on the existing noise zones, i.e. as a result of the proposed Relevant Action would land uses that were previously located within Noise Zone B no longer fit the Noise Zone B criteria and be more appropriately located within Noise Zone A, therefore impacting on the policy objectives of the existing noise zones. The assessment was carried out for each Assessment Year (2022, 2025 & 2035).

6.5.7 The assessment concludes that the impact of the proposed Relevant Action on the existing noise zones is considered to be neutral. As a result, it is concluded that the noise zones in the County Development Plan will continue to be an effective tool to manage the impact of noise on future residential development and other sensitive uses such as schools, hospitals and residential care facilities. As the noise zones will continue to operate efficiently in the management of sensitive uses within the area surrounding the airport, the planning authority will not need to change the existing noise zones to accommodate the proposed Relevant Action or the policy environment governing development within the study area. Based on this assessment no further review of the impact of the proposed Relevant Action on land zoning is required. Furthermore, where existing sensitive land uses are impacted by increased potential for noise exposure, such as the predicted increase in area affected by the 55dB Lnight contour, then mitigation measures are proposed as set out in *Chapter 13: Aircraft Noise and Vibration*.

6.6 Conclusion

6.6.1 The proposed Relevant Action will comply with the National, Regional and Local Policy Objectives that relate to Dublin Airport and the surrounding lands. The general thrust of these policies is to achieve a balance which supports the ongoing advancement of Dublin Airport as an international hub whilst managing sensitive development within proximity to the airport through land use management policies such as the noise zones. In this regard, the proposed Relevant Action will amend and replace the operating restrictions imposed by conditions no. 3(d) and 5 enabling greater connectivity and improving the airport's ability to return to its consented passenger capacity in a timely manner.

6.6.2 The potential impact of the Proposed Scenario in 2022, 2025 and 2035 on existing land use zoning has been assessed, showing that impact of the proposed Relevant Action to existing zoned land and the relevant zoning objectives within the County Development Plan is neutral. The existing noise zones and associated policy objectives within the County Development Plan are considered suitable to achieve the required outcomes sought by the County Development Plan. Importantly, the proposed Relevant Action will not necessitate any change to the existing Noise Zones or the existing PSZ's. As such, the existing policy environment relating to the airport and the surrounding lands will continue to operate sufficiently.

6.6.3 The proposed Relevant Action is fully in compliance with multi-governmental strategic objectives and policies that seek to facilitate the safe and efficient operation of Dublin Airport and foster the airport's connectiveness to the UK, Europe and wider global environment.

[4] These sensitive uses are set out within Variation No. 1 to the County Development Plan

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information from Fingal County Council dated 19/02/2021 to:

- Make several minor clarifications, updates, and corrections;
- Identify land use zoning in the wider area around the airport which may be potentially impacted by the proposed Relevant Action; and
- Assess the potential impacts of the proposed Relevant Action on the identified land use zoning.

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the proposed Relevant Action

7. Population and Human Health

7.1 Introduction

7.1.1 This chapter of the EIAR details the findings of an assessment of the likely effects on population and human health as a result of the proposed Relevant Action.

7.1.2 The appraisal of likely significant effects of the proposed Relevant Action on population and human health has been conducted by reviewing the Current State of the Environment in socio-economic terms and the anticipated Future Receiving Environment in the 2022, 2025 and 2035 Assessment Years.

7.1.3 This assessment will focus on impacts on:

- Amenity and local communities (effects on amenity uses of a site or of other areas in the vicinity); and
- Human health and well-being (to consider the impact of the proposed Relevant Action on the health and wellbeing of the communities).

7.1.4 Economic and employment impacts of the proposed Relevant Action are discussed in Chapter 3: Need for the Project.

7.1.5 This chapter describes the national and local policy and legislation context; the relevant literature on potential impacts on population and human health; assessment methods used; Current State of the Environment; potential direct and indirect population impacts during the operational phase of the proposed Relevant Action; potential human health and well-being impacts during the operational phase of the proposed Relevant Action; mitigation measures; and relevant residual effects for each of the Assessment Years.

7.1.6 The proposed Relevant Action will be an operational change, to remove the numerical cap on the number of flights permitted between the hours of 23:00 and 07:00 daily in the Permitted Scenario, replacing it with an annual night-time noise quota, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00.

7.1.7 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2027 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario. Around 7.1 million additional passengers will have used the airport in in the period 2022-2026 in the Proposed Scenario.

7.1.8 Further information of the economic impact of the Permitted Scenario, and the proposed Relevant Action is provided in *Chapter 3: Need for the Project*, and the InterVISTAS report Dublin Airport Economic Impact of Operating Restrictions[1] which is provided in Appendix 3A.

7.2 Legislation, Guidance and Planning Policy Context

National Guidance

7.2.1 The following national guidance is directly applicable to the proposed Relevant Action in terms of the assessment of population and human health effects:

[1] InterVISTAS (2021): Dublin Airport Economic Impact of Operating Restrictions, Final Report - June 2021

- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports[2] (hereafter referred to as 'the EPA Draft Guidelines');
- Draft Advice Notes for Preparing Environmental Impact Statements[3];
- Guidelines on the Information to be contained in Environmental Impact Statements[4]; and
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements[5].

National Planning Policy

National Planning Framework: Project Ireland 2040

7.2.2 The National Planning Framework: Project Ireland 2040 is the Government's high-level strategic plan for shaping the future growth and development of Ireland to the year 2040[6]. It is a framework to guide public and private investment, to create and promote opportunities for the people of Ireland, and to protect and enhance the environment.

7.2.3 Chapter 6: People, Homes and Communities of the National Planning Framework: Project Ireland 2040 sets out the following themes of relevance to Population and Human Health:

- 'Quality of Life and Place';
- 'Healthy Communities';
- 'Diverse and Inclusive Ireland';
- 'Age Friendly Communities';
- 'Childcare, Education and Life Long Learning'; and
- 'Housing'.

7.2.4 Within Section 6.2: 'Healthy Communities', it is noted how specific health risks, such as heart disease, respiratory disease, mental health, obesity and other injuries, can be influenced by spatial planning. It is also suggested that by taking a whole-system approach to addressing the many factors that impact on health and wellbeing and which contribute to health inequalities, and by empowering and enabling individuals and communities to make healthier choices, it will be possible to improve health outcomes, particularly for the next generation of citizens.

7.2.5 The following objectives are of relevance to this population and human health assessment:

- National Policy Objective 26: *"Support the objectives of public health policy including Healthy Ireland and the National Physical Activity Plan, though integrating such policies, where appropriate and at the applicable scale, with planning policy".*

Healthy Ireland Framework 2019 - 2025

7.2.6 The Healthy Ireland Framework sets out a vision to create *"A Healthy Ireland, where everyone can enjoy physical and mental health and wellbeing to their full potential, where wellbeing is valued and supported at every level of society and is everyone's responsibility".*

7.2.7 The Healthy Ireland Framework is designed to bring about real, measurable change and is based on an understanding of the determinants of health. Health and wellbeing are affected by all aspects of a person's life; economic status, education, housing, the physical environment in which people live and work.

7.2.8 The Healthy Ireland Framework was launched in 2013 and presents four central goals for improved health and well-being[7]:

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[2] Environmental Protection Agency, (2017); Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
[3] Environmental Protection Agency, (2017); Draft Advice Notes for Preparing Environmental Impact Statements
[4] Environmental Protection Agency, (2002); Guidelines on the Information to be contained in Environmental Impact Statements.
[5] Environmental Protection Agency, (2002); Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.
[6] Government of Ireland, (2018), National Planning Framework: Project Ireland 2040.
[7] Department of Health, (2019); Healthy Ireland Framework 2019 – 2025.

- *"increase the proportion of people who are healthy at all stages of life;*
- *Reduce health inequalities;*
- *Protect the public from threats to health and well-being; and*
- *Create an environment where every individual and sector of society can play their part in achieving a healthy Ireland."*

7.2.9 The Healthy Ireland Framework states that *"The area of environment and health, in its broadest sense, comprises those aspects of human health, disease, and injury that are determined or influenced by factors in the environment. This includes not only the study of the direct pathological effects of various chemical, physical, and biological agents, but also the effects on health of the broad physical and social environment, which includes housing, urban development, land use and transportation, industry, and agriculture".* As such, reaffirming the need for the proposed Relevant Action to be considered in respect of its impacts on health.

Local Planning Policy

Fingal Development Plan 2017-2023

7.2.10 FCC adopted the Fingal Development Plan 2017-2023[8] in March 2017 which sets out the policies and objectives to achieve the vision for the county over the plan period. The Development Plan aims to "*develop and improve, in a sustainable manner, the social, economic, environmental and cultural assets of the County*".

7.2.11 The following objectives are of relevance to this population and human health assessment:

- Objective PM69 in Chapter 3 seeks to *"Ensure that proposals do not have a detrimental effect on local amenity by way of traffic, parking, noise or loss of privacy of adjacent residents";*
- Objective ED31 in Chapter 6 aims to provide the infrastructure and facilities to allow Dublin Airport to operate at its maximum sustainable potential, "*whilst taking into account the impact on local residential areas, and any negative impact such proposed developments may have on the sustainability of similar existing developments in the surrounding area*". This will be key for the assessment;
- Objective DA07 in Chapter 7 seeks to *"Strictly control inappropriate development and require noise insulation where appropriate within the Outer Noise Zone, and actively resist new provision for residential development and other noise sensitive uses within the Inner Noise Zone, as shown on the Development Plan maps, while recognising the housing needs of established families farming in the zone. To accept that time based operational restrictions on usage of a second runway are not unreasonable to minimize the adverse impact of noise on existing housing within the inner and outer noise zone"; and*
- Objective DA09 in Chapter 7 seeks to *"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".*

7.2.12 The Fingal Development Plan also includes a map indicating zoning land uses across the county. This map and the following objectives are relevant to the overall assessment:

- Zoning Objective 'CI' Community Infrastructure aims to "*provide for and protect civic, religious, community, education, health care and social infrastructure*". This objective is relevant to high sensitivity receptors analysed in the assessment.
- Zoning Objective 'DA' Dublin Airport aims to "*ensure the efficient and effective operation and development of the airport*" in line with the Airport Local Area Plan. Within the vision for Dublin

[8] Fingal County Council, (2017); Fingal Development Plan 2017 – 2023.

Airport, the Fingal Development Plan states that *"minor extensions or alterations to existing properties located within the Airport Area which are not essential to the operational efficiency and amenity of the airport may be permitted, where it can be demonstrated that these works will not result in material intensification of land use*". This objective and vision will be accounted for throughout the assessment.

- Zoning Objective 'HA' High Amenity in Chapter 11 aims to protect and enhance the highly sensitive amenity areas and scenic locations "*from inappropriate development and reinforce their character, distinctiveness and sense of place*". This objective will be considered in the assessment of amenity effects.

Dublin Airport Local Area Plan

7.2.13 FCC published the Dublin Airport Local Area Plan[9] in January 2020. The Dublin Airport Local Area Plan identifies various issues of relevance and establishes the principles for future development in the area.

7.2.14 Within Chapter 9 Environment & Community, Figure 9.1 displays the updated Dublin Airport Noise Zones 2019. The accompanying text in Section 9.1 on noise details that these zones have been updated to allow for more effective land use planning within airport noise zones, using evidence on how aircraft noise can affect health and quality of life. Therefore, this text and map will be considered for the amenity and health and well-being assessments.

7.2.15 Appendix 1: Strategy for St. Margaret's Special Policy Area provides a plan and specific policies for the closest settlement to Dublin Airport. This strategy will be considered in the amenity and health and well-being assessment.

Other Legislation, International Policy, Standards and Guidance

Environmental Noise Directive 2002/49/EC

7.2.16 The Environmental Noise Directive (END) 2002/49/EC[10], published in June 2002, relates to the assessment and management of environmental noise within the EU.

7.2.17 The Directive states that it is necessary to establish a common assessment method for environmental noise and define limit values in terms of harmonised indicators for the determination of noise levels. Such limit values are to be determined by the Member States. The selected common noise indicators are L_{den}, to assess annoyance, and L_{night}, to assess sleep disturbance.

7.2.18 The harmful effects of environmental noise may be assessed by the means of dose-effects relations as set out in Annex III of END 2002/49/EC. Annex III states that dose-effect relations will concern the relation between annoyance and L_{den}, and relation between sleep disturbance and L_{night} for air traffic noise.

7.2.19 The END obliges the European Commission to adapt the END Annexes I-III to account for technical and scientific progress.

WHO Environmental Noise Guidelines for the European Region

7.2.20 The World Health Organisation (WHO) Regional Office for Europe published Environmental Noise Guideline for the European Region[11] in 2018. The main purpose of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from various sources including aircraft. The guidelines provide robust public health advice underpinned by evidence.

7.2.21 In respect of aircraft noise, the Environmental Noise Guidelines set out the following recommendations:

- For average daytime noise exposure, it is strongly recommended that daytime noise levels produced by aircraft are below 45 dB L_{den};

[9] Fingal County Council, (2019); Draft Dublin Airport Local Area Plan.
[10] European Commission, (2002); Environmental Noise Directive 2002/49/EC. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0049&from=EN
[11] World Health Organisation Regional Office for Europe, (2018); Environmental Noise Guidelines for the European Region. Available at: http://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf

- For average night noise exposure, it is strongly recommended that noise levels that night noise levels produced by aircraft are below 40 dB L_{night}; and
- To reduce health effects, policy makers should implement suitable measures to reduce noise exposure where the population is exposed to levels above the guideline values for average daytime and night noise exposure.

EU Commission Directive 2020/367

7.2.22 EU Commission Directive 2020/367[12], published in March 2020, concerns the amendment of Annex III within END 2002/49/EC. At the time of adoption of END 2002/49/EC, the high quality and statistically significant information that could be used was that of the WHO Environmental Noise Guidelines for the European Region, presenting dose-effect relations for harmful effects induced by the exposure to environmental noise. Consequently, the dose-effect relations introduced in Annex III to Directive 2002/49/EC should be based on those guidelines. However, by 31st December 2021, all Member States are to bring into force the laws, regulations and administrative provisions necessary to comply with the updated Annex III to END 2002/49/EC as set out in EU Commission Directive 2020/367[13].

7.2.23 The update to Annex III sets out the assessment methods for harmful effects from environmental noise. The harmful effects to be considered include ischaemic heart disease (IHD) (corresponding to codes BA40 and BA6Z of the international classification ICD-11 established by the WHO), high annoyance, and high sleep disturbance. The update to Annex III identifies the formulae to be used which compute a value for the proportion of a population highly annoyed or highly sleep disturbed from noise from specific sources, including aircraft.

London Healthy Urban Development Unit: Rapid Health Impact Assessment Tool (Fourth Edition)

7.2.24 The London Health Urban Development Unit (HUDU) Rapid Health Impact Assessment Tool[14], published in October 2019, is designed to assess the likely health impacts of development plans and proposals, and outline and detailed planning applications. The toolkit helps to identify determinants of health which are likely to be influenced by a specific development proposal, as well as issues directly or indirectly influenced by planning decisions. The way in which the London HUDU Rapid Health Impact Assessment Tool has supported the assessment is detailed in Section 7.3 Methodology.

7.3 Assessment Methodology

Study Area

7.3.1 As there is no national guidance available on identifying an appropriate study area to focus the assessment of population and human health, the study area for the population and human health assessment has considered the area of land that may be affected by the proposed Relevant Action. It should be noted, however, that it is not always possible to determine the catchment area for community facilities. Residents of an area may utilise facilities located within different electoral divisions, counties or regions without regard for statutory boundaries.

Methodology for Determining the Current State of the Environment and Sensitive Receptors

7.3.2 A community profile helps to establish an in-depth understanding of the population affected by the proposed Relevant Action, identifying potentially vulnerable groups. In order to gather information pertaining to employment, demographics, human health and local amenities, a robust desktop study has been undertaken, drawing on information from the following sources:

- Central Statistics Office (CSO);
- FCC; and

[12] European Commission, (2020); Commission Directive (EU) 2020/367 of 4 March 2020 amending Annex III to Directive 2002/49/EC of the European Parliament and of the Council as regards the establishment of assessment methods for harmful effects of environmental noise. Available at: https://eur-lex.europa.eu/eli/dir/2020/367/oj
[13] END Annex III has been considered in this assessment following RFI no. 83 from ANCA
[14] London Healthy Urban Development Unit, (2019); HUDU Planning for Health: Rapid Health Impact Assessment Tool (Fourth Edition, October 2019).

- The 2016 Pobal HP Deprivation Index for Small Areas (SA).

7.3.3 The community profile for the population and human health assessment was supported by a site visit undertaken by AECOM in August 2019. The site visit helped to develop a broader understanding of the local context and land uses in the local area. Key receptors, such as residential areas, community facilities, leisure facilities and walking routes, in the local area were visited during the site visit.

7.3.4 Data collection for the population and human health assessment has therefore considered the communities and areas of land which may potentially be impacted by the proposed Relevant Action. The impact areas for certain impacts such as human health, amenities and community facilities, and local land uses have been informed by other assessments (*Chapter 13: Aircraft Noise and Vibration, Chapter 14: Ground Noise and Vibration, Chapter 10: Air Quality* and *Chapter 11: Climate and Carbon*) during the assessment stage of the EIAR.

Methodology for Determining Operational Effects

7.3.5 Effects on amenity and local communities, employment opportunities and human health are described using the criteria provided in EPA guidance, European Commission guidance[15] and the *London HUDU Rapid Health Impact Assessment Tool*[16], as detailed in the following sub-sections.

Amenity and Local Communities

7.3.6 The assessment on amenity and local communities is concerned with how the proposed Relevant Action potentially impacts on the ability of residents and users of community and recreational facilities to achieve enjoyment and/or quality of life.

7.3.7 Assessing the impact of the proposed Relevant Action on amenity and local communities has taken into account the combined residual significant effects from other assessment topics (*Chapter 13: Aircraft Noise and Vibration, Chapter 14: Ground Noise and Vibration, Chapter 10: Air Quality* and *Chapter 11: Climate and Carbon*) which could affect people's enjoyment of a community facility, public space or residential property.

7.3.8 A descriptive approach has been used which gives an overall indication of the change i.e. positive, negative/adverse or neutral, in the amenity of the receptor. As set out in Table 7-4, the assessment is based on professional judgement and uses a four-point scale of high, medium, low and negligible in line with the EPA Draft Guidelines as explained in Chapter 1: Introduction. Depending on the type of receptor being assessed, the magnitude of effect is based on the number of users and the extent to which these users experience impacts on their amenity.

7.3.9 The assessment aligns with the relevant aspects of the EPA Draft Guidelines, as well as the European Commission's guidance document Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report[17].

Human Health and Well-being

7.3.10 The scope of the human health and well-being assessment includes impacts on the health of residents of properties and users of community resources in the study area. Relevant guidance from the Institute of Public Health in Ireland (IPH), specifically the Health Impact Assessment Guidance, has been considered to inform the assessment. There is no consolidated methodology or practice for describing effects on human health in the EPA Draft Guidelines[18]. The impacts of the proposed Relevant Action on human health will be assessed using the health and well-being determinants set out in the London HUDU Rapid Health Impact Assessment Tool. The human health and wellbeing assessment is informed by the quantitative assessment results from *Chapter 10: Air Quality, Chapter 11: Climate and Carbon, Chapter 13: Aircraft Noise and Vibration* and *Chapter 14: Ground Noise and Vibration*. The London HUDU Rapid Health Impact Assessment Tool is a checklist approach which provides a broad overview

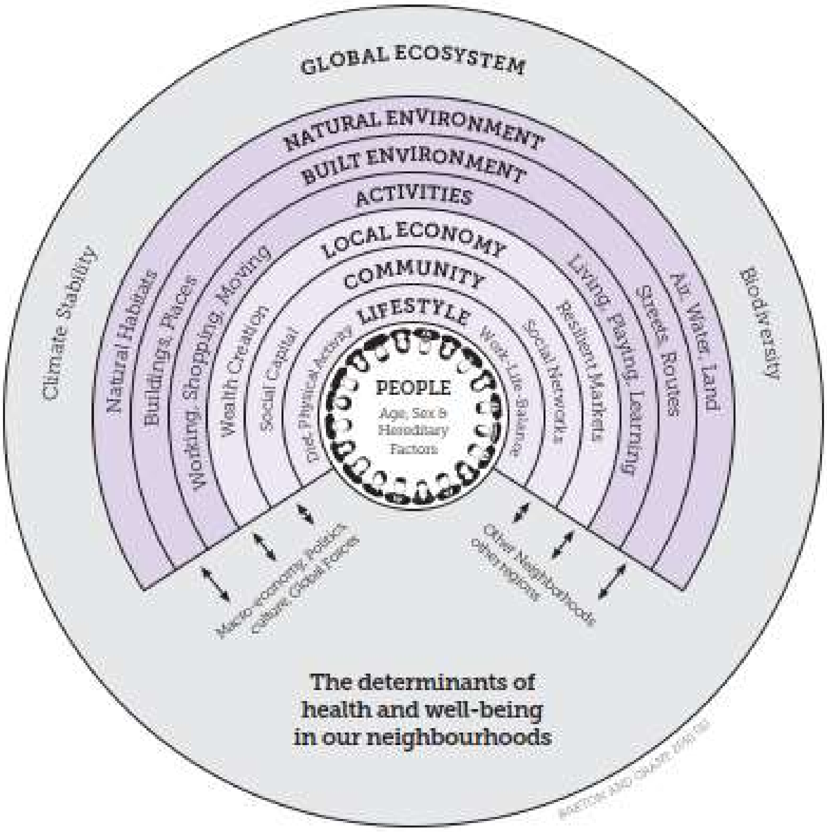
[15] European Commission, (2017); Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report.
[16] London Healthy Urban Development Unit, (2019); HUDU Planning for Health: Rapid Health Impact Assessment Tool (Fourth Edition, October 2019).
[17] European Commission, (2017); Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report.
[18] The World Health Organisation (WHO) are currently working on revised Community Noise Guidelines for Europe which are expected to present state of the art evidence on the health effects of noise and updated recommendations on acceptable exposures levels.

of the potential health impacts and is applicable to a wide range of proposals that considers impacts on a range of health determinants. The checklist is split into 11 broad determinants and is based on the WHO publication 'Healthy Urban Planning'[19].

7.3.11 The WHO Europe defines health as *"a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity"*[20]. Consequently, public health encompasses general wellbeing, not just the absence of illness. Some effects are direct and obvious, others are indirect, while some may be synergistic, with different types of impact acting in combination. In keeping with this definition, this assessment considers the potential impacts of the proposed Relevant Action on physical, mental and social health.

7.3.12 Factors that have the most significant influence on the health of a population are called 'determinants of health'; these include an individual's genetics and their lifestyle, the surrounding environment, as well as political, cultural and societal issues. The interrelationship between these factors is shown in Plate 7-1.

Plate 7-1: Social determinants of health



Source: Barton and Grant (2006)

7.3.13 An initial scoping exercise for this population and human health assessment was undertaken to determine the health determinants within the London HUDU Rapid Health Impact Assessment Tool which are relevant to this assessment. The following health determinants in the London HUDU Rapid Health Impact Assessment Tool are associated with construction activities or the provision of new physical infrastructure and were not deemed to be of relevance to the proposed Relevant Action and therefore are not assessed further:

- Housing design and affordability;
- Access to health and social care services and other social infrastructure;
- Accessibility and active travel;

[19] Barton, H. and Tsourou, C, (2000), Healthy Urban Planning. World Health Organisation
[20] World Health Organisation, (2020), Constitution. [Online]. Available from: https://www.who.int/about/who-we-are/constitution

- Crime reduction and community safety;
- Access to healthy food;
- Social cohesion and inclusive design; and
- Minimising the use of resources.

7.3.14 The health determinants which will be assessed as part of this chapter are listed below:

- Air quality, noise and neighbourhood amenity; and
- Climate change.

7.3.15 A literature review further considers existing scientific evidence in order to identify the determinants of relevance to the proposed Relevant Action. This literature review provides scientific evidence which supports assumptions made about the potential health impacts of the proposed Relevant Action.

7.3.16 HUDU advises that its tool is generic and should be adapted to local circumstances. This assessment of human health and well-being effects includes the likely direct, indirect and cumulative effects of the proposed Relevant Action. Potential impacts on the health and well-being of the existing local community and residents has been considered, in particular for more vulnerable groups (such as children and the elderly). Health inequalities have also been considered. Mitigation and enhancement measures for the proposed Relevant Action (some of which may have already been considered through the development of the proposed Relevant Action) have been considered and key indicators for monitoring health and well-being impacts moving forward have been established.

Annoyance and Sleep Disturbance

7.3.17 As stated in *Chapter 13. Air and Noise Vibration: Appendix 13A* the number of people 'highly sleep disturbed' and 'highly annoyed' has been predicted in accordance with the approach recommended by the WHO Environmental Noise Guidelines 2018 as endorsed by the European Commission through Directive 2020/367. The methodology has taken into account the noise exposure from 45 dB L_{den} and 40 dB L_{night} as appropriate. It is aircraft noise above these levels that the WHO Regional Office for Europe states are associated with adverse health effects.

7.3.18 For the L_{den} and L_{night} noise indicators the significance of effect has been determined by separately rating both the absolute noise levels and the change in noise level as set out below. The individual ratings are then combined to determine the significance of any effects.

7.3.19 The absolute noise values and associated impact criteria for residential receptors that have been developed are given in Table 7-1. They commence with a negligible band which applies to noise levels that lie below a low threshold, specifically 45 dB L_{den} and 40 dB L_{night}, as the WHO Regional Office for Europe states that aircraft noise above these levels is associated with adverse health effects. The subsequent bands are defined by values that are required to be reported under Directive 2002/49/EC.

Table 7-1 Noise Impact Criteria (absolute) – Residential

Scale Description	Annual dB L_{den}	Annual dB L_{night}
Negligible	<45	<40
Very Low	45 – 49.9	40 – 44.9
Low	50 – 54.9	45 – 49.9
Medium	55 – 64.9	50 – 54.9
High	65 – 69.9	55 – 59.9
Very High	≥70	≥60

7.3.20 The scale to be used to assess the change in noise level is given in Table 7-2. The thresholds are derived from the different contour bands recommended in CAP1616a[21] (see *Chapter 13: Aircraft Noise and Vibration* for more information). A semantic scale of this type, following the format of examples given in the Institute of Environmental Management and Assessment guidelines[22], has been applied in previous air noise assessments and accepted in Public Inquiries and Oral Hearings for airport developments in the UK and Ireland.

Table 7-2 Noise Impact Criteria (relative)

Scale Description	Change in noise level, dB(A)
Negligible	0 – 0.9
Very Low	1 – 1-9
Low	2 – 2.9
Medium	3 – 5.9
High	6 – 8.9
Very High	≥9

Classification of Effects and Significance Criteria

Amenity and Local Communities

7.3.21 For amenity and local communities, conclusions on the classification of effects have been made by assessing the magnitude of impact, combined with the sensitivity of resources and receptors to these impacts.

Table 7-3: Type of Effects

Type of Effects	*Description of Effect*
Beneficial	An impact that has a potential advantageous or beneficial effect on receptors within a specific geographical area, which may be minor, moderate, or major in effect.
Negligible	An impact that is expected to have imperceptible effects on receptors within a defined area.
Adverse	An impact that is expected to have a disadvantageous or adverse effect on receptors within a specific geographical area, which may be minor, moderate or major in effect.
No effect	An impact that is likely to have no effect on an area or local receptors.

7.3.22 Duration of effect is also considered, with more weight given to permanent changes than to temporary ones.

7.3.23 The impact assessment has been undertaken in accordance with the broad magnitude of impact and sensitivity of receptor definitions summarised in Table 7-4 and Table 7-5.

Table 7-4: Magnitude of Impact Criteria

Magnitude of Impact	*Magnitude of Effect*
High	An impact that is expected to have considerable adverse or beneficial effects on receptors. Such impacts will typically affect large numbers of residents, users, businesses or workers.

[21] Civil Aviation Authority, (2017); CAP1616: Airspace Design: Guidance on the regulatory process for changing airspace design including community engagement requirements. Available at: https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8127
[22] Institute of Environmental Management and Assessment (2014). Guidelines for Environmental Noise Impact Assessment. London: IEMA.

	High magnitude impacts will typically be long-term in nature, resulting in the permanent change of the study area's Current State of the Environment.
Medium	An impact that is expected to have a moderate effect on receptors. Such impacts will typically have a noticeable effect on a limited number of residents, users, businesses or workers, and will lead to a permanent (but not drastic) change to the study area's Current State of the Environment.
Low	An impact that is expected to affect a small number of residents, users, businesses or workers. Or an impact that may affect a larger number of receptors but without materially changing the study area's Current State of the Environment. Such impacts are likely to be temporary in nature.
Negligible	An impact that is likely to be temporary in nature, or which is anticipated to have a slight effect on the residents, users, businesses or workers.

Table 7-5: Sensitivity of Receptors

Sensitivity of Receptors	*Sensitivity of Receptors*
High	Receptor is likely to be directly affected. Receptor is well placed to take advantage of beneficial impacts, and/or is not well placed to deal with any adverse impacts.
Medium	Receptor is likely to be indirectly affected. Average ability to maximise beneficial impacts or cope with adverse impacts.
Low	Receptor is unlikely to benefit or be adversely affected. Receptor is not well placed to take advantage of beneficial impacts, and/or is well placed to deal with any adverse impacts.
Negligible	Receptor is very unlikely to benefit or be adversely affected. Receptor is not well placed to take advantage of any beneficial impacts, and/or is well placed to deal with any adverse impacts.

7.3.24 Once the magnitude of the effect has been identified, this can be cross-referenced with the importance of the sensitivity of the receptor to derive the overall significance of impact informed by the EPA Draft Guidelines. By bringing together magnitude and sensitivity, the assessment considers the classification of the effects as outlined in Table 7-6. Moderate and Major effects are considered to be significant. Minor and Negligible effects are considered to be not significant.

Table 7-6: Significance Criteria

Description of Impact	*Sensitivity of Existing Environment*			
	High	**Medium**	**Low**	**Negligible**
High	Profound	Very Significant	Significant / Moderate	Moderate / Slight
Medium	Very Significant / Significant	Significant / Moderate	Moderate	Slight / Not Significant
Low	Significant / Moderate	Moderate / Slight	Slight / Not Significant	Not significant / Imperceptible
Negligible	Slight / Not Significant	Not significant	Not significant / Imperceptible	Imperceptible

Human Health and Well-being

7.3.25 Potential health impacts are described as outlined in Table 7-7, based on broad categories for the effects identified. Where an effect has been identified, actions have been recommended to mitigate negative impact on health, or opportunities to enhance health benefits. As detailed in *Chapter 13. Aircraft Noise and Vibration* and *Chapter 14. Ground Noise and Vibration*, embedded mitigation to reduce these effects or measures to enhance certain benefits already form part of the proposed Relevant Action and the assessment has considered these impacts as such.

Table 7-7: Human Health Impact Categories

Impact category	*Impact symbol*	*Description*
Positive	+	A beneficial impact is identified
Neutral	0	No discernible health impact is identified
Negative	-	An adverse impact is identified
Uncertain	?	Where uncertainty as to the overall impact

Limitations and Assumptions

7.3.26 This population and human health assessment is based on professional judgement and takes into account both the adverse and beneficial impacts that the proposed Relevant Action can have upon existing and surrounding receptors. It provides a broad, high level indication of effects, reporting on the potential effects to people and the local community.

7.3.27 Community resources are mentioned expressly in the Current State of the Environment section only where they contribute to the local context or where they may be affected by the proposed Relevant Action. Consequently, not all community resources within the study area are mentioned.

7.3.28 Information in the Current State of the Environment related to demographics and the health profile of the population in the study area uses statistics from the census. Five years have passed since the previous census was published (2016).

7.3.29 Section 7.6 establishes the socio-economic context of the Future Receiving Environment for the 2035 assessment. This section is limited by the availability and accuracy of future socio-economic statistics, particularly at smaller geographies.

7.4 Literature Review

7.4.1 As set out by the Institute of Public Health in Ireland, *"A literature review should be undertaken to find evidence which supports or refutes the assumptions made at the screening stage about the potential health impacts of the proposal"*[23]. Therefore, a literature review which focuses on the potential impacts of the proposed Relevant Action on human health and well-being has been carried out.

7.4.2 Initially, this literature review has considered whether there is sufficient evidence from within the London HUDU Rapid Health Impact Assessment Tool to support an association between the activities associated with the proposed Relevant Action and the relevant determinant of health. The potential effects on health determinants have been summarised in Table 7-8.

[23] Institute of Public Health in Ireland, (2009). Health Impact Assessment Guidance.

Table 7-8: Potential Effects of Activities Associated with the Proposed Relevant Action on Health Determinants

Activity associated with the proposed *Relevant Action*	***Health determinant and potential impact***
Increased frequency of emissions and noise exposure from additional aircraft movements and associated operations	***Air quality, noise and neighbourhood amenity*** *– the quality of the local environment can have a significant impact on physical and mental health. Pollution caused by construction, traffic and commercial activity can result in poor air quality, noise nuisance and vibration. Poor air quality is linked to incidence of chronic lung disease (chronic bronchitis or emphysema) and heart conditions and asthma levels of among children and young people. Noise pollution can have a detrimental impact on health resulting in sleep disturbance, cardiovascular and psycho-physiological effects. Good design and the separation of land uses can lessen noise impacts.*
Increased frequency of emissions from additional aircraft movements and associated operations	***Climate change*** *– there is a clear link between climate change and health. Local areas should prioritise policies and interventions that 'reduce both health inequalities and mitigate climate change' because of the likelihood that people with the poorest health would be hit hardest by the impacts of climate change.*

Source: London HUDU Rapid Health Impact Assessment Tool (2019)

7.4.3 Having identified the health determinants which have the potential to be impacted by the activities associated with the proposed Relevant Action, this literature review now provides additional evidence, based on existing scientific literature, to reaffirm such potential health impacts.

Air Quality, Noise and Vibration, and Neighbourhood Amenity

7.4.4 Based on the scientific literature reviewed and referenced throughout this chapter, there is strong evidence for the adverse effects of air pollution, specifically particulate matter (PM) and nitrogen dioxide (NO_2), on human health. Exposure to air pollution – induced *inter alia* by aircraft, airside plant and vehicle movements - over several years can reduce life-expectancy, mainly due to an increased risk of cardiovascular and respiratory illness such as chronic obstructive pulmonary disease[24] and lung cancer[25], while short-term exposure can aggravate respiratory and cardiovascular conditions, and trigger asthma attacks[26] and premature deaths. The evidence is strongest for cardiovascular and respiratory effects, particularly in younger[27] and older people[28]. The evidence for population level changes in health outcomes due to concentrations of fine PM and NO_2 below statutory levels (see *Chapter 10: Air Quality*) is more limited, but there is a general association of sufficient strength to warrant assessment and development of environmental measures to reduce emission levels to as low as reasonably practicable[29].

7.4.5 Based on the scientific literature reviewed in this section, the strength of evidence is strong for a direct causal relationship between noise disturbance and health outcomes and quality of life effects, although this is dependent on the level of disturbance. Emerging from the evidence base are a number of key health outcomes, including noise annoyance, sleep disturbance, cardiovascular health, mental health, and children's learning.

7.4.6 Noise annoyance, commonly used within European policy to measure the quality of life impacts of noise exposure on communities around airports, is defined as disturbance, irritation, dissatisfaction and nuisance from environmental noise[30]. Existing evidence displays a variation in the strength of the

[24] Liu, Y., Yan, S., Poh, K., et al., (2016). Impact of air quality guidelines on COPD sufferers. Int J Chron Obstruct Pulmon Dis. 11. 839-872.
[25] Loomis, D., Grosse, Y., et al., (2013). IARC evaluation of the carcinogenicity of outdoor air pollution. Lancet Oncol. 14. 1262–1263.
[26] Orellano, P., Quaranta, N., Reynoso, J., et al., (2017). Effect of outdoor air pollution on asthma exacerbations in children and adults: Systematic review and multilevel metaanalysis. PLoS One, 12.
[27] Bell, M. L., Zanobetti, A. & Dominici, F., (2013). Evidence on vulnerability and susceptibility to health risks associated with short-term exposure to particulate matter: a systematic review and meta-analysis. Am J Epidemiol, 178, 865-76.
[28] Braubach, M., Jacobs, D. E. & Ormandy, D. (eds.), (2011). Environmental burden of disease associated with inadequate housing. A method guide to the quantification of health effects of selected housing risks in the WHO European Region, Copenhagen, Denmark: World Health Organization Europe.
[29] Bell, M. L., Zanobetti, A. & Dominici, F., (2013). Evidence on vulnerability and susceptibility to health risks associated with short-term exposure to particulate matter: a systematic review and meta-analysis. Am J Epidemiol, 178, 865-76.
[30] Institute of Public Health in Ireland, (2005), Health Impacts of Transport: a review.

relationship between aircraft noise and annoyance which may be associated with differences in methodologies, operational factors (i.e. runway operations and night-flight operations) and non-acoustic factors. Studies of change in aircraft noise exposure, including studies of newly affected communities, have found that there is an excess-response in relation to the change in noise exposure, both for decreased and for increased aircraft noise exposure[31] [32]. Whilst there is a relationship between aircraft noise and annoyance, there is very little evidence evaluating the impact of operational interventions on annoyance[33].

7.4.7 Sleep disturbance, potentially induced by aircraft noise, can, in the short-term, impair mood and cognitive performance[34] [35]. The long-term effects of sleep disturbance can influence glucose metabolism, appetite regulation, memory immune response and endothelial dysfunction, which can act as precursors for high blood pressure, cardiovascular disease, diabetes and obesity[36]. Measuring sleep is challenging as there is no one physical, physiological or psychological measure that is considered reliable. As such, there is little evidence evaluating the relationship between aircraft noise and sleep disturbance. However, a recent study utilised meta-analysis (including a study of the London Docklands Light Railway (DLR)) to estimate exposure-response functions for the probability of sleep change as a result of aircraft noise and findings suggested that a relationship did exist[37].

7.4.8 Cardiovascular Disease (CVD), a term used to describe an umbrella of health conditions such as Coronary Heart Disease (CHD), Ischaemic Heart Disease (IHD), angina, heart failure, stroke, and Acute Myocardial Infarction (AMI), have been widely studied in relation to environmental noise. Many studies have found that it is biologically plausible that environmental noise exposure might influence CVD[38] [39] [40]. It is hypothesised that heightened noise exposure can cause physiological stress reactions, which in turn can increase CVD risk factors[41]. In regards to studies which have specifically assessed aircraft noise and cardiovascular outcomes, a number of studies have found small, but statistically significant effects, on a range of cardiovascular outcomes including AMI and CHD as well as risk factors including hypertensions and diabetes[42] [43] [44].

7.4.9 Mental health and well-being is defined by the WHO as a "*state of well-being in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community*". Mental health and well-being is strongly influenced by socioeconomic status, age, gender, history of poor-mental health, and exposure to other life stressors[45] [46]. This said, noise is thought to be an environmental stressor influencing mental

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[31] Breugelmans, O., Houthuijs, D., van Kamp, I., Stellato, R., van Wiechen, C. and Doornbos, G., (2007). Longitudinal effects of a sudden change in aircraft noise exposure on annoyance and sleep disturbance around Amsterdam Airport. Paper presented at the International Congress on Acoustics, Madrid.
[32] Brown, A. L., and van Kamp, I., (2009). Response to a change in transport noise exposure: competing explanations of change effects. Journal of the Acoustical Society of America, 125, 905-914.
[33] White, K., Arntzen, M., Walker, F., Waiyaki, F. M., Meeter, M., and Bronkhorst, A. W., (2017). Nosie annoyance caused by continuous descent approaches compared to regular descent procedures. Applied Acoustics, 125, 194-198.
[34] Basner, M., & McGuire, S., (2018). WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Effects on Sleep. Int J Environ Res Public Health. 14.
[35] Institute of Public Health in Ireland, (2005), Health Impacts of Transport: a review.
[36] Müller, U., Schreckenberg, D., Möehler, U., and Liepert, M., (2018). Maximum level as an additional criterion for the assessment of railway noise at night: derivation of a wake-up protection criterion for standards and regulations. Paper presented at the Euronoise, Crete
[37] Basner, M., & McGuire, S., (2018). WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Effects on Sleep. Int J Environ Res Public Health. 14.
[38] Babisch, W., (2014). Updated exposure-response relationship between road traffic noise and coronary heart diseases: A metaanalysis. Noise and Health, 16(68), 1-9
[39] Munzel, T., and Daiber, A., (2018). Environmental Stressors and Their Impact on Health and Disease with Focus on Oxidative Stress. Antioxid Redox Signal, 28(9), 735-740
[40] Munzel, T., Sorensen, M., Schmidt, F., Schmidt, E., Steven, S.,Kroller-Schon, S., and Daiber, A., (2018). The Adverse Effects of Environmental Noise Exposure on Oxidative Stress and Cardiovascular Risk. Antioxid Redox Signal, 28(9), 873-908
[41] Institute of Public Health in Ireland, (2005), Health Impacts of Transport: a review.
[42] Basner, M., Babisch, W., Davis, A., Brink, M., Clark, C., Janssen, S., and Stansfeld, S., (2014). Auditory and non-auditory effects of noise on health. Lancet, 383(9925), 1325-1332
[43] Kempen, E. V., Casas, M., Pershagen, G., and Foraster, M., (2018). WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Cardiovascular and Metabolic Effects: A Summary. International Journal of Environmental Research and Public Health, 15(2)
[44] Vienneau, D., Schindler, C., Perez, L., Probst-Hensch, N., and Roosli,M., (2015). The relationship between transportation noise exposure and ischemic heart disease: a meta-analysis. Environmental Research, 138, 372-380
[45] Gruebner, O., Rapp, M. A., Adli, M., Kluge, U., Galea, S., and Heinz, A., (2017). Cities and Mental Health. Dtsch Arztebl Int, 114(8), 121-127.
[46] Clark, C., Pike, C., McManus, S., Harris, J., Bebbington, P., Brugha, T., and Stansfeld, S. A., (2012). The contribution of work and non-work stressors to common mental disorders in the 2007 Adult Psychiatric Morbidity Survey. Psychological Medicine, 42(4), 829-842.

health and well-being[47] [48] [49]. In regards to studies relating to aircraft noise, a number of studies have found evidence to suggest aircraft noise can be linked to a number of mental health and well-being outcomes including anxiety and depressive disorders.

7.4.10 In addition, there is a reasonable body of scientific evidence indicating that both actual and perceived neighbourhood amenity plays an important role in physical and mental health[50]. Broadly, the literature indicates that environmental features of a neighbourhood, such as its attractiveness or pollution levels, affect the socio-economic position of residents, which in turn affects health and health inequalities[51].

Climate Change

7.4.11 There is an existing evidence base which suggests that climate change has a wide range of implications for human health, including increased mortality and morbidity from extreme weather events, infectious diseases (waterborne, foodborne and vector-borne), diseases resulting from degraded air pollution and mental health[52]. As climate change is multi-faceted, it is not possible for studies to attribute health outcomes to specific developments such as airports.

7.4.12 Various studies have assessed the likely future effects of climate change on various health outcomes induced by extreme weather events, including heat waves, storms, cyclone, fires and floods[53]. Evidence suggests that in temperate countries, as summers become increasingly hotter and heat waves more frequent and severe, additional heat-related deaths will progressively overwhelm the number of deaths averted as a result of milder winters[54] [55].

7.4.13 Evidence also suggests that rising temperatures also have implications on the formation and dispersal of various air pollutants. Ozone, a major urban pollutant, accumulates more readily from engine exhausts at higher temperatures. Studies have found that the mortality rate caused by Europe's 2003 heat wave was exacerbated by high temperatures and ozone formation[56] [57].

7.4.14 Furthermore, extensions in the geographic range of several vector-borne infectious diseases or their vectors have been linked to rising temperatures induced by climate change. Evidence suggest that temperature, rainfall and humidity can influence the replication and viability of pathogens and vectors[58].

7.5 Current State of the Environment

7.5.1 This section establishes a comprehensive and coherent socio-economic profile of the area, including consideration of the labour market and health indicators. The conditions described in this section are considered applicable to the Future Receiving Environments in the 2022 and 2025 Assessment Years, as these assessment years are in the near future and the socio-economic conditions of the environment

[47] Baudin, C., Lefevre, M., Champelovier, P., Lambert, J., Laumon, B., & Evrard, A. S. (2018). Aircraft Noise and Psychological Ill-Health: The Results of a Cross-Sectional Study in France. International Journal of Environmental Research and Public Health, 15(8)
[48] Beutel, M. E., Junger, C., Klein, E. M., Wild, P., Lackner, K., Blettner, M., and Munzel, T., (2016). Noise Annoyance Is Associated with Depression and Anxiety in the General Population- The Contribution of Aircraft Noise. PloS One, 11(5).
[49] Schreckenberg, D., Griefahn, B., and Meis, M., (2010). The associations between noise sensitivity, reported physical and mental health, perceived environmental quality, and noise annoyance. Noise & health, 12(46), 7-16
[50] Miller, W. D., Pollack, C. E. & Williams, D. R., (2011). Healthy homes and communities: putting the pieces together. Am J Prev Med, 40, S48-57.
[51] Egan, M., Tannahill, C., Petticrew, M., et al., (2008). Psychosocial risk factors in home and community settings and their associations with population health and health inequalities: a systematic meta-review. BMC Public Health, 8, 239.
[52] WHO, (2009). Protecting health from climate change: connecting science, policy and people. Geneva, World Health Organization.
[53] McMichael, A.J., and Lindgren, E., (2011). Climate change: present and future risks to health, and necessary responses. Journal of Internal Medicine. 270. (5).
[54] Knowlton. K., Lynn. B., and Goldberg. R.A., et al., (2007) Projecting heat-related mortality impacts under a changing climate in the New York City region. Am J Public Health; 97:2028-34.
[55] Bambrick. H., Dear. K., Woodruff. R., Hanigan. I., and McMichael. AJ., (2008) The impacts of climate change on three health outcomes: temperature-related mortality and hospitalisations, salmonellosis and other bacterial gastroenteritis, and population at risk from dengue. Garnaut Climate Change Review
[56] McMichael, A.J., and Lindgren, E., (2011). Climate change: present and future risks to health, and necessary responses. Journal of Internal Medicine. 270. (5).
[57] Dear, K., Ranmuthugala, G., and Kjellström, T., et al. (2005). Effects of temperature and ozone on daily mortality during the August 2003 heat wave in France. Arch Environ Occup Health; 60: 205–12.
[58] McMichael, A.J., and Lindgren, E., (2011). Climate change: present and future risks to health, and necessary responses. Journal of Internal Medicine. 270. (5).

are not anticipated to significantly change between the present day and these dates. A description of the Future Receiving Environment for the 2035 Assessment Year is presented in Section 7.6.

7.5.2 Dependent on the availability of data from the CSO, the Current State of the Environment section presents analysis of socio-economic indicators which provides the narrative and evidence base of the current status of Dublin Airport. Analysis in this section sets the context for the potential impacts of the proposed Relevant Action.

7.5.3 Dublin Airport intersects the two Electoral Divisions (ED) of Airport and Dubber. Both EDs are located within the county of Fingal, which itself, is situated in the wider jurisdictions of the Dublin Regional Authority and the Eastern & Midland Regional Assembly (see Figure 7.1 in *EIAR Volume 3: Figures*).

7.5.4 This section establishes the Current State of the Environment with regards to the following characteristics relevant to the potential impacts of Dublin Airport:

- Population;
- Labour market indicators; including:
  - Participation rate and unemployment
  - Education and skills
  - Occupational profile
  - Income profile
- Human health; and
- Local community facilities and land uses.

Population

Population

7.5.5 As shown in Table 7-9, the resident population of the Airport ED was 5,018 whilst Dubber ED was 7,372 in 2016[59]. Both the Airport ED and Dubber ED, where the airport is located, had a higher proportion of working age residents and lower proportion of retirement age (65+ years) in comparison to Fingal County, Dublin Regional Authority, the Eastern & Midland Regional Assembly and the average for Ireland. In 2016, 3,823 (76.2%) of the residents in the Airport ED were aged between 15 and 64 years. Dubber ED had 5,160 (70.0%) residents aged between 15 and 64 years in 2016.

7.5.6 The proportion of working aged residents in both the Airport ED and Dubber ED was noticeably higher than the average recorded for Fingal County (66.3%), Dublin Regional Authority (68.5%), the Eastern & Midland Regional Assembly (66.8%) and Ireland (65.5%) as a whole. In addition, the Airport ED had a smaller proportion of residents aged 14 years or under (15.0%) in comparison to Fingal County (24.5%), Dublin Regional Authority (19.3%), the Eastern & Midland Regional Assembly (21.1%) and Ireland (21.1%). Dubber ED (26.8%) had the largest proportion of residents aged 14 years or under. The proportion of residents aged 65 years or older in the Airport ED (8.8%) and Dubber ED (3.2%) was smaller than the average for Fingal County (9.1%), Dublin Regional Authority (12.2%), the Eastern & Midland Regional Assembly (12.0%) and Ireland (13.4%).

Table 7-9: Population by age, (2016).

	Airport ED		*Dubber ED*		*Fingal County*		*Dublin Regional Authority*		*Eastern & Midland Regional Assembly*		*Ireland*	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
Aged 14 years or under	753	15.0	1,977	26.8	72,613	24.5	259,953	19.3	492,198	21.1	1,006,552	21.1

[59] Central Statistics Office (Ireland), (2016), Census 2016.

	Airport ED		Dubber ED		Fingal County		Dublin Regional Authority		Eastern & Midland Regional Assembly		Ireland	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Aged 15-64 years	3,823	76.2	5,160	70.0	196,372	66.3	922,422	68.5	1,556,487	66.8	3,117,746	65.5
Aged 65 years or over	442	8.8	235	3.2	27,035	9.1	164,984	12.2	279,832	12.0	637,567	13.4
Total Population	**5,018**	**-**	**7,372**	**-**	**296,020**	**-**	**1,347,359**	**-**	**2,328,517**	**-**	**4,761,865**	**-**

Source: Central Statistics Office (Ireland) (2016), Census 2016.

Deprivation

7.5.7 The Podal HP Deprivation Index[60] is the primary source for deprivation in Ireland by combining three dimensions of affluence or disadvantage (demographic profile, social class composition and labour market situation) to provide a relative index score for every small area in Ireland. The relative index scores are normally distributed around a bell-shaped curve to display the current levels of deprivation compared to other areas, with most areas clustered around the mean and comparatively fewer areas exhibiting extreme levels of affluence or deprivation. The eight classifications for deprivation range from extremely affluent to extremely disadvantaged. According to the latest data, Fingal County is classified as 'marginally above average' (5th least deprived rank out of 8 classifications) in 2016 with a relative score of 5.3, whilst the Airport ED is considered 'affluent' (6th least deprived rank) with a relative score of 13.1.

7.5.8 As shown in Figure 7.2 (*EIAR Volume 3: Figures*), all small areas which make up the Airport ED are classified by the Irish Deprivation Index as 'affluent'. Several small areas surround Dublin Airport are classified as 'marginally below average' and 'disadvantaged', this includes the neighbouring settlement of St Margaret's.

7.5.9 North of Dublin airport is the settlement of Swords which contains four small areas which are classified as 'disadvantaged' and seventeen which are classified as 'marginally below average'. West of Dublin is the settlement of Malahide which is classified as a mix of 'marginally above average', 'affluent' and 'very affluent'.

Labour Market Indicators

Participation Rate and Unemployment

7.5.10 The total size of the labour force across the Airport ED and Dubber ED in 2016 was 7,482. Within the labour force in this area, 711 (7.4%) people were unemployed having lost or given up a previous job. A further 78 people were looking for their first regular job. Of the labour force within this area, 6,693 (60.3%) were in employment.

7.5.11 The labour force participation rate (15-64 years) in the Airport ED (75.1%) and Dubber ED (79.3%) was significantly higher than the recorded rate in Fingal County (66.9%), Dublin Regional Authority (63.9%), the Eastern & Midland Regional Assembly (63.3%) and Ireland (61.4%) as a whole.

7.5.12 The unemployment rate (15-64 years) in the Airport ED (8.3%) was significantly lower than the recorded rate in the Dubber ED (12.2%), Fingal County (10.3%), Dublin Regional Authority (11.6%), the Eastern & Midland Regional Assembly (12.4%) and Ireland (12.9%) as a whole.

[60] Haase, T., and Pratschke, J. (2017); The 2016 Pobal HP Deprivation Index for Small Areas (SA).

Table 7-10: Labour Force Participation Rate and Unemployment Rate, (2016).

Indicator	Airport ED	Dubber ED	Fingal County	Dublin Regional Authority	Eastern & Midland Regional Assembly	Ireland
	%	%	%	%	%	%
Labour Force Participation Rate	75.1	79.3	66.9	63.9	63.3	61.4
Unemployment Rate	8.3	12.2	10.3	11.6	12.4	12.9

Source: Central Statistics Office (Ireland) (2017), Census 2016.

Live Register

7.5.13 The Live Register is used to provide a monthly series of the numbers of people (with some exceptions) registering for Jobseekers Benefit (JB) or Jobseekers Allowance (JA) or for various other statutory entitlements at local offices of the Department of Social Protection.

7.5.14 Table 7-11 shows that the proportion of residents in the Dublin Regional Authority (48.4%) and the Eastern & Midland Regional Assembly (47.9%) on the Live Register for twelve months or more is slightly lower than Ireland (54.2%) as a whole.

Table 7-11: Live register, (June 2021)

Indicator	Dublin Regional Authority		Eastern & Midland Regional Assembly		Ireland	
	Claimants	%	Claimants	%	Claimants	%
Claiming for under 12 months	22,708	51.6	41,673	52.1	80,316	45.8
Claiming for over 12 months	21,339	48.4	38,366	47.9	94,965	54.2
Total	**44,047**	**-**	**79,939**	**-**	**175,281**	**-**

Source: CSO, Live Register, (June 2021).

Education and Skills

7.5.15 The working-age residents within the Airport ED are well-qualified. Table 7-12 shows that 37.1% of residents within the Airport ED are qualified to Ordinary bachelor's degree / professional qualification and above, which is higher than the recorded rate in Fingal County (33.9%), Dublin Regional Authority (36.2%), the Eastern & Midland Regional Assembly (31.9%) and Ireland (28.5%) as a whole.

7.5.16 However, the proportion of working-age residents within the Dubber ED who hold an Ordinary bachelor's degree / professional qualification is just 27.1%, significant lower than all other areas presented in Table 7-12.

Table 7-12: Highest level of education completed, (2016)

	Airport ED	Dubber ED	Fingal County	Dublin Regional Authority	Eastern & Midland Regional Assembly	Ireland
	%	%	%	%	%	%
No formal education	0.5	0.7	1.1	1.3	1.5	1.7
Primary education	2.9	5.0	6.6	9.2	9.8	10.8
Lower secondary	3.9	9.4	11.5	11.6	13.2	14.5
Upper secondary	12.3	17.8	19.6	17.0	18.0	18.5
Technical or vocational qualification	7.5	12.2	9.0	7.5	8.3	8.8
Advanced certificate / Completed apprenticeship	4.1	5.7	5.8	4.6	5.4	5.9
Higher certificate	5.4	5.8	5.7	4.6	4.9	5.0
Ordinary bachelor's degree	9.3	8.2	9.1	8.0	7.9	7.7
Honours bachelor's degree	12.7	10.9	12.6	13.4	12.0	10.7
Postgraduate diploma or degree	13.4	7.6	11.2	13.3	11.0	9.2
Doctorate (PhD)	1.7	0.4	1.0	1.4	1.1	0.9
Not stated	26.3	16.5	6.7	8.1	7.1	6.4

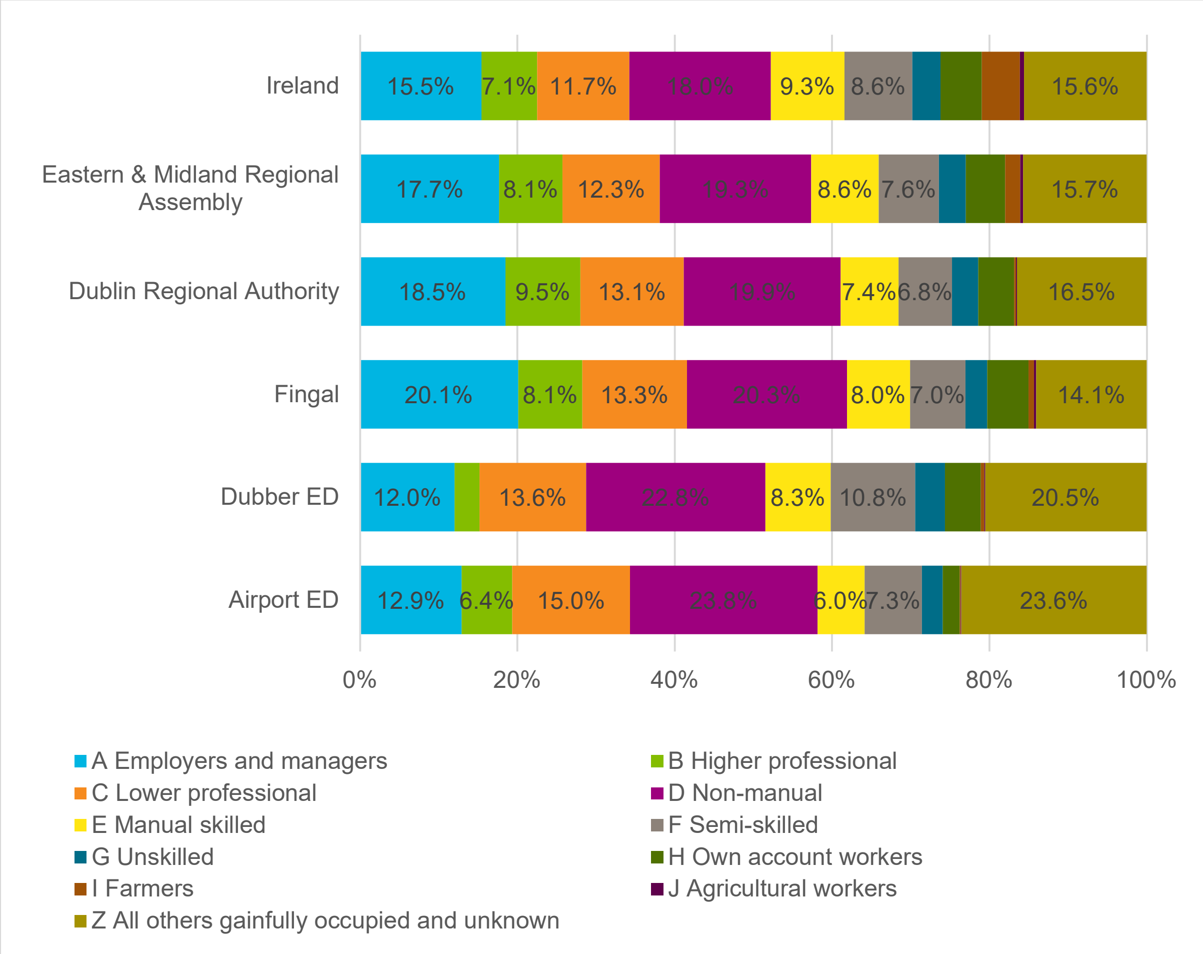
Source: Central Statistics Office (Ireland) (2017), Census 2016.

Occupational Profile

7.5.17 Socio-economic Group (SEG) classifies the entire population into one of eleven groups based on the level of skill and educational attainment of the occupation (of those at work, unemployed or retired) while all other persons are classified to the socio-economic group of the person in the family on whom they are deemed to be dependent.

7.5.18 Within the Airport ED and Dubber ED, a large proportion of workers are employed within the lower professions or non-manual occupations. Similarly, the Airport ED and Dubber ED have a lower proportion of employers and managers and higher professionals in comparison to the averages for Fingal County, the Dublin Regional Authority, the Eastern & Midland Regional Assembly and Ireland as a whole. This can be attributed to the large proportion of workers employed to support the operations of Dublin Airport.

Plate 7-2: Occupational profile by socio-economic group (15+ years) (%), (2016).



Source: Central Statistics Office (Ireland) (2017), Census 2016.

Income

7.5.19 Average household annual income in Fingal is substantially greater than across the country, likely helped by the high-level occupations that the residents in Fingal tend to hold. The median household annual income in Fingal in 2016 was €58,795, comfortably higher than the median rate for Ireland (€45,256). The median household weekly income within the Airport ED and Dubber ED is less than the average for Fingal County, but still greater than the average across Ireland as a whole – as displayed in Table 7-13.

Table 7-13: Household income, (2016)

Indicator	*Airport ED*	*Dubber ED*	*Fingal*	*Ireland*
Median household annual income (€)	52,482	52,108	58,795	45,256

Source: CSO, Geographical Profiles of Income in Ireland (2016).

Human Health

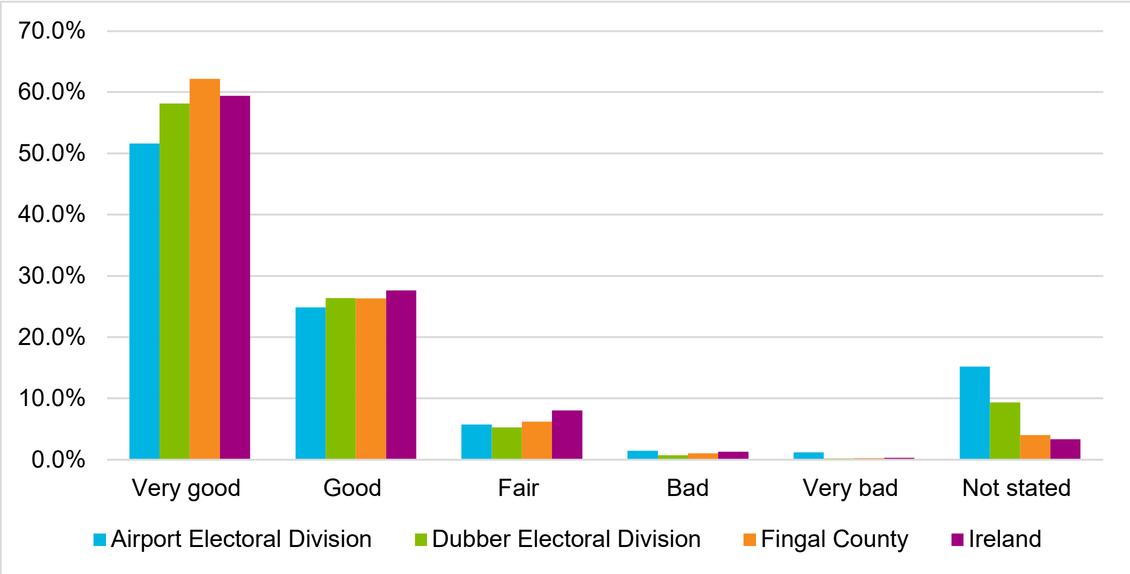
7.5.20 The life expectancies in Dublin and Ireland have been increasing in recent years creating an ageing population, a trend that is currently being experienced across most developed countries. In 2016, male residents in the Dublin Regional Authority were expected to live to 80.1 years whilst female residents were expected to live to 83.4 years, compared to 78.3 years and 82.7 years respectively in 2011[61]. The life expectancies in 2016 are broadly in line with the country's averages (79.6 years for males and 83.4 years for females).

[61] Central Statistics Office, (2019); Irish Life Tables: Period Life Expectancy by Sex, Age, Region and Year.

7.5.21 The health conditions in Dubber ED, Fingal County and across the country are positive, but they appear slightly worse within the Airport ED. In 2016, 89% of the population aged 15 years and over in Fingal County considered themselves to be in very good or good health, compared to Ireland's average of 88%[62]. In comparison, around 84% of residents in Dubber ED and 77% of residents in the Airport ED were in very good or good health[63].

7.5.22 It is worth noting that Ireland has the highest self-perceived health status of all EU countries, with 83% of people rating their health as good or very good, considerably above the EU average (69%)[64]. Only 1% of residents in Dubber ED and Fingal were in bad or very bad health, which is the fourth lowest proportion of the 31 counties and cities across Ireland[65]. However, this proportion increases to 3% for Airport ED, which is high for the country. Plate 7-3 presents the health conditions in the Airport ED, Dubber ED and Fingal County, compared to the conditions across Ireland.

Plate 7-3: Health conditions for all persons aged 15 years and over (2015)



Source: Central Statistics Office (Ireland) (2017), Census 2016.

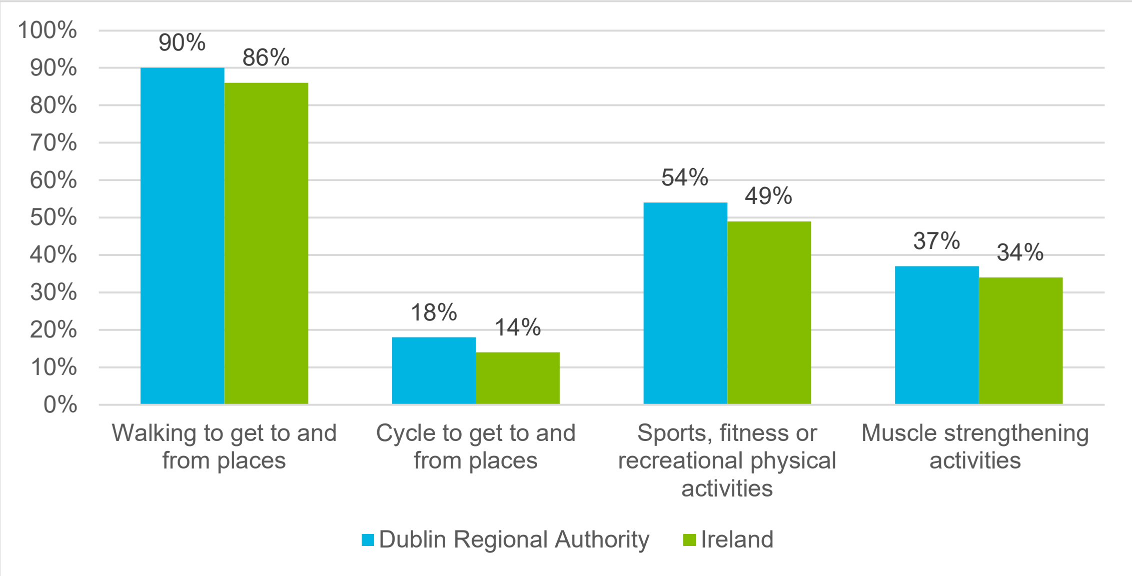
7.5.23 Fewer residents (as a percentage of total population) live with a disability in the Airport and Dubber EDs compared to Fingal County and Ireland as a whole. In the 2016 Census, of residents aged 15 and over, 8.3% stated they had a disability in the Airport ED and 7.7% stated this in Dubber ED. These proportions are considerably lower than the averages for Fingal (10.8%) and Ireland (13.5%).

7.5.24 The Census 2016 does not provide further information on health limitations or physical activity data by local area. However, the Irish Health Survey provides further detail on health profiles at a regional level[66].

7.5.25 Most residents aged 15 and over in the Dublin Regional Authority (73%) are not limited at all in their daily activities, with 24% limited slightly and only 3% considered to be severely limited. This profile almost matches the national results exactly, where 72% are not limited at all, 24% are limited slightly and 4% are severely limited. However, the residents in the region of Dublin tend to engage in more physical activity than the country's average. Plate 7-4 displays the proportion of residents aged 15 and over undertaking physical activity in the Dublin Regional Authority and Ireland. This highlights that residents in the Dublin Regional Authority are slightly more active across all metrics in comparison to the national averages.

[62] Central Statistics Office (Ireland), (2016), Census 2016.
[63] These statistics may not be wholly representative of the health conditions in the Electoral Divisions (ED), particularly the Airport ED, as 15% of respondents in the Airport ED and 9% of respondents in Dubber ED did not state an answer (country's average is 3%).
[64] Government of Ireland: Prepared by Department of Health, (2019); Health in Ireland: Key Trends 2019.
[65] Central Statistics Office (Ireland), (2016), Census 2016.
[66] Central Statistics Office, (2019); Irish Health Survey 2015.

Plate 7-4: Physical activity undertaken for all persons aged 15 years and over in the Dublin Regional Authority and Ireland (2015)



Source: Centre Statistics Office (Ireland) (2019), Irish Health Survey 2015.

7.5.26 The Irish Health Survey reports the mental health status of residents (aged 15 and over). In 2015, 72% of residents stated they experience no or minimal depression in the Dublin Regional Authority, which was marginally lower than across Ireland (74%). The full mental health statistics for Dublin Regional Authority and Ireland are shown in Table 7-14, which indicates on the whole residents in Dublin experience similar levels of depression as residents across the county.

Table 7-14: Mental health status for all persons aged 15 and over

Mental health indicator	*Dublin Regional Authority*	*Ireland*
None to minimal depression	72%	74%
Mild depression	19%	18%
Moderate depression	6%	5%
Moderately severe or severe depression	3%	3%

Source: Central Statistics Office (Ireland), Irish Health Survey 2015.

7.5.27 There are several healthcare facilities in the area surrounding Dublin Airport. The nearest of which is located within the Airport grounds, Medmark Dublin Airport Hospital, which provides occupational healthcare to residents in the area. Beaumont Hospital Dublin is the closest major hospital facility, located around 6 km south of the airport and easily accessible following the M1 South from the airport. The Beaumont Hospital is a large facility, with 669 available inpatient beds (the third most of any hospital in Ireland) and 159 available day beds (most of any hospital in Ireland)[67]. On average, across the Dublin Regional Authority, there are six general practitioner consultations per person per year; this is the same as the country's average.

Local Community Facilities and Land Uses

Local Community Facilities

7.5.28 The area surrounding Dublin Airport is made up of several local communities which include numerous residential areas and community and recreational facilities such as open spaces and parks. Within the immediate vicinity of the airport, there is a cluster of community facilities. This includes the ALSAA Sports Centre, Swords Rugby Club, Kealy's public house and The Coachman's Inn; all of which are located

[67] Department of Health, (2019); Open Beds Report – June 2019.

along the R132. Approximately 500 m to the south of these facilities is Dardistown Cemetery. North west of the airport is the St Margaret's Golf & Country Club and the St Margaret's GAA Club. North east of the airport, directly east of the E132 is the Halpenny Golf Driving Range. Immediately north of the airport is the Forrest Little Golf Club.

7.5.29 To the immediate west of the airport boundary, located on the R108, is the Boot Inn public house. Directly to the south of the airport beyond the Blue Long Stay Car Park is the Silloge Park Golf Club, Na Fianna GAA Club, Ballymun Kickhams GAA Club and Starlights GFC.

Land Uses

7.5.30 Although strategic land-use planning means there are a lot fewer residential developments within close proximity to Dublin Airport in comparison to other airports of a similar size, there are a number of residential properties located to the west of the airport along Dunbro Lane. Beyond these is the community of Saint Margaret's. In addition to numerous residential dwellings, the village is home to St Margaret's Church and St Margaret's National Primary School.

7.5.31 The largest town within the surrounding area is Swords which is located around 5 km north of airport. Swords contains numerous community facilities, businesses, leisure and residential assets.

7.5.32 There are several villages located further to the east of the airport towards the coast. This includes the suburbs of The Baskins (2.5 km) and Kinsealy (3.5 km). Further east towards the Irish Sea are the coastal towns of Malahide (5.5 km) and Portmarnock (6.5 km) which contain numerous community and recreational facilities. Several golf courses are located around Malahide and along the western coastline, including Malahide Golf Club (6.0 km) and Portmarnock Hotel and Golf Links (7.0 km).

Dublin Airport Community Fund

7.5.33 Dublin Airport, through the Dublin Airport Community Fund, provides support for sports and recreation, social inclusion and community development, health and well-being, culture and heritage, and environment and sustainability. Established in 2017, the €10 million Dublin Airport Community Fund has an annual investment of €400,000 over a 25-year period[68].

7.5.34 The Dublin Airport Community Fund supports community-led projects in 13 eligible areas[69] located in the immediate vicinity of Dublin Airport where communities are situated under flight paths[70]. The design of the Dublin Airport Community Fund, both in terms of geography and the type of activities which are being supported, was agreed following consideration of detailed feedback from the North Runway second public consultation process in 2016.

7.5.35 All applications are independently assessed by a panel based on the project's positive contribution to local communities. To date, over 480 local community projects have shared over €1 million of allocations from the Dublin Airport Community Fund.

7.6 Future Receiving Environment

7.6.1 This section establishes the socio-economic context of the Future Receiving Environment for the 2035 Assessment Year, as far as is possible to do so due to the limitations of future years statistics in terms of their availability and accuracy.

7.6.2 Population projections in Ireland are only available at the regional and national level. Population projections produced by the CSO[71] are based upon several scenarios including differences in internal migration, specifically the rate of inflow and outflow of residents between Dublin and other Irish regions. Table 7-15 below presents the available mid-tier population projections under the Dublin inflow and outflow scenarios in 2035 and identifies the percentage change from the population recorded by the 2016 Irish Census.

[68] Dublin Airport, (2021); Dublin Airport's Community Fund Reopens for Applications. Available at: https://www.dublinairport.com/latest-news/2021/03/10/dublin-airport's-community-fund-reopens-for-applications
[69] Ballymun, Cloghran, Forrest Little, Greater Baskin, Hollystown, Malahide, Portmarnock, Rolestown, Santry, St. Margarets, Swords, The Ward, Tyrrelstown.
[70] Beutel, M. E., Junger, C., Klein, E. M., Wild, P., Lackner, K., Blettner, M., and Munzel, T., (2016). Noise Annoyance Is Associated with Depression and Anxiety in the General Population- The Contribution of Aircraft Noise. PloS One, 11(5).
[71] Central Statistics Office, (2017); Regional Population Projections 2017 – 2036

Table 7-15 Mid-tier Population Projections (Dublin inflow and outflow)

Area	2016 Population	Mid-tier population projection 2035 (Dublin outflow M2F2)	Population change	Mid-tier population projection 2035 (Dublin inflow M2F2)	Population change
Dublin Regional Authority	1,335,900	1,488,100	+11.4%	1,741,800	+30.4%
Ireland	4,739,600	5,536,500	+16.8%	5,536,500	+16.8%

Source: CSO Ireland, (2017); Regional Population Projections 2017 – 2036. Projection M2F2.

7.6.3 Between 2016 and 2035, taking account of the mid-tier growth estimate, the population in Dublin is projected to increase by between 11.4% and 30.4% depending on internal migration in and out of the city, while the population of Ireland is projected to increase by 16.8%. Population projections are not available at smaller geographies; however, it is reasonable to assume that similar population trends will be experienced at the local level within Fingal County, and the Airport and Dubber EDs, given that these geographies fall within the wider region of Dublin.

7.6.4 With the exception of population statistics, no projections or future estimates are available for the other socio-economic indicators that have been analysed in the above Current State of the Environment. However, it is not anticipated that the socio-economic conditions of the study area will differ significantly between the present day and 2035, therefore the socio-economic context described in Section 7.5, Current State of the Environment, remains relevant to the future receiving environment in 2035.

7.6.5 The European Centre for the Development of Vocational Training's skills forecast for Ireland[72] identifies the key trends expected to occur in Ireland up to the year 2030 with regards to occupations and skills within the Irish labour force. The realisation of these predicted trends has relevance to the Future Receiving Environment in 2035. Some of these key trends are identified below:

- The labour force is expected to grow by 15% between 2020 and 2030 due to population growth and increased labour force participation across all age bands;
- Skilled occupations including "professionals" and "technicians" are expected to see the highest number of job openings over the forecast period 2018 to 2030, with over 514,00 job openings between them (accounting for one third of all job openings in Ireland);
- Between 2018 and 2030, the most job openings (taking both new/lost jobs and replacement needs together) are expected to be in "highly skilled non-manual occupations" (approximately 677,000 jobs in total);
- There is expected to be a significant downward trend in job openings across low qualification levels, with 98,000 jobs lost between 2018 and 2030;
- Most job openings between 2018 and 2030 are expected to be filled by high qualified workers, but it is projected that high-level graduates in Ireland will continue to be employed in jobs below their skill level; and
- The share of high-qualified persons in the labour force is expected to increase from 46% in 2018 to 53% by 2030, while those with low qualifications will decrease from 16% to 9%.

7.7 Environmental Design and Management

7.7.1 There are a number of measures already in place at Dublin Airport that reduce or mitigate the noise effects of aircraft operations. As described in Section 13.5 of *Chapter 13. Aircraft Noise and Vibration* and Section 14.5 of *Chapter 14. Ground Noise and Vibration*, these include:

- Reduction of noise at source;

[72] European Centre for the Development of Vocational Training (Cedefop), (2020); Skills forecast 2020: Ireland

- Land use planning and management (noise zones, residential sound insulation schemes, the schools sound insulation scheme, and the dwelling purchase scheme); and
- Operational procedures.

7.8 Assessment of Effects and Significance

Amenity and Local Communities

Air Quality

7.8.1 As set out in *Chapter 10: Air Quality*, for each Assessment Year (2022, 2025 and 2035) the proposed Relevant Action will not result in any significant change to the local air quality environment (NO_2, PM_{10} and $PM_{2.5}$) or odour when comparing the Permitted and Proposed Scenarios. More specifically, the proposed Relevant Action will not result in air quality at any receptors being in breach of European standards or the Irish air quality upper limits under any of the Assessment Years (2022, 2025 and 2035). Therefore, there is little risk of any exceedance of the relevant environmental air quality thresholds applicable for the protection of human health.

Air Noise and Vibration

7.8.2 With regards to air noise and vibration impacts associated with the proposed Relevant Action, a package of existing and proposed sound insulation schemes is offered, and will continue to be offered as part of this application by Dublin Airport to deliver improvements in internal noise levels experienced by residential and community facilities. This section of the assessment considers the residual significant effects of air noise and vibration after allowing for the benefit of the existing and proposed sound insulation schemes.

7.8.3 Table 7-16 below presents the residual findings from *Chapter 13: Aircraft Noise and Vibration*. It shows the number of people assessed to have a residual significant beneficial and residual significant adverse effect as a result of the implementation of the proposed Relevant Action for each assessment year (Proposed vs Permitted Scenario) using the 24-hour period metric and the overnight metric for residential receptors. This number is also shown as a proportion of the population in Fingal in 2016[73].

Table 7-16 Residual Air Noise and Vibration Significant Effects, Proposed vs Permitted

Year	L_{den} 24-hour period metric				L_{night} Overnight Metric			
	Significant Beneficial	Percentage of population proportion	Significant Adverse	Percentage of population proportion	Significant Beneficial	Percentage of population proportion	Significant Adverse	Percentage of population proportion
2022	79	<0.01%	10	<0.01%	151	<0.01%	8,985	3.0%
2025	8	<0.01%	54	<0.01%	86	<0.01%	10,560	3.6%
2035	0	0.0%	20	<0.01%	12	<0.01%	4,284	1.5%

7.8.4 When assessing the impact of the Proposed Scenario compared to the Permitted Scenario using the overnight metric, the number of residents that will experience a significant adverse residual affected as a result of implementation of the proposed Relevant Action increases for all Assessment Years.

7.8.5 Using the 24-hour period metric, residential receptors close to flight paths to the west of the existing South Runway or close to flight paths from the Crosswind Runway typically are forecast to see reductions in noise level, whereas the opposite is true for receptors closer to flight paths to the west of North Runway. Similarly, using the overnight metric, the majority of the residual significant adverse effects are expected to be experienced within close proximity to the flight paths from the North Runway.

7.8.6 The impact of noise and vibration on community facilities is also considered within *Chapter 13: Aircraft Noise and Vibration*. The assessment considers, schools, residential healthcare facilities and places of worship as high sensitivity receptors. For all Assessment Years (2022, 2025 and 2035), under both the

[73] The population of Fingal used to determine the proportion of the population highly sleep disturbed by air noise and vibration is the latest available (2016). Population projections are not available below the regional level in Ireland. It is recognised that the population of Fingal is likely to change (particularly by 2035) which would impact the percentages presented in Table 7-25.

24-hour period and overnight assessment metrics, there are no significant residual air noise and vibration effects reported on schools, residential health care facilities[74] or places of worship when comparing the Permitted and Proposed Scenarios.

Ground Noise and Vibration

7.8.7 With regards to ground noise and vibration impacts associated with the proposed Relevant Action, a package of existing and proposed sound insulation schemes is offered and will continue to be offered as part of this application by Dublin Airport. In addition to this, there is a proposal to enhance the sound insulation scheme such that dwellings will be eligible for a grant to pay for sound insulation improvement works based on their night-time air noise level. This section of the assessment considers the residual significant effects of ground noise and vibration after allowing for the benefit of the existing and proposed sound insulation schemes.

7.8.8 Table 7-17 below presents the residual findings from *Chapter 14. Ground Noise and Vibration*. It shows the number of people assessed to have a residual significant beneficial and residual significant adverse effect as a result of the implementation of the proposed Relevant Action for each Assessment Year (Proposed vs Permitted Scenario) using the 24-hour period metric and the overnight metric for residential receptors. This number is also shown as a proportion of the population in Fingal in 2016[75].

Table 7-17 Residual Ground Noise and Vibration Significant Effects, Proposed vs Permitted

Year	*L_{den} 24-hour period metric*				*L_{night} Overnight Metric*			
	Significant Beneficial	*Percentage of population proportion*	*Significant Adverse*	*Percentage of population proportion*	*Significant Beneficial*	*Percentage of population proportion*	*Significant Adverse*	*Percentage of population proportion*
2022	0	0.0%	0	0.0%	0	0.0%	0	0.0%
2025	0	0.0%	0	0.0%	0	0.0%	9	<0.1%
2035	0	0.0%	0	0.0%	0	0.0%	9	<0.1%

7.8.9 Using the 24-hour period metric to assess residential receptors as set out in *Chapter 14: Ground Noise and Vibration*, for all Assessment Years (2022, 2025 and 2035) no people are assessed as having a residual significant beneficial or residual significant adverse effect as a result of the implementation of the proposed Relevant Action.

7.8.10 Using the overnight metric to assess residential receptors as set out in *Chapter 14: Ground Noise and Vibration*, for all Assessment Years (2022, 2025 and 2035) no people are assessed as having a significant beneficial effect as a result of the implementation of the proposed Relevant Action. However, in assessment years 2022 and 2025 a small number of people (nine) will experience residual significant adverse effects.

7.8.11 The impact of noise and vibrations on community facilities is also considered within *Chapter 14: Ground Noise and Vibration*. The assessment considers dwellings, schools, residential healthcare facilities and places of worship as high sensitivity receptors. Receptors with a lower sensitivity to noise, such as open spaces and recreation grounds, have not been considered as part of their assessment. For all Assessment Years (2022, 2025 and 2035), under both the 24-hour period and overnight assessment metrics, there are no significant residual air noise and vibration effects reported on schools, residential health care facilities[76] or places of worship when comparing the Permitted and Proposed Scenarios.

Cumulative Air and Ground Noise and Vibration

7.8.12 As stated in *Chapter 14: Ground Noise and Vibration*, ground noise from aircraft and the noise from aircraft in the air have different characteristics. Consequently, it is standard practice to consider the noise

[74] It should be noted that only residential healthcare facilities are highly sensitive to noise at night. Schools and places of worship are not expected to be used during the hours specified in the overnight metric.
[75] The population of Fingal used to determine the proportion of the population highly sleep disturbed by air noise and vibration is the latest available (2016). Population projections are not available below the regional level in Ireland. It is recognised that the population of Fingal is likely to change (particularly by 2035) which would impact the percentages presented in Table 7-25.
[76] It should be noted that only residential healthcare facilities are highly sensitive to noise at night. Schools and places of worship are not expected to be used during the hours specified in the overnight metric.

from each separately. This is consistent with the following statement in the European Commission Directive 2020/367:

"The exposure of the population shall be assessed independently for each noise source and harmful effect. Where the same people are simultaneously exposed to different noise sources, the harmful effects may -in general- not be cumulated. However, those effects may be compared to assess the relative importance of each noise."

7.8.13 Combining the noise levels can be undertaken, although there are no current standards or guidance available specific to the consideration of in-combination noise effects associated with the proposed Relevant Action. It is therefore not appropriate to determine the significance of cumulative effects, as the different sources should normally be considered independently. In addition, it is not expected that cumulative assessment would find any significant effects that are not already identified in the individual air and ground noise and vibration assessment.

7.8.14 To provide information on the relative contribution of the air and ground noise the L_{den} and L_{night} noise metrics have been used to represent the relative contributions in isolation and cumulatively under the Permitted Scenario and the Proposed Scenario. This has been undertaken for representative locations, with the L_{den} noise levels for the Assessment Years 2022, 2025 and 2035 presented in Table 7-18, Table 7-19 and 7-20 respectively.

Table 7-18 2022, Ground, Road and Air Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			Proposed Scenario			Change
		Ground and Road	Air	Total	Ground and Road	Air	Total	Total
Ridgewood	GR01	56	56	59	57	58	61	+2
The Baskins	GR02	59	57	61	59	57	61	+0
Mayeston Hall	GR03	71	53	72	72	52	72	+0
St Margret's	GR04	57	61	63	57	62	63	+1

Note – values rounded to the nearest whole number. Differences based on unrounded values.

Table 7-19 2025 Ground, Road and Air Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			Proposed Scenario			Change
		Ground and Road	Air	Total	Ground and Road	Air	Total	Total
Ridgewood	GR01	57	56	60	58	59	61	+1
The Baskins	GR02	60	57	62	60	58	63	+0
Mayeston Hall	GR03	73	54	73	73	54	73	+0
St Margret's	GR04	58	62	64	58	63	64	+1

Note – values rounded to the nearest whole number. Differences based on unrounded values.

Table 7-20 2035 Ground, Road and Air Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			Proposed Scenario			Change
		Ground and Road	Air	Total	Ground and Road	Air	Total	Total
Ridgewood	GR01	58	54	59	58	56	60	+1
The Baskins	GR02	61	56	62	61	57	62	+0
Mayeston Hall	GR03	73	52	73	73	52	73	+0
St Margret's	GR04	59	60	62	59	60	63	+0

Note – values rounded to the nearest whole number. Differences based on unrounded values.

7.8.15 The relative contribution from the noise sources is similar by scenario but varies by location. For all Assessment Years (2022, 2025 and 2035), when using the 24-hour period metric, the noise level either remains the same or increases by up to 2dB as a result of the implementation of the proposed Relevant Action.

7.8.16 Table 7-21, Table 7-22 and Table 7-23 below present the cumulative air and ground noise and vibration results for representative locations when using the overnight (Lden) metric, as replicated from *Chapter 14: Ground Noise and Vibration.*

Table 7-21 2022 Ground, Road and Air Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			Proposed Scenario			Change
		Ground and Road	Air	Total	Ground and Road	Air	Total	Total
Ridgewood	GR01	46	41	47	49	49	52	+5
The Baskins	GR02	50	48	52	51	49	53	+1
Mayeston Hall	GR03	63	46	63	63	45	63	+0
St Margret's	GR04	49	52	53	49	54	55	+2

Note – values rounded to the nearest whole number. Differences based on unrounded values.

Table 7-22 2025 Ground, Road and Air Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			Proposed Scenario			Change
		Ground and Road	Air	Total	Ground and Road	Air	Total	Total
Ridgewood	GR01	47	41	48	50	50	53	+4
The Baskins	GR02	52	48	54	52	50	54	+1
Mayeston Hall	GR03	64	47	64	65	47	65	+0
St Margret's	GR04	50	52	54	50	54	56	+1

Note – values rounded to the nearest whole number. Differences based on unrounded values.

Table 7-23 2035 Ground, Road and Air Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			Proposed Scenario			Change
		Ground and Road	Air	Total	Ground and Road	Air	Total	Total
Ridgewood	GR01	48	39	48	50	47	52	+3
The Baskins	GR02	52	47	53	53	49	54	+1
Mayeston Hall	GR03	65	45	65	65	45	65	+0
St Margret's	GR04	51	50	53	51	52	54	+1

Note – values rounded to the nearest whole number. Differences based on unrounded values.

7.8.17 The relative contribution from the noise sources is similar by scenario but varies by location. For all Assessment Years (2022, 2025 and 2035), when using the overnight metric, the noise level either remains the same or increases by up to 5dB as a result of the implementation of the proposed Relevant Action. The representative location of Ridgewood is the location that would be most impacted by the implementation of the proposed Relevant Action when assessing using the overnight metric.

Amenity and Local Communities Assessment

7.8.18 The amenity and local communities assessment considers the assessment findings from air quality, air noise and vibration, and the ground noise and vibration assessments. The sensitivity of affected local residents is assessed to be high while the impact is assessed as medium given the number of dwellings affected. Some residents will benefit from the proposed Relevant Action whilst others will experience significant effects from air and ground-borne noise and vibration.

7.8.19 On the basis of the number of residents that are assessed to experience residual significant adverse impacts by air noise and vibration, the post-mitigation effect on amenity and local communities from a population and human health perspective is assessed to be **permanent moderate adverse (significant)** for all Assessment Years (2022, 2025 and 2035).

Human Health and Well-being

Air Quality

7.8.20 As set out in Section 7.4, the quality of the local environment can have a significant impact on physical and mental health. Pollution caused by aviation and commercial activity can result in poor air quality, noise nuisance and vibration. Poor air quality is linked to incidence of chronic lung disease (chronic bronchitis or emphysema), heart conditions and the prevalence of asthma among children and young people.

7.8.21 An assessment of the likely significant effects on air quality as a result of the proposed Relevant Action has been presented in *Chapter 10: Air Quality.* In regard to emissions, the proposed Relevant Action will not result in any significant change to the local air quality environment (NO_2, PM_{10} and $PM_{2.5}$) or odour as a result of the proposed change in aircraft movements for any of the Assessment Years (2022, 2025 and 2035). More specifically, the implementation of the proposed Relevant Action is not predicted to result in any breach of European standards or exceedance of Irish air quality upper thresholds for any receptor. Therefore, there is little risk of any exceedance of the relevant environmental air quality thresholds applicable for the protection of human health.

Noise and Vibration

7.8.22 Noise pollution, both as a result of air noise and vibrations and ground noise and vibrations, can have a detrimental impact on health resulting in annoyance, sleep disturbance, cardiovascular and psycho-physiological effects[77].

[77] The impact of the proposed Relevant Action on the incidence of IHD has not been assessed. As stated within EU Directive 2020/367, as well as Chapter 13: Aircaft Noise and Vibration (section 13.3.44) and Chapter 14: Ground Noise and Vibration, for IHD in the case of aircraft noise, the population exposed above adequate Lden levels is estimated as subject to an increased risk of IHD, while the exact number of cases of IHD cannot be calculated. For this reason, it has not been possible to assess the impact of the proposed relevant action on IHD.

Air Noise and Vibration

7.8.23 An assessment of the likely residual significant effects of air noise and vibrations as a result of the proposed Relevant Action for each Assessment Year (2022, 2025 and 2035) has been presented in *Chapter 13: Aircraft Noise and Vibration* (as detailed in sections 7.8.2 to 7.8.6). Some residents benefit from lower noise levels whilst some residents will be impacted adversely by higher noise levels, however, when assessing using the overnight metric there is a trend that many more residents experience significant adverse air noise and vibration effects as a result of the implementation of the proposed Relevant Action. Of additional note, there are no significant noise and vibration effects reported on schools or residential health care facilities for any Assessment Year (2022, 2025 and 2035).

7.8.24 *Chapter 13: Aircraft Noise and Vibration* presents an assessment of the number of people who would be highly annoyed and highly sleep deprived as a result of the implementation of the proposed Relevant Action. The results of this assessment are presented in Table 7-24 and Table 7-25 below[78].

7.8.25 The number of people highly annoyed (during the daytime) by air noise and vibration for each assessment scenario is presented in Table 7-24 below. This number is also shown as a proportion of the population in Fingal in 2016[79]. For all assessment years (2022, 2025 and 2035) there is an increase in the number of annoyed people as a result of the implementation of the Relevant Action.

Table 7-24 Number of people highly annoyed by air noise and vibration (Permitted vs Proposed scenarios)

Scenario	*Number of people highly annoyed*			
	Excluding consented developments	*Percentage of population highly annoyed*	*Including consented developments*	*Percentage of population highly annoyed*
2022 Permitted	50,603	17.1%	58,880	19.9%
2022 Proposed	52,713	17.8%	61,161	20.7%
2022 Permitted vs Proposed Change	+2,110 (+4.2%)	-	+2,281 (+3.9%)	-
2025 Permitted	64,241	21.7%	73,209	24.7%
2025 Proposed	79,405	26.8%	88,950	30.0%
2025 Permitted vs Proposed Change	+15,164 (+23.6%)	-	+15,741 (+21.5%)	-
2035 Permitted	33,437	11.3%	41,234	13.9%
2035 Proposed	39,693	13.4%	47,963	16.2%
2035 Permitted vs Proposed Change	+6,256 (+18.7%)	-	+6,729 (+16.3%)	-

7.8.26 The number of people highly sleep disturbed (during the night) by air noise and vibration for each assessment scenario is presented in Table 7-25 below. This number is also shown as a proportion of the population in Fingal in 2016[80]. In assessment year 2022, there is a slight percentage increase in the

[78] Chapter 13: Aircraft Noise and Vibration does not assign significance to these results as there is not published guidance regarding significance thresholds for a collective community-level assessment. On an individual level however, high annoyance and high sleep disturbance is considered harmful to health, as outlined in EU Directive 202/367.
[79] The population of Fingal used to determine the proportion of the population highly annoyed by air noise and vibration is the latest available (2016). Population projections are not available below the regional level in Ireland. It is recognised that the population of Fingal is likely to change (particularly by 2035) which would impact the percentages presented in Table 7-24 Number of people highly annoyed by air noise and vibration (Permitted vs Proposed scenarios)
[80] The population of Fingal used to determine the proportion of the population highly sleep disturbed by air noise and vibration is the latest available (2016). Population projections are not available below the regional level in Ireland. It is recognised that the population of Fingal is likely to change (particularly by 2035) which would impact the percentages presented in Table 7-25.

number of people highly sleep disturbed as a result of the implementation of the Relevant Action. In 2025, the result of the Relevant Action is a percentage decrease in the number of people highly sleep disturbed, whereas in assessment year 2035 the implementation of the Relevant Action results in a relatively large percentage increase in the number of highly sleep disturbed people.

Table 7-25 Number of people highly sleep disturbed by air noise and vibration (Permitted vs Proposed scenarios)

Scenario	*Number of people highly sleep disturbed*			
	Excluding consented developments	*Percentage of population highly sleep disturbed*	*Including consented developments*	*Percentage of population highly sleep disturbed*
2022 Permitted	18,789	6.3%	23,729	8.0%
2022 Proposed	19,188	6.5%	23,885	8.1%
2022 Permitted vs Proposed Change	+399 (+2.1%)	-	+156 (+0.7%)	-
2025 Permitted	22,500	7.6%	27,806	9.4%
2025 Proposed	18,789	6.3%	23,729	8.0%
2025 Permitted vs Proposed Change	-3,711 (-16.5%)	-	-4,077 (-14.7%)	-
2035 Permitted	11,374	3.9%	15,551	5.3%
2035 Proposed	18,711	6.3%	23,567	8.0%
2035 Permitted vs Proposed Change	+7,337 (+64.5%)	-	+8,016 (+51.5%)	-

Ground Noise and Vibration

7.8.27 An assessment of the likely residual significant effects of ground noise and vibrations as a result of the proposed Relevant Action for each Assessment Year (2022, 2025 and 2035) has been presented in *Chapter 14: Ground Noise and Vibration* (as detailed in sections 7.8.7 to 7.8.11). For each Assessment Year (2022, 2025 and 2035), no residents benefit from lower noise levels whilst a small number of residents will be impacted adversely by higher noise levels as a result of the implementation of the proposed Relevant Action. Of additional note, there are no significant noise and vibration effects reported on schools or residential health care facilities for any Assessment Year (2022, 2025 and 2035).

7.8.28 *Chapter 14: Ground Noise and Vibration* presents as assessment of the number of people who would be highly annoyed and highly sleep deprived as a result of the implementation of the proposed Relevant Action. The results of this assessment are presented in Table 7-26 and Table 7-27 below.[81]

7.8.29 The number of people highly annoyed (during the daytime) by ground noise and vibration caused by road traffic noise for each assessment scenario is presented in Table 7-26 below. This number is also shown as a proportion of the population in Fingal in 2016[82]. For all assessment years (2022, 2025 and 2035) there is a very minor increase in the number of people highly annoyed by ground noise and vibrations as a result of the implementation of the Relevant Action.

[81] Chapter 14: Ground Noise and Vibration does not assign significance to these results as there is not published guidance regarding significance thresholds for a collective community-level assessment. On an individual level however, high annoyance and high sleep disturbance is considered harmful to health, as outlined in EU Directive 202/367.
[82] The population of Fingal used to determine the proportion of the population highly annoyed by air noise and vibration is the latest available (2016). Population projections are not available below the regional level in Ireland. It is recognised that the population of Fingal is likely to change (particularly by 2035) which would impact the percentages presented in Table 7-24 Number of people highly annoyed by air noise and vibration (Permitted vs Proposed scenarios)

Table 7-26 Number of people highly annoyed by ground noise and vibration (Permitted vs Proposed scenarios)

Scenario	Number of people highly annoyed			
	Excluding consented developments	Percentage of population highly annoyed	Including consented developments	Percentage of population highly annoyed
2022 Permitted	7,497	2.5%	8,297	2.8%
2022 Proposed	7,527	2.5%	8,330	2.8%
2022 Permitted vs Proposed Change	+30 (+0.4%)	-	+33 (+0.4%))	-
2025 Permitted	8,580	2.9%	9,454	3.2%
2025 Proposed	8,607	2.9%	9,485	3.2%
2025 Permitted vs Proposed Change	+27 (+0.3%)	-	+31 (+0.3%)	-
2035 Permitted	8,825	3.0%	9,715	3.3%
2035 Proposed	8,835	3.0%	9,782	3.3%
2035 Permitted vs Proposed Change	+10 (+0.1%)	-	+67 (+0.7%)	-

7.8.30 The number of people highly sleep disturbed (during the night) by ground noise and vibration for each assessment scenario is presented in Table 7-27 below. This number is also shown as a proportion of the population in Fingal in 2016[83]. For all assessment years (2022, 2025 and 2035) there is a very minor increase in the number of people highly sleep deprived by ground noise and vibrations as a result of the implementation of the Relevant Action.

Table 7-27 Number of people highly sleep disturbed by ground noise and vibration (Permitted vs Proposed scenarios)

Scenario	Number of people highly sleep disturbed			
	Excluding consented developments	Percentage of population highly sleep disturbed	Including consented developments	Percentage of population highly sleep disturbed
2022 Permitted	2,263	0.8%	2,529	0.9%
2022 Proposed	2,282	0.8%	2,548	0.9%
2022 Permitted vs Proposed Change	+19 (+0.8%)	-	+19 (+0.8%)	-
2025 Permitted	2,598	0.9%	2,893	1.0%
2025 Proposed	2,619	0.9%	2,916	1.0%
2025 Permitted vs Proposed Change	+21 (+0.8%)	-	+23 (+0.8%)	-

[83] The population of Fingal used to determine the proportion of the population highly sleep disturbed by air noise and vibration is the latest available (2016). Population projections are not available below the regional level in Ireland. It is recognised that the population of Fingal is likely to change (particularly by 2035) which would impact the percentages presented in Table 7-25.

Scenario	Number of people highly sleep disturbed			
	Excluding consented developments	Percentage of population highly sleep disturbed	Including consented developments	Percentage of population highly sleep disturbed
2035 Permitted	2,698	0.9%	2,998	1.0%
2035 Proposed	2,715	0.9%	3,017	1.0%
2035 Permitted vs Proposed Change	+17 (+0.6%)	-	+19 (+0.6%)	-

Human Health Assessment of Air Quality, Noise and Vibration, and Neighbourhood Amenity

7.8.31 There are a number of people assessed as experiencing residual significant adverse effects within *Chapter 13: Aircraft Noise and Vibration.* The chapter has also identified the number of people who would be highly annoyed or highly sleep disturbed by the implementation of the proposed Relevant Action. Therefore, the impact of the proposed Relevant Action on air quality, noise and vibration and neighbourhood amenity as a determinant of human health and well-being is assessed as **negative (-)** for all assessment years (2022, 2025 and 2035).

Climate Change

7.8.32 No significant effects on climate change have been identified in *Chapter 11: Climate and Carbon*. Therefore, no additional mitigation measures are required during the operation of the proposed Relevant Action.

7.8.33 An assessment of the likely significant effects on greenhouse gas (GHG) emissions as a result of the proposed Relevant Action has been presented in *Chapter 11: Climate and Carbon* for each Assessment Year (2022, 2025 and 2035).

7.8.34 The GHG assessment study area considers all GHG emissions from fuel used by aircraft during the LTO cycle (i.e. approach/landing, taxiing, take-off and climb to 3,000 feet), CCD (climb, cruise and descent) and surface access passenger journeys. Table 7-28 below presents the changes in total annual GHG emissions (tCO_2) for each Assessment Year (2022, 2025 and 2035) between the Permitted and Proposed Scenarios.

Table 7-28 Total Annual GHG Emissions Projections – Permitted vs Proposed Scenarios

Year	Total Annual GHG Emissions (tCO2)			
	Permitted	Proposed	Variation	% Variation (permitted to proposed)
2022	2,132,154	2,249,576	117,421	5.51%
2025	3,101,502	3,203,276	101,774	3.28%
2035	3,185,352	3,128,361	-56,991	-1.79%

7.8.35 For each Assessment Year (2022, 2025 and 2035) the impact of the proposed Relevant Action has been compared with Ireland's projected National Emissions Inventories (under the With Additional Measures scenario) to determine the level of significance. As the GHG emissions associated with the proposed Relevant Action do not represent ≥1% of the projected National Emissions Inventory for any of the Assessment Years (2022, 2025 and 2035), GHG emissions are considered to be of minor significance.

7.8.36 For all assessment years (2022, 2025 and 2035), the impact of the proposed Relevant Action on climate change as a determinant of human health and well-being is assessed to be **neutral (0).**

7.9 Mitigation and Monitoring

7.9.1 No additional mitigation measures related to Population and Human Health are proposed during the operation of the proposed Relevant Action, however mitigation for noise impacts is discussed in *Chapter 13: Aircraft Noise and Vibration* and *Chapter 14: Ground Noise and Vibration*. Details of noise monitoring measures at the airport are provided in *Chapter 13: Aircraft Noise and Vibration*. No additional monitoring measures are proposed.

7.10 Residual Effects and Conclusions

7.10.1 As part of the assessment of impacts on population, the overall classification and significance of each effect has been assessed across the study area. A summary of the potential residual effects on population for each Assessment Year (2022, 2025 and 2035) is identified in Table 7-29.

Table 7-29: Population Summary of Potential Residual Effects

Description of Effect	*Sensitivity of Receptor*	*Nature of Effect / Geographic Scale*	*Magnitude of Impact*	*Initial Classification of Effect (with embedded mitigation)*	*Additional Mitigation*	*Residual Effect Classification and Significance*
Operation (2022)						
Amenity and Local Communities	High	Permanent / Local	Medium	Moderate Adverse (significant)	None	Moderate Adverse (significant)
Operation (2025)						
Amenity and Local Communities	High	Permanent / Local	Medium	Moderate Adverse (significant)	None	Moderate Adverse (significant)
Operation (2035)						
Amenity and Local Communities	High	Permanent / Local	Medium	Moderate Adverse (significant)	None	Moderate Adverse (significant)

7.10.2 As part of the assessment of impacts on human health, the overall classification for each health determinant has been assessed across the study area. A summary of the potential residual effects on human health for each assessment year is identified in Table 7-30.

Table 7-30: Human Health Summary of Potential Residual Effects

Health Determinant	*Potential Health Impact*	*Additional Mitigation*	*Residual Effect Classification*
Operation (2022)			
Air Quality, Noise and Neighbourhood Amenity	Negative (-)	None	Negative (-)
Climate Change	Neutral (0)	None	Neutral (0)

Health Determinant	Potential Health Impact	Additional Mitigation	Residual Effect Classification
Operation (2025)			
Air Quality, Noise and Vibration, and Neighbourhood Amenity	Negative (-)	None	Negative (-)
Climate Change	Neutral (0)	None	Neutral (0)
Operation (2035)			
Air Quality, Noise and Vibration, and Neighbourhood Amenity	Negative (-)	None	Negative (-)
Climate Change	Neutral (0)	None	Neutral (0)

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections and additions, the chapter has been revised to:

- Address an additional assessment year requested by the Council
- Set out more clearly the scenarios for assessment in the EIAR
- Respond to the latest passenger growth forecasts at Dublin Airport

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the proposed Relevant Action.

8. Major Accidents and Disasters

8.1 Introduction

8.1.1 This chapter of the EIAR reports the findings of an assessment of the effects of the proposed Relevant Action associated with the risks to third parties arising from aircraft crash.

8.1.2 The assessment takes account of the requirement in Annex IV of the EIA Directive for "*A description of the likely significant effects of the proposed project on the environment resulting from, inter alia: (d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters)"* and the reference in point 8 of the Annex: "*A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned. ... Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies*".

8.1.3 The primary focus is on the risk of air accident since the proposed Relevant Action is a purely operational change concerning the use of the runways, with no requirement for new physical infrastructure anywhere in the airport and consequently no change in the risk profile of other potentially dangerous activities such as the storage or delivery of aviation fuel. The assessment also considers the effects of the following items of risk:

- Bird strike;
- Wake vortex (disturbance in the atmosphere that forms behind an aircraft as it passes through the air); and
- Fuel dumping.

8.1.4 There is essentially no material difference between the Permitted and Proposed Scenarios in respect of the last three topics above. However, for completeness, a summary of each and the existing controls is provided in Section 8.7 of this chapter. The primary focus of this chapter is therefore on the first of the above issues: the risk to third parties and the environment arising from aircraft crashes.

8.1.5 Aircraft crashes are very rare events but those that do occur take place predominantly during take-off and landing, along flight paths and close to the ends of runways. The risks to members of the public that live and work in these areas can therefore be expected to be elevated to some extent above the background to which people in general are exposed.

8.1.6 The proximity of populated areas close to the runway ends where the crash risk is more concentrated, and along flight paths give rise to risks to third parties. They are therefore potential concerns for any airport development or operational change proposal. Given established land use patterns, such risks cannot be eliminated completely and must therefore be tolerated in return for the benefits of air transport. In practice, in comparison with the situations encountered more generally in Europe and elsewhere, there are generally fairly limited areas of existing development in locations subject to elevated risks along flight paths at Dublin Airport. Nevertheless, it is appropriate to provide a thorough account of the implications of the proposed Relevant Action for the risks to third parties arising from aircraft crashes.

8.1.7 This assessment and EIAR chapter have been produced by Eddowes Aviation Safety Limited, with additional input by AECOM.

8.2 Legislation and Planning Policy Context

National Legislation

8.2.1 The primary legislation relating to aviation safety in the Republic of Ireland is set at European Union (EU) level in accordance with Regulation No. 1139/2018[1] on common rules in the field of civil aviation,

[1] Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency.

which includes the establishment of the European Aviation Safety Agency (EASA). This regulation defines the framework through which the standards and recommended practices of the International Civil Aviation Organisation (ICAO), which govern international civil aviation world-wide, are adopted across the EU. In the case of airports, Regulation No. 139/2014, as amended by Regulation No. 161/2017 and Regulation No. 401/2018, establishes the basis for licensing of aerodromes by reference to defined certification specifications, which identify the technical standards adopted by EASA, indicating means to show compliance with the framework regulation. Licensing of aerodromes in accordance with these technical standards ensures that international airports such as Dublin Airport provide safe environments for the operation of the types of aircraft that they are intended to serve. Further regulations apply to the operation of aircraft and to air traffic management services to ensure that all elements of the system provide for safe and efficient air transport. These requirements are implemented at national level by the Irish Aviation Authority (IAA).

8.2.2 Whilst the safety framework identified above is intended primarily to provide for the safety of aircraft and their occupants, it will also support the safety of those living and working in the vicinity of airports by ensuring that aircraft crashes are very rare events. Nevertheless, as has already been noted above at paragraph 8.1.5, although aircraft crashes are very rare events, the majority occur along flight paths and close to the runway ends, as demonstrated by the detailed technical analysis that underpins the models employed to support the assessment of crash risk described later in this chapter and summarised by the risk contour plots shown in Figures 8-2 to 8-4 (*EIAR Volume 3: Figures*). Whilst the ICAO and EASA technical specifications for the physical characteristics of aerodromes provide a safe operating environment for aircraft, they do not make any specific provisions for the protection of third parties. Guidance in relation to airport planning supporting the implementation of the standards recognises that third party risk is an important issue in decision making on airport development. No specific aerodrome design prescriptions relating to this issue are provided in the standards. However, the guidance advises that specific methodologies can be developed by states and used to define dedicated land use policy controls.

8.2.3 Within the above international regulatory framework for aviation safety, the Republic of Ireland is one of a limited number of countries that has developed specific land use controls to address third-party risk, as discussed below.

National Planning Policy

8.2.4 In 2003, the Department of Transport and the Department of Environment, Heritage and Local Government (DoEHLG) commissioned a study[2] into Public Safety Zones (PSZs) at Ireland's three principal airports; Cork, Dublin, and Shannon (hereafter referred to as the DoEHLG study). The study resulted in the recommendation that a policy for land-use planning control be adopted in areas located in the vicinity of runway ends that are subject to higher levels of risk, in accordance with what are known as the ERM guidelines on development within Public Safety Zones. The two primary elements of this policy recommendation were as follows:

- To prevent further development within inner PSZs, defined by the limits of the area subject to an individual risk of 1 in 100,000 per year, but to allow existing developments to remain; and
- To allow existing developments to remain within the outer PSZs, defined by the limits of the area subject to an individual risk of 1 in 1,000,000 per year but prevent high density housing development, and the building of schools, hospitals and facilities attracting large numbers of people.

8.2.5 The concept of individual risk that underpins these recommendations is explained further in Section 8.3 and, in particular, in paragraph 8.3.22 which identifies the assessment criteria for evaluation of impact significance.

[2] ERM Public Safety Zones Main Report, prepared by ERM on behalf of the Department of Transport and the Department of Environment, Heritage and Local Government, February 2005
http://www.transport.ie/sites/default/files/publications/aviation/english/erm-public-safety-zones-report/erm-public-safety-zones-text-main-report.pdf

8.2.6 As yet, guidelines for the implementation of this PSZ policy recommendation have not been issued by the Department of Housing, Local Government and Heritage. However, the general principles behind the guidelines are adopted at the regional and local planning level, as described further below.

8.2.7 It should be recognised that the PSZ approach to the control of new development in the vicinity of airports does not explicitly address the issues associated with a new airport development within an established built environment. These are two distinct development control issues and the assessment of the proposed Relevant Action requires consideration of the latter one relating to impacts of the proposed Relevant Action on existing development. In that context, the inner and outer PSZs, as determined for the operations foreseen for the Application, identify areas that are subject to identified levels of risk and establish an objective framework for the consideration of the significance of risk impacts. Thus, whilst not directly relevant to the evaluation of the proposed Relevant Action, PSZ policy provides a useful reference point.

Local Planning Policy

8.2.8 Provisional PSZs, based on the 1 in 100,000 per annum and 1 in 1,000,000 per annum individual risk contours, were identified for Dublin Airport as part of the DoEHLG study. These provisional PSZs, shown in Figure 8-1 (*EIAR Volume 3: Figures*), were based on an assumed maximum capacity situation, involving the equal use of the two parallel runways in mixed mode. They are therefore conservative and cover larger areas than those required to meet the identified PSZ policy objective for the anticipated operations considered in this assessment.

8.2.9 The PSZ policy approach was first recognised formally in local planning policy in 2005 under the Fingal Development Plan 2005 – 2011[3] (hereafter referred to as the Development Plan). The Development Plan describes the background to PSZ policy, stating that "*the purpose of Public Safety Zones is to protect the public on the ground from the small but real possibility that an aircraft might crash in a populated area"* and that "*a Public Safety Zone is used to prevent inappropriate use of land where the risk to the public is greatest.*" In that context, the Development Plan identifies a commitment to implement the policies to be determined by Government in relation to Public Safety Zones for Dublin Airport under Policy TP19. The Development Plan also identified a more general requirement under Strategy DAS3 "*to promote appropriate land use patterns in the vicinity of the Airport and of the flight paths serving the Airport, having regard to the existing and anticipated noise, safety and environmental impacts of aircraft movements*" which is consistent with Policy TP19. Whilst noting that the definition of the extent of PSZs and the associated land use restrictions were awaiting a decision by Government on the Draft PSZ Study, the Development Plan identified the zones determined in the DoEHLG study on the Development Plan maps. These elements of policy have been retained in subsequent Development Plans[4] [5], including the current Fingal Development Plan 2017-2023, as described further in the following section.

8.2.10 The PSZs were also employed to support the consideration of the safety impacts of the proposals for North Runway during the planning process for North Runway[6]. Clarification concerning the interpretation of the status of PSZs by Fingal County Council was provided at the oral hearing for the North Runway planning Permission when it was stated that the Council was taking the view that a cabinet decision was made to adopt the DoEHLG study in principle. As such, the planning authority was complying with the relevant recommendations in terms of restrictions on development.

Fingal Development Plan 2017-2023

8.2.11 In accordance with the above discussion, the Fingal Development Plan 2017-2023 identifies the following objectives in relation to land use controls and public safety in the vicinity of Dublin Airport:

[3] Fingal Development Plan 2005 – 2011 https://live.fingal.ie/fingal-development-plan-2005-2011

[4] Fingal Development Plan 2011 – 2017 https://live.fingal.ie/development-plan-2011-2017

[5] Fingal Development Plan 2017 – 2023 https://live.fingal.ie/fingal-development-plan-2017-2023

[6] APB Report on the Proposal for a Northern Runway at Dublin Airport: Volume 1 – Assessment, PL06F.217429, An Bord Pleanála, 2006

- Objective DA13: Promote appropriate land use patterns in the vicinity of the flight paths serving the Airport, having regard to the precautionary principle, based on existing and anticipated environmental and safety impacts of aircraft movements; and
- Objective DA14: Implement the policies to be determined by the Government in relation to Public Safety Zones for Dublin Airport.

Other Relevant Policy, Standards and Guidance

8.2.12 In addition to the standards applicable to development control in the vicinity of airports under PSZ policy to address risk associated with aircraft crash events, the Health and Safety Authority (HSA) provides guidance[7] on the assessment and management of other potentially hazardous activities in the Republic of Ireland, more specifically in the context of the regulation of Control of Major Accident Hazard (COMAH) sites[8] and land-use planning in their vicinity. Whilst aircraft related operations at airports are not covered by the COMAH Regulation, the nature of the hazard associated with an aircraft crash is similar in some respects to that associated with COMAH sites in so far as both may give rise to periodic accidental events causing multiple fatalities. The approach set out by the HSA is consistent with that adopted more widely in Europe and elsewhere. It reflects the recognition that risks in modern industrial society cannot be eliminated entirely in the context of the existing development framework and so may need to be tolerated in return for the benefits associated with them, provided that they are sufficiently small and managed so as to be as low as reasonably practicable, as summarised broadly in United Kingdom (UK) guidance[9].

8.2.13 The HSA guidance describes requirements for the rigorous and systematic quantitative assessment of major accidents and disasters and the use of quantitative risk criteria for evaluating risk significance and acceptability. As well as identifying individual risk criteria, conceptually similar to those adopted under PSZ policy, the HSA guidance identifies "societal risk" criteria that provide a basis for assessing the significance of periodic accidents that may give rise to multiple fatalities. This broader guidance has been employed to support the establishment of an objective framework for evaluation of the risks associated with operations at Dublin Airport.

8.3 Assessment Methodology

8.3.1 This section describes the approach to the assessment of the risks to third parties arising from aircraft crash associated with the proposed Relevant Action, covering the following:

- Information sources that have supported the preparation of this chapter;
- Details of supporting consultation that has been undertaken;
- The methodology behind the assessment, including the criteria for the determination of the scale of impacts and the magnitude of change from the identified 'baseline' conditions for the parallel runway system from the start of its operation: i.e. a comparison between the assessment years 2022, 2025 and 2035 for the Permitted and Proposed Scenarios;
- An explanation as to how the identification and assessment of potential third-party risk impact effects has been reached; and
- The significance criteria and terminology for the assessment of residual risk impacts to people within the vicinity of the airport and with consideration to ecological designated sites.

[7] Policy & Approach of the Health & Safety Authority to COMAH Risk-based Land-use Planning, Health and Safety Authority, 19 March 2010

https://www.hsa.ie/eng/Your_Industry/Chemicals/Legislation_Enforcement/COMAH/Land_Use_Planning/Land_Use_Planning.pdf

[8] COMAH Regulations 2015 (S.I. No. 209 of 2015) and associated guidance: A Guide to the Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015)
https://www.hsa.ie/eng/Your_Industry/Chemicals/Legislation_Enforcement/COMAH/A_Guide_to_COMAH_SI_No_209_of_2015.pdf
Note that, whereas the regulations were revised in 2015, there were no changes in relation to safety reporting that required revision to the guidance on risk tolerability identified in references 7and 9.

[9] Reducing risks, protecting people, HSE's decision-making process, Health & Safety Executive, 2001

http://www.hse.gov.uk/risk/theory/r2p2.pdf

8.3.2 The key characteristics of the proposed Relevant Action that define the basis for the assessment of potentially significant third-party risk impacts are as follows:

- The runway layout, in particular the runway end locations that provide the reference points for the relevant take-off and landing operations;
- Flight paths to and from the runways that define the areas over which aircraft fly and hence where the crash risk may be elevated above the wider background levels;
- The fleet mix of aircraft operating under the scenarios identified for assessment and the annual number of movements of each aircraft type, which determine the scale of the risk in accordance with the risk model that identifies crash rates from the historical accident record. These are dependent upon the different aircraft types concerned and the consequences of ground impacts that are similarly dependent upon the aircraft types, according to their size.

8.3.3 The assessment has employed equivalent assumptions in respect of these characteristics to those used in the noise assessment in this EIAR (*Chapter 13: Aircraft Noise and Vibration*, and *Chapter 14: Ground Noise and Vibration*). It is based on forecast operations for the Permitted and Proposed Scenarios in Assessment Years 2022, 2025 and 2035.

Methodology for Determining Construction Effects

8.3.4 As the proposed Relevant Action comprises a change to runway operating restrictions and will involve no construction works or changes to the consented physical infrastructure of North Runway or any other areas of the airport. On that basis, the assessment of construction phase impacts on the identified major accidents and disasters have not been further assessed in the EIAR.

Methodology for Determining Baseline and Proposed Operational Effects

8.3.5 The risks associated with civil aviation are well-established on the basis of considerable operational experience worldwide over a substantial period of time. Whilst crashes may be considered rare at any given airport and within any limited time period, reference to the wider international accident record over an extended time period provides an effective basis for characterising this risk. It is evident from that experience that the primary hazard requiring attention in the context of the proposed Relevant Action relates to aircraft crash that might affect people living and working in the vicinity of the airport.

8.3.6 Site-specific risks to the public in the vicinity of airports can be estimated quantitatively by using an empirical modelling approach, based on historical accident data that characterises risk by reference to three key parameters as follows:

- The likelihood or probability (frequency per annum) of an aircraft crash occurring during take-off or landing operations, anywhere in the vicinity of an airport. This takes into account the number of movements and the inherent reliability of different aircraft types, as determined from the available crash statistics;
- The probability of impact at any specific location at or near an airport relative to the runway ends and the flight paths beyond them, as described by the crash location distribution. This is determined by reference to crash locations in the historical accident data set;
- The severity of the consequences of an impact on the ground, according to the size of the aircraft concerned and again determined by reference to the historical accident data set.

8.3.7 The model provides estimates for the first factor on the basis of the crash rates derived for different aircraft types (e.g. civil passenger jet aircraft, civil passenger turboprop aircraft, business jet aircraft, jet and turboprop cargo aircraft) from the recent historical accident record. The model identifies different crash rates for take-off and landing operations. Based on the crash rates per movement for each aircraft type, and the anticipated annual number of movements at Dublin Airport, the model provides an estimated annual crash rate for those operations.

8.3.8 The model provides estimates for the second factor by using generic crash location distribution functions that are determined for the observed historical distribution for civil aircraft accidents involving aircraft types that are generally representative of those operating at Dublin Airport.

8.3.9 The historical accident record demonstrates a relationship between the severity of crash consequences and the size of aircraft involved from which an empirical model relating the area affected to the take-off weight of the aircraft concerned has been derived to address the third factor. The crash consequences for the anticipated operations at Dublin can therefore be expected to cover a range of severities. The empirical crash consequence model is used to estimate the severities of these accident consequences by reference to the aircraft types and the associated size characteristics of aircraft within the anticipated fleet mix.

8.3.10 The modelling approach employed in the current assessment is essentially that identified by the UK Department for Transport (DfT)[10] [11] for the support of PSZ policy and which was applied in the DoEHLG study. No equivalent model has been developed in the Republic of Ireland and, given the time and effort that would be required to develop one, the adoption of the available UK DfT model was considered to be fit for purpose in support of the DoEHLG study. Its use in this assessment is similarly considered to be appropriate. The technical details of the model are described further in Appendix 8A.

8.3.11 In accordance with the outline provided in paragraph 8.3.2, key inputs required to support the above modelling approach are therefore as follows:

- The geometrical characteristics of the runway layout, in particular the runway end locations that provide the reference points for the relevant take-off and landing operations, and the associated flight paths to and from the runways that define the areas over which aircraft fly; and
- The fleet mix of aircraft operating under the scenarios identified for assessment and the annual number of movements of each aircraft type which determine the scale of the risk.

8.3.12 The Permitted Scenario impacts have been assessed on the basis of forecast operations for the assessment years, 2022, 2025 and 2035. All modelled scenarios employ forecast operations based on the assumption that the airport will not exceed the 32 mppa Cap. Further details can be found in *Chapter 2: Characteristics of the Project*.

8.3.13 Aircraft routes are defined according to international standards for the design of instrument flight procedures that ensure the safe separation of aircraft in flight, having further regard to the objective of minimising noise impacts on neighbouring communities. The use of noise preferential routes that avoid flight over populated areas where practicable will assist in minimising the third-party risk impacts.

8.3.14 Further details concerning the assumptions in the model and the relevant operational assumptions are provided in Appendix 8A supporting the EIAR.

Study Area

8.3.15 The study area has been defined essentially as that area across which the scale of the risks to third parties arising from aircraft crash is sufficient to be considered potentially significant, when judged against the criteria described further below. A risk level above 1 in a million per annum has been identified as the appropriate criteria for the identification of a potentially significant risk of fatality for an individual, in accordance with the ERM guidelines and the significance criteria set out in Table 8-1. The primary study area in respect of individual risk was therefore defined to extend to at least the limit of the 1 in a million per annum individual risk contours for the different scenarios, as discussed in further detail in Sections 8.4 and 8.5. In order to provide an effective description of elevated risk levels along all flight paths, the study area was selected to extend out to beyond the limits of the 1 in a million per annum individual risk contours.

8.3.16 For societal risk estimation, the study area extends to a distance of 16km laterally from the runway extended centrelines of the Southern Runway (Runway 10R-28L) and to a longitudinal distance of 18km beyond and behind the Runway 10R Threshold. The mathematical functions that are employed for the estimation of risk as a function of location relative to flight paths, identify crash probabilities that decrease progressively with increasing distance from the line of the flight paths and increasing distance from the runway ends. For mathematical functions of this sort, some residual element of risk will be identified to

[10] Third Party Risks Near Airports and Public Safety Zone Policy: A Report to the Department by Consultants, Department of the Environment, Transport and the Regions, October 1997
https://saeninfo.files.wordpress.com/2013/05/dpartyrisknearairportsan2989.pdf

[11] A Methodology for Calculating Individual Risk Due to Aircraft Accidents near Airports, P.G.Cowell, P.B. Foot, R.J.Gerrard, D.Kent, S.M.Mason & A.Rivoire, NATS R&D Report 0007, 2000

be located beyond any defined area extending out to any given distance from the runway. It is therefore impractical to define an area that encapsulates all the risk predicted by these mathematical functions. Adoption of the area identified accounts for all but a few percent of the risk identified by the model functions and this area covers the vast majority of the areas of development where there would be a risk of fatalities in the event of an aircraft crash. The selection of this study area represents a pragmatic balance that will therefore ensure that reliable societal estimates are provided in return for a practical level of assessment effort.

8.3.17 In the context of the EIA, the sensitive receptors in the study area are the people living and working across it. The risks vary according to the precise location of sites relative to the runway ends and flight paths. The locations where people may be present and the numbers of individuals at each of the occupied locations was identified primarily by reference to the Q2 2019 An Post GeoDirectory, in accordance with the approach employed for the noise assessment. This approach identified individual residential development locations and community buildings within three categories: education, healthcare and religious buildings.

8.3.18 For the purposes of the third-party risk assessment, business premises that were identified through the Q2 2019 An Post GeoDirectory not included in the noise assessment were also considered on the basis of location, numbers present and periods of occupancy. The characterisation of these areas of development was supported by the review of Google Earth satellite images. The assessment also included consideration of risks to occupants within the airport terminal complex, taking account of the numbers working at the airport and the anticipated passenger throughput.

8.3.19 The specifications for distribution of people across the study area and the basis on which they were derived are described in further detail in Appendix 8A.

Significance Criteria

8.3.20 Two distinct measures are available for characterising the risks estimated by airport-related crash risk models, as follows:

- Individual Risk: the annual probability of fatality for a hypothetical resident present at any given location relative to the runway threshold and flight path to and from it; and
- Societal Risk: the annual probability of accidents causing any given number of fatalities in any particular area of development, taking account of the nature of the development, in particular the density of occupancy.

Both measures have been employed in this assessment. They are routinely employed in the assessment of the risks associated with other potentially hazardous facilities, within the Republic of Ireland[7, 12] and internationally[9].

8.3.21 Individual risk is the measure employed for the definition of PSZs. Public Safety Zone policy is a land-use planning tool for controlling new residential and other development in the vicinity of existing airport infrastructure. Certain land-uses are restricted in areas subject to a defined quantitative level of risk or more, on the basis that it is considered cost-beneficial to forego the development potential of the land, which involves a lost opportunity cost, in return for the benefit of reducing the risk of people on the ground being killed in areas along flight paths that are subject to elevated levels of risk. The individual risks are characterised in terms of a set of risk contours, representing the limit of the area subject to a defined level of risk.

8.3.22 Risk contours for three different levels of risk are typically employed in the assessment of individual risk, as follows:

- A risk of 1 in 10,000 per annum, considered to be a relatively high risk and at the limit of what is considered to be an acceptable level of risk exposure for members of the public;
- A risk of 1 in 100,000 per annum, considered to be a risk that is of potential concern but one that can nevertheless be considered acceptable in return for the economic benefits derived from the

[12] ERM Public Safety Zones Report Appendix B Public Safety Zones: Criteria and Policy, Risk Assessment and Expert Opinions, prepared by ERM on behalf of the Department of Transport and the Department of Environment, Heritage and Local Government, February 2005

activity giving rise to the risk, provided that the risk is managed to be as low as reasonably practicable; and

- A risk of 1 in a million per annum, considered to be a low risk that is a generally acceptable level of exposure for members of the public.

8.3.23 These identified risk levels provide a well-defined set of internationally recognised quantitative criteria for the evaluation of risk impact significance. In addition to the risk levels themselves, the relative numbers of people exposed to these risk levels provide a further criterion for evaluation of risk significance. Having regard to the established practice in the Republic of Ireland and elsewhere, criteria for assessing the significance of individual risk impacts have been developed in the format recommended in Section 3: Page 53 of the EPA draft Guidelines[13]. These individual risk criteria for the identified descriptors of impact significance, summarised in Table 8-1, have been employed for the assessment of the impacts of operations at Dublin Airport. They are based on professional judgement concerning the alignment of the established safety standards and terminology with the framework identified in EPA draft guidelines.

Table 8-1 Assessment Criteria for Individual Risk Significance

Significance of Impact	Topic Specific Criteria
Negligible[1]	Individual fatality risk < 1 in 1,000,000 per annum
Slight Effects	1 in 1,000,000 per annum < Individual fatality risk < 1 in 100,000 per annum Low numbers (up to a few tens) of people exposed
Moderate Effects[2]	1 in 1,000,000 per annum < Individual fatality risk < 1 in 100,000 per annum High numbers (hundreds to thousands) of people exposed, Or 1 in 100,000 per annum < Individual fatality risk < 1 in 10,000 per annum Low numbers (up to a few tens) of people exposed
Significant Effects	1 in 100,000 per annum < Individual fatality risk < 1 in 10,000 per annum High numbers of people exposed
Very Significant Effects	Individual fatality risk > 1 in 10,000 per annum Low numbers (up to a few tens) of people exposed
Profound Effects	Individual fatality risk > 1 in 10,000 per annum High numbers (hundreds to thousands) of people exposed

Note 1: The term "negligible" is typically employed in safety regulation for risk levels that are below regulatory concern and this category can be considered to equate essentially with the "Not significant" and "Imperceptible" impact significance categories identified in EPA guidance.
Note 2: There will be some overlap between scenarios meeting the criteria identified for "moderate effects", according to the level of risk within the identified bands and the numbers of people exposed.

8.3.24 Individual risks for airport operations were estimated as part of the DoEHLG study into PSZs. These risk estimates and the ERM Guidelines derived from them provide a further potentially useful reference for evaluation of the risk impacts predicted as a result of the Proposed Scenario.

8.3.25 Whilst the identified individual risk criteria that underpin PSZ policy in the Republic of Ireland can provide some insight into the extent to which people living and working in the vicinity of Dublin Airport are exposed to the risk of aircraft crash, the individual risk measure does not effectively characterise the true nature of the risk. PSZ policy is concerned with the control of new development near existing airports and the use of individual risk criteria in that context is entirely appropriate. However, the current assessment is concerned with determining the impact of airport operations on existing development which is a distinct question. For these purposes, the aircraft crash risk is better represented as a periodic event that may lead to multiple fatalities, where the number of fatalities will depend on the density of occupation of the crash site and size of the aircraft concerned. This sort of scenario can be characterised more effectively in terms of the "societal risk", characterised quantitatively in terms of the estimated frequency of accidents, $f(N)$, leading to a defined number of fatalities, N. Societal risk estimates typically take account of the wide range of potential outcomes of an accident from the more common scenarios involving relatively few fatalities to less common ones involving larger numbers of fatalities.

[13] Draft Guidelines on the Information to be Contained in Environmental Impact Statements (EPA draft 2017)

8.3.26 Specific quantitative criteria for evaluating the significance of societal risks in the Republic of Ireland have been identified [7] in the context of the regulation of COMAH sites and land-use planning in their vicinity. Whilst the operation of aircraft at and in the vicinity of an airport are not covered by the COMAH regulations, the nature of the hazard associated with an aircraft crash is similar in some respects to the operation of facilities that are in so far as both may give rise to periodic accidental events causing multiple fatalities. In common with COMAH sites, operation of the airport provides a clear tangible economic benefit that must be balanced against the risk associated with operation. In the absence of any societal risk criteria developed specifically for airport operations, reference has been made to these available criteria which can be seen to have been developed to address a broadly equivalent issue. These criteria are defined by reference to a "Scaled Risk Integral" (SRI) representing the sum over all scenarios of the accident frequency, *f(N)*, multiplied by the number of fatalities, *N*.

The risk integral is defined as:

$$SRI = \sum_{1}^{Nmax} f(N).N^{a}$$

8.3.27 In this expression, *f(N)* is the frequency of events leading to *N* fatalities (in units of casualties per million years), and '*a*' is a constant. For the assessment of COMAH establishments, the Health and Safety Authority guidance identifies the use of a value of *a* = 1.4, and the scale of the risk as measured by the risk integral can be judged against criteria of 2,000, identified as "broadly acceptable" in the wording of the guidance and 500,000, identified as "significant" in the wording of the guidance. In order to define quantitative criteria corresponding with the range of impact significance descriptions, in accordance with the approach identified for individual risk in Table 8-1, an SRI score of 2,000 has been equated with the upper limit of the "Not Significant" band whilst an SRI score of greater than 500,000 has been equated with the lower limit of the "Significant Effects" band. A factor of approximately 16 between the upper and lower limits of each band is found to provide for the required subdivisions across that range and the societal risk significance criteria identified in Table 8-2 are determined on that basis. These societal risk criteria for the identified descriptors of impact significance have been developed, based on professional judgement, to set the standards identified in HSA guidance[7] in a framework consistent with the EPA draft Guidelines.

Table 8-2 SRI Assessment Criteria for Societal Risk Significance

Significance of Impact	Topic Specific Criteria
Negligible	Societal Risk Index (SRI) < 2,000
Slight Effects	2,000 < Societal Risk Index (SRI) < 32,000
Moderate Effects	32,000 < Societal Risk Index (SRI) < 500,000
Significant Effects	Societal Risk Index (SRI) > 500,000

8.3.28 The HSA guidance states (Footnote 12, Section 2.2, page 11) [7] that the SRI is used "t*o provide a rapid initial assessment of the societal risk*" and that "*it must be emphasised that a full consideration of the FN curve is probably a more robust approach.*" The more robust approach through consideration of the FN curve, based on estimates for the frequency, F, of events that cause N or more casualties, has been adopted in this assessment. The guidance further states that "*there is ongoing debate as to whether scale aversion should be included at all in societal risk measures for land use planning, and so such risk integrals are only used as screening aids*." Both of these approaches have been applied here and it is found that they lead to comparable conclusions concerning the significance of the impacts associated with the Permitted and Proposed Scenarios.

8.3.29 The choice of the value of the constant, *a*, determines the extent to which the possible greater aversion to accidents involving larger numbers of fatalities is factored into the evaluation of the risk significance. In the UK, the identified quantitative criteria[14] [15] [16] for assessing the risks associated with major accidents and disasters have typically not adopted an aversion factor, corresponding with a value for the constant, *a* = 1. The most recent UK Health and Safety Executive guidance[9] identifies an event giving rise to 50 or more deaths with a frequency of more than 1 in 5,000 years as one that should be regarded as

[14] Quantified risk assessment: Its input to decision making, UK Health and Safety Executive, HMSO, 1989

[15] The tolerability of risk from nuclear power stations, UK Health and Safety Executive, 1992

[16] Major hazard aspects of the transport of dangerous substances, Health and Safety Commission, 1991

intolerable where there is a choice whether to accept the risk or not. The selection of that criterion takes some account of the aversion to events leading to large numbers of fatalities. The proposed Relevant Action has been assessed against these available quantitative criteria. These criteria have been developed by reference to the risks associated with a wide range of industrial and other activities. Whilst not developed specifically by reference to the risks associated with airport operations, they are considered to be of general utility for the assessment of the significance of societal risk and provide useful reference points in the current context.

Effects on Other Environmental Receptors

8.3.30 Risk of accidents affecting other environmental receptors are also considered, including risk of impacts on water, biodiversity, material assets and cultural heritage. No other environmental receptors could experience a significant effect from aircraft crashes.

Limitations and Assumptions

8.3.31 As outlined earlier in Section 8.3, the assessment is based on an empirical model that was developed by reference to recent historical accident data, which provides generic insight into the likelihood of aircraft crashes, the likely locations of events in relation to flight paths and the impact consequences on the ground. Future risks associated with operations at Dublin Airport are estimated on the basis of forecasts for future operations, in terms of the numbers of aircraft movements following the available departure and approach paths to the three runways (North Runway, South Runway and Cross Wind Runway) and the aircraft types involved. There will inevitably be limitations to the reliability of any quantitative risk model of this type due to inherent uncertainties in the model itself and the forecasts for future operations. Careful consideration has been given to the possible limitations of the modelling approach employed, as set out in Section A8.5 of Appendix 8A. It has been concluded that this modelling approach is consistent with current best practice[2 11 17] and provides a sound basis for assessing the implications for public safety of the proposed Relevant Action.

8.4 Permitted Scenario

2022 Individual Risk

8.4.1 The Permitted Scenario in respect of the individual risk impacts in 2022, when the North Runway becomes operational, is summarised by the contour plots shown in Figure 8-2 (*EIAR Volume 3: Figures*). The 1 in 10,000 per annum upper risk contours for both ends of all three runways are contained entirely within the airport boundary. A substantial proportion of the total area of the 1 in 100,000 per annum risk contours (85%) is also contained within the airport boundary. The length and area characteristics of these contours are summarised in Table 8-3 which also summarises the number of residential properties located within the contours and the number of commercial properties, excluding those within the airport campus buildings.

Table 8-3 2022 Permitted Scenario Individual Risk Contour Characteristics

Contour Feature	South Runway		North Runway		Cross Runway	
	West end	East end	West end	East end	North end	South end
1 in 100,000 per annum individual risk contour						
Distance from runway end	1,286	2,139	1,402	934	30	93
Distance outside airside limit	240	1,154	709	598	0	0
Total area (hectares)[1]	10.26	20.58	14.45	4.98	N/A	N/A
Area outside airside limit (hectares)	1.04	6.92	5.07	2.90	-	-
Number of dwellings[2] inside	0	0	0	0	0	0
Commercial sites inside	0	0	0	1	0	0
1 in 1,000,000 per annum individual risk contour						
Distance from runway end	4,149	9,576	5,138	2,528	543	737
Distance outside airside limit	3,103	8,591	4,445	2,192	288	483
Total area (hectares)	49.47	213.79	124.84	26.24	N/A	N/A
Number of dwellings inside[3]	0	78	13	2	0	0
Commercial sites inside[4]	2	6	2	2	0	0

Note 1: The area identified for the 1 in 100,000 per annum risk contour includes a small contribution from the 1 in 10,000 per annum risk contour. Due to the nature of the overlap between the contours for the cross runway with the other two runways and the limited size of these contours, no attempt has been made to estimate the areas of the Cross Wind Runway (16/34) contours.

Note 2: The count of dwellings in this assessment includes residential properties for which the available building inventory identifies both residential and commercial use and where the commercial use is relatively small scale. Counts include a small number of developments evident on satellite images which are not listed in the available building inventory some of which may not be currently in use. Judgements on use categories have been made on the basis of the satellite images.

Note 3: In addition to the dwellings located within the contours beyond the runway ends, there are several residential properties located within the 1 in 1,000,000 per annum risk contour between the thresholds of the Southern Runway but none elsewhere between the thresholds.

Note 4: This count excludes commercial facilities within the Airport Campus and dual residential/commercial use sites which are identified in the dwellings count. Some identified sites accommodate multiple enterprises.

8.4.2 A desktop review of the land-uses in the areas covered by the 2022 future receiving environment within the 1 in 100,000 per annum individual risk contours has been carried out with the assistance of the available satellite imagery and other data sources. The key findings of the review are as follows:

- ***South Runway, eastern end:*** The contour extends approximately 1,154 m from the airport operational boundary, crossing the R132 dual carriageway and the M1 motorway. The majority of the land within the contour outside the airport operational boundary is open fields with scattered trees. The contour encroaches slightly on an area of car parking and also two football pitches within the ALSAA Sports Complex. There are no commercial or residential properties within this contour;
- ***South Runway, western end:*** The contour extends approximately 240 m from the airport operational boundary, crossing the R122 single carriageway road that is located immediately to the west of the airport boundary. Land within the contour located further to the west is entirely open fields. There are no commercial or residential properties within this contour;
- ***North Runway, eastern end:*** The contour extends approximately 598 m from the airport operational boundary, mostly across open fields. There is a single apparent commercial site within the contour shown on the satellite images but this site is not listed in the available buildings inventory. There are no residential properties within this contour;

- ***North Runway, western end:*** The contour extends approximately 709 m from the future airport operational boundary, mostly across open fields with trees. The contour crosses the L3132 Dunbro Lane and Kilreesk Lane, immediately to the west of the airport boundary. There are no commercial or residential properties within this contour; and
- ***Cross Wind Runway:*** The 1 in 100,000 per annum risk contours for this runway are contained entirely within the airport boundary, due to the low forecasted number of movements.

8.4.3 The 2022 Permitted Scenario 1 in 1,000,000 per annum individual risk contours cover a substantially larger area than the 1 in 100,000 per annum individual risk contours. The sizes of the contours are summarised in Table 8-3. The desktop review of land-use reveals that the majority of the additional areas covered by the 1 in 1,000,000 per annum contours compared with the 1 in 100,000 per annum contours are open fields. However, there are some developed areas within the contours that merit some specific comment. The key findings of the review in this respect are as follows:

- ***South Runway, eastern end:*** The contour extends approximately 8.6 km from the airport operational boundary, slightly beyond the coast to the south of Portmarnock, crossing the R132 dual carriageway and the M1 motorway. Closer to the runway on the north side, it encompasses some aircraft stands and other airport-related facilities. Immediately to the east of the R132 on the north side of the runway extended centreline, prior to reaching the M1 motorway, the contour contains some commercial sites within the airport campus, including car rental facilities, and the ALSAA Sports Centre (located outside the airport). To the south, at Dardistown, there are several commercial properties, two residential properties and an area of airport long-term car parking within the contour. Immediately to the east of the M1 motorway, the contour includes several football pitches (Athletic Union League). The remainder of the land within the contour beyond that point is agricultural land comprising of open fields with scattered trees, but includes also a small number of isolated residential properties. The key exception to that is at Drumnigh Wood, Portmarnock where the contour includes approximately 50 hectares of residential development, including approximately 60 residential properties. A total of 78 residential dwellings are identified as being located within this contour. Further to the east by the coast, a narrow strip of this contour crosses a golf course, part of the Portmarnock Hotel and Golf Links Complex*;*
- ***South Runway, western end:*** The contour extends approximately 3.1 km from the airport operational boundary, crossing a number of roads, including the N2 dual carriageway and two small light industrial/commercial sites. Otherwise, the land within the contour is open fields and contains no residential development;
- ***North Runway, eastern end:*** The contour extends approximately 2.2 km from the current airside boundary, mostly across open fields but also across a number of roads, including the M1 motorway. Two commercial sites on the north side of the runway extended centreline and two residential properties are included within this contour;
- ***North Runway, western end:*** The contour extends approximately 4.4 km from the anticipated future operational airside boundary, mostly across open fields with trees. The contour crosses a number of roads, including the M2 motorway. There are a number of scattered residential developments in this area and the contour includes a total of 13 residential dwellings and two commercial sites; and
- ***Cross Wind Runway:*** The 1 in 1,000,000 per annum risk contours are shorter compared with those for the other runways but, unlike the 1 in 100,000 per annum risk contours, extend outside the airside operational boundary. To the south, the contour extends into a car park, Quickpark at Dublin Airport. To the north, the contour covers open ground, extending across some minor roads (R108 and L3132, Naul Road), but excludes residential or other development.

8.4.4 To summarise, for the Permitted Scenario in assessment year 2022, there are no residential properties located within the 1 in 100,000 per annum contours for all runways. In total, 93 residential properties are identified as being located between the limits of the 1 in 100,000 and 1 in 1,000,000 per annum contours in 2022. There is a single apparent commercial site within the 1 in 100,000 per annum contours. There are 12 non-airport commercial sites between the limits of the 1 in 100,000 and 1 in 1,000,000 per annum contours, some of which accommodate multiple small enterprises. None of these are major employment sites holding large numbers of people. This contour contains further commercial sites within the airport campus.

2025 Individual Risk

8.4.5 The future receiving environment in respect of the individual risk impacts for the Permitted Scenario in assessment year 2025 is summarised by the contour plots shown in Figure 8-3 (*EIAR Volume 3: Figures*). The key characteristics of the contours are summarised in Table 8-4. These contours are quite similar to those described for the 2022 Permitted Scenario. They are longer and broader, covering a correspondingly larger area, as summarised in Table 8-4. This increase in contour size reflects the 37% increase in forecast movement numbers expected between 2022 and 2025.

8.4.6 There is no change in the number of properties within the North or South Runway within the 1 in 100,000 per annum contours between the 2022 and 2025 Permitted Scenarios. As for the 2022 Permitted Scenario, there is a single commercial site at the eastern end of the North Runway within the 2025 Permitted Scenario within the 1 in 100,000 per annum contour. There is a predicted minor increase in the number of residential properties within the 1 in 1,000,000 per annum contours from 93 in 2022 to 105 in 2025. There is also an increase in the number of commercial sites within the 1 in 1,000,000 per annum contours from 12 in 2022 to 19 in 2025.

Table 8-4 2025 Permitted Scenario Individual Risk Contour Characteristics

Contour Feature	South Runway		North Runway		Cross Runway	
	West end	East end	West end	East end	North end	South end
1 in 100,000 per annum individual risk contour						
Distance from runway end	1,490	2,610	1,581	1,057	34	125
Distance outside airside limit	444	1,625	888	721	0	0
Total area (hectares)[1]	12.99	27.41	17.64	6.42	N/A	N/A
Area outside airside limit (hectares)	2.34	10.73	6.74	4.00	-	-
Number of dwellings[2] inside	0	0	0	0	0	0
Commercial sites inside	0	0	0	1	0	0
1 in 1,000,000 per annum individual risk contour, excluding 1 in 100,000 contour						
Distance from runway end	4,850	10,874	6,106	2,810	682	870
Distance outside airside limit	3,804	9,889	5,413	2,474	427	616
Total area (hectares)[3]	63.07	279.96	167.84	30.91	N/A	N/A
Number of dwellings inside[4]	0	85	17	3	0	0
Commercial sites inside[5]	3	9	5	2	0	0

For explanatory notes 1 to 5, see Table 8-3.

2035 Individual Risk

8.4.7 The future receiving environment in respect of the individual risk impacts for the Permitted Scenario in 2035 is summarised by the contour plots shown in Figure 8-4 (*EIAR Volume 3: Figures*). The key characteristics of the contours are summarised in Table 8-5. These contours are very similar to those described for the 2025 Permitted Scenario, reflecting the equivalent numbers of passengers for these two scenarios. The minor differences estimated arise from slight differences in the anticipated fleet compositions between the two years.

8.4.8 There is no change in the number of properties within the North or South Runway within the 1 in 100,000 per annum contours between the 2025 and 2035 Permitted Scenarios. As for the 2022 and 2025 Permitted Scenarios, there is a single commercial site at the eastern end of the North Runway within the 2035 Permitted Scenario 1 in 100,000 per annum contour. There is a minor increase in the number of residential properties within the 1 in 1,000,000 per annum contours from 105 in 2025 to 109 in 2035. There is no increase in the number of commercial sites within the 1 in 1,000,000 per annum contours from 2025 to 2035.

8.4.9 The risk estimates made for the 2035 scenario are based on the assumption that aircraft crash rates remain the same as those determined according to the recent historical accident record that have also been applied to the 2022 risk estimates which are outlined in Appendix 8A to this chapter. In practice, there is clear evidence over a period of many decades, including recent years, for a continuing decline in aircraft crash rates. Statistical studies undertaken in relation to a previous new runway development programme at Frankfurt[17] have indicated an annual reduction, year-on-year, of around 0.732% for commercial air transport movements in so called "first world" countries that operate to the highest safety standards. Over a period of 13 years from 2022 to 2035, this yearly improvement in the safety record represents a decrease in the crash risk by 9.5%. If applied, this potential improvement would significantly offset the estimated growth in contour size predicted. Given the common standards employed in aviation and the common operators involved, this safety performance is considered to be indicative of operations at any major international airport in the region concerned and to be as representative of Dublin Airport operations as it is of those at Frankfurt. Whilst rates of improvements have slowed since the major gains achieved in the earlier years of commercial civil aviation, the recent trends in the historical accident record indicate that the current safety practices will continue to provide some improvement in safety into the future.

[17] Externes Risiko für den Flughafen Frankfurt Main, report prepared for Frankfurt Airport by Gesellschaft für Luftverkehrsforschung mbH, 2003

Table 8-5 2035 Permitted Scenario Individual Risk Contour Characteristics

Contour Feature	South Runway		North Runway		Cross Runway	
	West end	East end	West end	East end	North end	South end
1 in 100,000 per annum individual risk contour						
Distance from runway end	1,530	2,681	1,609	1,132	35	126
Distance outside airside limit	484	1,696	916	796	0	0
Total area (hectares)[1]	13.58	28.53	18.22	7.45	N/A	N/A
Area outside airside limit (hectares)	2.62	11.42	7.06	4.95	-	-
Number of dwellings[2] inside	0	0	0	0	0	0
Commercial sites inside	0	0	0	1	0	0
1 in 1,000,000 per annum individual risk contour						
Distance from runway end	5,042	11,086	6,200	2,866	707	889
Distance outside airside limit	3,996	10,101	5,507	2,530	452	635
Total area (hectares)[3]	67.02	289.76	175.22	33.12	N/A	N/A
Number of dwellings inside[4]	0	89	17	3	0	0
Commercial sites inside[5]	3	9	5	2	0	0

For explanatory notes 1 to 5, see Table 8-3.

Societal Risk

8.4.10 The societal risk impacts have been determined by consideration of the full range of accident scenarios involving aircraft of different sizes from the fleet mix anticipated for the Permitted Scenarios and impacts in different locations with different densities of occupation. This approach provides for the determination of the probability of accidents giving rise to a defined number of fatalities from one up to the maximum number estimated for a crash of the largest aircraft type into an area with the highest density of occupation. Societal risks were estimated separately for:

- Airport campus sites;
- All other sites; and
- For all sites combined.

8.4.11 These estimates were characterised by means of a number of quantitative risk measures, as follows:

- The overall frequency of accidents causing fatalities;
- The average number of fatalities involved;
- The expectation value, representing the average number of fatalities per annum;
- The Scaled Risk Integral Index (SRI), as employed in land-use planning in the vicinity of major hazard (COMAH) sites; and
- FN curves for the full range of accident frequencies and consequences.

8.4.12 These risk estimates are summarised in Table 8-7 and the FN curve is shown in Figure 8-5 (*EIAR Volume 3: Figures*).

8.4.13 Taking account of the distribution of accident locations, which are concentrated along the runway centreline and more towards the runway ends, and having regard to the locations of properties around the airport, the vast majority of accidents are expected not to give rise to any third-party fatalities. For the 2022 Permitted Scenario, the probability of an aircraft crash accident affecting third parties is estimated to be 0.00082 per annum, or 1 in 1,224 years. For sites outside the airport campus, that value is slightly lower at 1 in 1,248 years. The average number of third-party fatalities per crash event that is expected to lead to at least one third-party fatality is estimated to be around 21. For sites outside the airport campus, the average number of fatalities per crash is estimated to be around 17. These estimates for the average number of fatalities and event frequency represent an expectation value of 1 fatality in every 59 years for all sites and 1 fatality in 75 years for non-airport sites outside the airport campus, on average.

8.4.14 For the 2025 Permitted Scenario, summarised in Table 8-6, the societal risk is predicted to increase broadly in line with the 37% increase in the movement numbers and 11% increase in the average destroyed area. The societal risk increase between 2025 and 2035 Permitted Scenarios is more modest, in line with the much smaller increase in movement numbers forecast for these years. As can be seen from the FN curve shown in Figure 8-5 (*EIAR Volume 3: Figures*), there is a visible increase in the probability of all fatality events due to the increase in movement numbers for 2025 and 2035, with the most significant increase in the probability of high N fatality events which can be attributed to the increase in the average destroyed area in 2025 compared to 2022 resulting in slightly higher fatality predictions for on airport campus accidents. There is very little difference between the risks estimated for the 2025 and 2035 Permitted Scenarios. The expectation value for 2025 Permitted Scenario is 42% higher than the 2022 expectation value and the SRI score is 55% higher than the 2022 SRI score. The expectation value for 2035 Permitted Scenario is 7% higher than the 2025 expectation value and the SRI score is 12% higher than the 2025 SRI score. In accordance with the earlier discussion in relation to the 2035 individual risk estimates, the frequency of crash events in 2035 would reduce by 9.5% if the anticipated improvement in safety performance with time is taken into account, leading to a 9.5% reduction in the expectation value and in the frequency of all events identified in the FN curve.

Table 8-6 Permitted Scenarios Societal Risk Estimate Summary

Scenario	Rate of Fatality Accidents		Average fatalities	Expectation Value		SRI
	Per Annum	Return period / years		Per Annum	Return period / years	
2022 Permitted						
All sites	8.17×10^{-4}	1,224	20.8	1.70×10^{-2}	59	101,896
Non-airport sites	8.01×10^{-4}	1,248	16.7	1.34×10^{-2}	75	63,863
Airport campus	1.61×10^{-5}	61,946	225.3	3.64×10^{-3}	275	38,033
2025 Permitted						
All sites	1.05×10^{-3}	957	23.1	2.41×10^{-2}	41	158,363
Non-airport sites	1.02×10^{-3}	976	17.6	1.81×10^{-2}	55	87,521
Airport campus	2.03×10^{-5}	49,162	296.6	6.03×10^{-3}	166	70,843
2035 Permitted						
All sites	1.08×10^{-3}	929	24.0	2.58×10^{-2}	39	177,234
Non-airport sites	1.06×10^{-3}	947	17.9	1.89×10^{-2}	53	92,052
Airport campus	2.07×10^{-5}	48,254	333.5	6.91×10^{-3}	145	85,182

8.5 Proposed Scenario

2022 Individual Risk

8.5.1 The individual risk impacts for the 2022 Proposed Scenario are summarised by the contour plots shown in Figure 8-6 (*EIAR Volume 3: Figures*). The key parameters of the contours are summarised in Table 8-7.

8.5.2 The individual risk contours for the 2022 Proposed Scenario are very similar to those for the Permitted Scenario for that year but marginally larger. As for the 2022 Permitted Scenario, there are no residential or commercial properties inside the 1 in 100,000 per annum risk contour associated with the South Runway for the 2022 Proposed Scenario. Whilst there is a slight increase in the length of the 1 in 100,000 per annum risk contour associated with the North Runway for the 2022 Proposed Scenario at the west end, there are still no residential properties contained within it. A single commercial property is located within this contour for the 2022 Proposed Scenario, as is the case for the 2022 Permitted Scenario.

8.5.3 Whilst there is a predicted minor increase in the 1 in 1,000,000 per annum contours for the 2022 Proposed Scenario, no changes in the number of residential or commercial properties contained within the contours are observed.

Table 8-7 2022 Proposed Scenario Individual Risk Contour Characteristics

Contour Feature	South Runway		North Runway		Cross Runway	
	West end	East end	West end	East end	North end	South end
1 in 100,000 per annum individual risk contour						
Distance from Runway end	1,302	2,214	1,450	947	32	97
Distance outside airside limit	256	1,229	757	611	0	0
Total area (hectares)[1]	10.15	21.59	15.41	5.16	N/A	N/A
Area outside airside limit (hectares)	1.13	7.48	5.56	3.04	-	-
Number of dwellings[2] inside	0	0	0	0	0	0
Commercial sites inside	0	0	0	1	0	0
1 in 1,000,000 per annum individual risk contour, excluding 1 in 100,000 contour						
Distance from Runway end	4,172	9,801	5,246	2,563	571	758
Distance outside airside limit	3,126	8,816	4,553	2,227	316	504
Total area (hectares)[3]	47.94	223.73	136.64	26.82	N/A	N/A
Number of dwellings inside[4]	0	78	13	2	0	0
Commercial sites inside[5]	2	6	2	2	0	0

For explanatory notes 1 to 5, see Table 8-3.

2025 Individual Risk

8.5.4 The individual risk impacts for the 2025 Proposed Scenario are summarised by the contour plots shown in Figure 8-7 (*EIAR Volume 3: Figures*). The key characteristics of the contours are summarised in Table 8-8. As for all the other scenarios, there is one commercial property within the 1 in 100,00 per annum contour for the 2025 Proposed Scenario and no residential properties.

8.5.5 With the minor increase in size of the 1 in 1,000,000 per annum contour predicted for the 2025 Proposed Scenario, the estimated number of dwellings inside this contour is estimated to increase to 109, compared with 105 estimated for the 2025 Permitted Scenario.

Table 8-8 2025 Proposed Scenario Individual Risk Contour Characteristics

Contour Feature	South Runway		North Runway		Cross Runway	
	West end	East end	West end	East end	North end	South end
1 in 100,000 per annum individual risk contour						
Distance from Runway end	1,513	2,663	1,614	1,127	35	125
Distance outside airside limit	467	1,678	921	791	0	0
Total area (hectares)[1]	13.19	28.12	18.26	7.32	N/A	N/A
Area outside airside limit (hectares)	2.49	11.19	7.08	4.84	-	-
Number of dwellings[2] inside	0	0	0	0	0	0
Commercial sites inside	0	0	0	1	0	0
1 in 1,000,000 per annum individual risk contour, excluding 1 in 100,000 contour						
Distance from Runway end	4,945	11,038	6,177	2,859	702	883
Distance outside airside limit	3,899	10,053	5,484	2,523	447	629
Total area (hectares)[3]	63.82	286.13	175.50	32.80	N/A	N/A
Number of dwellings inside[4]	0	89	17	3	0	0
Commercial sites inside[5]	3	9	5	2	0	0

For explanatory notes 1 to 5, see Table 8-3.

2035 Individual Risk

8.5.6 The individual risk impacts for the 2035 Proposed Scenario are summarised by the contour plots shown in Figure 8-8 (*EIAR Volume 3: Figures*). The key characteristics of the contours are summarised in Table 8-9. As for the other scenarios, there is one commercial property within this contour for the 2035 Proposed Scenario and no residential properties.

8.5.7 With the small change in the 1 in 1,000,000 per annum contour predicted for the 2035 Proposed Scenario, the estimated number of dwellings inside this contour is estimated to remain unchanged compared to the 2035 Permitted Scenario.

Table 8-9 2035 Proposed Scenario Individual Risk Contour Characteristics

Contour Feature	South Runway		North Runway		Cross Runway	
	West end	East end	West end	East end	North end	South end
1 in 100,000 per annum individual risk contour						
Distance from Runway end	1,522	2,686	1,625	1,132	35	127
Distance outside airside limit	476	1,701	932	796	0	0
Total area (hectares)[1]	13.37	28.63	18.53	7.43	N/A	N/A
Area outside airside limit (hectares)	2.57	11.47	7.23	4.92	-	-
Number of dwellings[2] inside	0	0	0	0	0	0
Commercial sites inside	0	0	0	1	0	0
1 in 1,000,000 per annum individual risk contour, excluding 1 in 100,000 contour						
Distance from Runway end	4,980	11,104	6,220	2,871	712	890
Distance outside airside limit	3,934	10,119	5,527	2,535	457	636
Total area (hectares)[3]	64.73	290.74	178.71	33.14	N/A	N/A
Number of dwellings inside[4]	0	89	17	3	0	0
Commercial sites inside[5]	3	9	5	2	0	0

For explanatory notes 1 to 5, see Table 8-3.

Societal Risk

8.5.8 Societal risk estimates have been made for the 2022, 2025 and 2035 Proposed Scenarios, following the same approach employed for the assessment of the Permitted Scenarios. The risk estimates for 2022 and 2025 are slightly larger, compared with those for the Permitted Scenarios, in accordance with the increased movement numbers for these scenarios. The risk estimates for the 2035 Permitted and Proposed Scenarios are very similar as the annual movements and average crash rates for Permitted and Proposed Scenarios in 2035 are the same. These risk estimates are summarised in Table 8-10 and the FN curves are shown in Figure 8-9 (*EIAR Volume 3: Figures*).

Table 8-10 Proposed Scenarios Societal Risk Estimate Summary

Scenario	Rate of Fatality Accidents		Average fatalities	Expectation Value		SRI
	Per Annum	Return period / years		Per Annum	Return period / years	
2022 Proposed						
All sites	8.47×10^{-4}	1,181	21.0	1.78×10^{-2}	56	108,636
Non-airport sites	8.30×10^{-4}	1,205	16.6	1.38×10^{-2}	73	65,718
Airport campus	1.68×10^{-5}	59,476	238.7	4.01×10^{-3}	249	42,919
2025 Proposed						
All cites	1.08×10^{-3}	928	23.1	2.49×10^{-2}	40	164,785
Non-airport sites	1.06×10^{-3}	946	17.6	1.86×10^{-2}	54	89,861
Airport campus	2.08×10^{-5}	48,137	303.7	6.31×10^{-3}	159	74,924
2035 Proposed						
All cites	1.08×10^{-3}	927	23.9	2.58×10^{-2}	39	177,303
Non-airport sites	1.06×10^{-3}	945	17.8	1.89×10^{-2}	53	91,838
Airport campus	2.08×10^{-5}	48,108	333.5	6.93×10^{-3}	144	85,465

8.6 Environmental Design and Management

8.6.1 A considerable amount of effort is directed towards ensuring that civil aviation is as safe as is reasonably practicable. The primary driving force for these efforts is, of course, the protection of passengers and crew and the material assets of aircraft operators. The very high safety standards of the aviation industry, combined with appropriate land-use planning controls, provide for low risks to third parties in the vicinity of airports. There are limits to the extent to which the risk of aircraft crash can be further mitigated since risks cannot be eliminated entirely from aircraft operations which take place within an established pattern of land use around the airport and along flight paths.

8.6.2 In the unlikely event of a crash, or other emergency situation arising, Dublin Airport will implement its emergency response plan which is regularly reviewed and updated, to ensure that all necessary steps are taken to mitigate the consequences for people and the environment.

8.7 Assessment of Effects and Significance

2022 Permitted Scenario

8.7.1 The individual risk impacts associated with the 2022 Permitted Scenario, as described in Section 8.4, are determined to fall around the border between the "slight effects" and "moderate effects" category, on the basis of the relatively low numbers of people exposed to an individual fatality risk between 1 in 100,000 per annum and 1 in 1,000,000 per annum. Based on the identified number of 93 residential properties within this contour, and the limited number of relatively small commercial sites outside the airport campus (12) within this contour, a few hundred people can be expected to be exposed to these levels of risk. Only one commercial site is found to be located within the 1 in 100,000 per annum risk contour. Given the generally sparse and distributed nature of existing development, this total number of people would not be at risk from any single accident and, as discussed in further detail in the societal risk assessment, the numbers of fatalities associated with a single crash event are expected to be quite limited. For the larger number of road users that pass through the areas covered by the contours, the individual fatality risk is less than 1 in 1,000,000 per annum and the risk falls into the "negligible" category.

8.7.2 When judged against the identified UK societal risk criteria [9, 14, 15, 16], the risks associated with the 2022 Permitted Scenario can be seen to be above the level where the risks would be considered to be negligible but below the "scrutiny level" at which risks would be considered to be significant and requiring specific regulatory scrutiny. The risk can therefore be seen to be within the "moderate effects" category when judged against the UK societal risk criteria, a finding that is consistent with SRI impact significance.

2025 Permitted Scenario

8.7.3 When assessed against the criteria identified in Table 8-1, the individual risks associated with the 2025 Permitted Scenario are determined to fall around the border between the "slight effects" and "moderate effects" category on the basis of the low numbers of people exposed to an individual fatality risk between 1 in 100,000 per annum and 1 in 1,000,000 per annum. Compared with the 2022 Permitted Scenario, the increased contour size is expected to increase the number of residential dwellings within this contour slightly from 93 to 105 and the number of commercial sites outside of the airport campus increases from 12 to 19. Nevertheless, the overall risk categorisation remains essentially the same as for the 2022 Permitted Scenario.

8.7.4 For the 2025 Permitted Scenario, summarised in Table 8-6, the societal risk is predicted to increase broadly in line with the increase in the number of movements. As can be seen from the FN curve shown in Figure 8-5 (*EIAR Volume 3: Figures*), the increase is mainly noticeable for the lower probability, higher fatality events associated with accidents on the airport campus. Nevertheless, the risk remains in the "moderate effects" category when judged against the UK societal risk criteria. The SRI score determined for the 2025 Permitted Scenario is also within the "moderate effects" category identified in the societal risk significance assessment criteria.

2035 Permitted Scenario

8.7.5 When assessed against the criteria identified in Table 8-1, the individual risks associated with the 2035 Permitted Scenario are determined to fall around the border between the "slight effects" and "moderate effects" category on the basis of the low numbers of people exposed to an individual fatality risk between 1 in 100,000 per annum and 1 in 1,000,000 per annum. Compared with the 2022 Permitted Scenario, the increased contour size is expected to increase the number of residential dwellings within this contour slightly from 93 to 109 and the number of commercial sites outside of the airport campus increases from 12 to 19. Nevertheless, the overall risk categorisation remains essentially the same as for the 2022 Permitted Scenario.

8.7.6 For the 2035 Permitted Scenario, summarised in Table 8-6, the societal risk is predicted to increase broadly in line with the increase in the number of aircraft movements. As can be seen from the FN curve shown in Figure 8-5 (*EIAR Volume 3: Figures*), the increase is mainly noticeable for the lower probability, higher fatality events associated with accidents on the airport campus. Nevertheless, the risk remains in the "moderate effects" category when judged against the UK societal risk criteria. The SRI score determined for the 2035 Permitted Scenario is also within the "moderate effects" category identified in the societal risk significance assessment criteria.

2022 Proposed Scenario

8.7.7 The estimated individual risks associated with the 2022 Proposed Scenario are very similar to those identified for the 2022 and 2025 Permitted Scenarios: i.e. around the border between the "slight effects" and "moderate effects" category on the basis of the low numbers of people to an individual fatality risk between 1 in 100,000 per annum and 1 in 1,000,000 per annum. The contour size increases slightly, compared with the 2022 Permitted Scenario but the number of residential dwellings and commercial sites does not increase. Therefore, the overall risk categorisation remains the same as that for the 2022 Permitted Scenario.

8.7.8 The estimated societal risks associated with the 2022 Proposed Scenario are very similar to those estimated for the 2022 and 2025 Permitted Scenarios: i.e. the "moderate effects" category applies.

8.7.9 The estimated risks to ecological designated sites with the 2022 Proposed Scenario are of the same order of magnitude as those for the 2022 Permitted Scenario and therefore the anticipated change in effects is not considered significant. Further details of the risk to ecologically sensitive sites is provided within *Chapter 15: Biodiversity (Terrestrial).*

2025 Proposed Scenario

8.7.10 When assessed against the criteria identified in Table 8-1, the individual risks associated with the 2025 Proposed Scenario are determined to fall around the border between the “slight effects” and “moderate effects” category on the basis of the low numbers of people to an individual fatality risk between 1 in 100,000 per annum and 1 in 1,000,000 per annum. The contour size is expected to increase slightly, compared with the 2025 Permitted Scenario. However, the number of residential dwellings within this contour is expected to increase by only 4 to 109, and the number of commercial sites remains unchanged. Therefore, the overall risk categorisation remains essentially the same as that for the 2025 Permitted Scenario.

8.7.11 For the 2025 Proposed Scenario, summarised in Table 8-10, the societal risk is predicted to increase broadly in line with the increase in the number of movements. As can be seen from the tabulated risk estimates and the FN curve shown in Figure 8-9, the increase in risk is relatively minor and only noticeable for low probability, high fatality events. Therefore, the risk for this scenario remains in the “moderate effects” category when judged against the UK societal risk criteria. The SRI score determined for the 2025 Proposed Scenario is also within the “moderate effects” category identified in the societal risk significance assessment criteria.

8.7.12 The estimated risks to ecological designated sites with the 2025 Proposed Scenario are of the same order of magnitude as the 2025 Permitted Scenario and therefore the anticipated change in effects is not considered significant. An assessment of effects of the proposed Relevant Action is provided in *Chapter 15: Biodiversity (Terrestrial)*.

2035 Proposed Scenario

8.7.13 When assessed against the criteria identified in Table 8-1, the individual risks associated with the 2035 Proposed Scenario are determined to fall around the border between the “slight effects” and “moderate effects” category on the basis of the low numbers of people to an individual fatality risk between 1 in 100,000 per annum and 1 in 1,000,000 per annum. The contour size is expected to increase slightly, compared with the 2035 Permitted Scenario, however, the number of residential dwellings and commercial sites does not increase. Therefore, the overall risk categorisation remains essentially the same as that for the 2035 Permitted Scenario.

8.7.14 For the 2035 Proposed Scenario, summarised in Table 8-10, the societal risk predicted is very similar to the risks predicted for the 2035 Permitted Scenario. Therefore, the risk for this scenario remains in the “moderate effects” category when judged against the UK societal risk criteria. The SRI score determined for the 2035 Proposed Scenario is also within the “moderate effects” category identified in the societal risk significance assessment criteria.

8.7.15 The estimated risks to ecological designated sites with the 2035 Proposed Scenario are of the same order of magnitude as the 2035 Permitted Scenario and therefore the anticipated change in effects is not considered significant. An assessment of effects of the proposed Relevant Action is provided in *Chapter 15: Biodiversity (Terrestrial)*.

Permitted and Proposed Scenarios Comparison

8.7.16 The scale of the increase in risk estimated for the different scenarios considered is most readily evaluated numerically by reference to the expectation values associated with the societal risk. It is also useful to consider more specifically the risk to third parties outside the airport campus when assessing the significance of risk impacts. It is common practice in risk management decision making to place more weight on the involuntary risks to which third parties are exposed than to the voluntary risks to those working at or using a facility that are gaining a direct benefit from it.

8.7.17 Quantitative risk comparisons between different scenarios are presented in Table 8-11. The first key point to note from the risk comparisons shown in the table is that an overall increase in risk, as measured in terms of the expectation value, by around 32% is expected due to the anticipated evolution of activity under the Permitted Scenarios between 2022 and 2035. That overall risk increase is associated with a broadly similar increase in the number of aircraft movements over that period but is offset slightly due to the effect of the changes in the fleet mix on the crash rate per annum. The risk increase for non-airport sites is also estimated to be 32%, which is again similar to the increase in the crash rate per annum. A similar risk increase is predicted between these scenarios for airport sites.

Table 8-11 Between Scenario Societal Risk (Expectation Value) Comparisons

Measure	2022 permitted to 2035 permitted	2022 permitted to 2022 proposed	2025 permitted to 2025 proposed	2035 permitted to 2035 proposed
Movement number increase	42.2%	6.0%	4.0%	0.0%
Crash rate per million movements increase	-9.4%	-1.9%	-1.1%	0.2%
Crash rate per annum increase	29.1%	4.0%	2.8%	0.2%
Non-airport sites risk increase	31.8%	3.6%	3.2%	0.2%
Airport sites risk increase	28.4%	4.2%	2.1%	0.3%
All sites risk increase	31.7%	3.6%	3.1%	0.2%

8.7.18 Risk increases following broadly similar patterns are estimated for the comparisons between the 2022 Permitted and Proposed Scenarios and between the 2025 Permitted and Proposed Scenarios. The risk increase of 3.6% between the 2022 Permitted and 2022 Proposed Scenarios that is predicted is slightly lower than the 6.0% increase in movement numbers, partly due to an anticipated reduction in the average crash rate per movement associated with fleet mix changes. For the comparison between the 2025 Permitted and 2025 Proposed Scenarios a similar pattern is observed. Again, the estimated risk increase of around 3.1% between these two scenarios, compared with the 4.0% increase in movement numbers, can be expected to arise from changes in other factors that influence the magnitude of the risk, including a 1% decrease in the average crash rate per movement. For the 2035 Permitted and 2035 Proposed Scenarios, there is a negligible increase in the risk estimate of 0.2%, reflecting the marginal increase in crash rate per million movements due to small fleet mix changes.

8.7.19 When set against the current level of risk to non-airport sites and the anticipated increase of around 32% that is estimated for the evolution of the Permitted Scenarios between 2022 and 2035, the small increases estimated for the 2025 and 2035 Proposed Scenarios can be seen to be small when set in the context of the increased level of activity that would be supported by the change.

Bird Strike

8.7.20 Bird strike is a well-recognised hazard to aviation. Most bird strikes take place in the vicinity of airports during take-off and landing operations when aircraft are flying at lower altitudes at which birds fly. Following a number of catastrophic bird strike incidents in the earlier years of civil aviation, effective mitigation measures against bird strike have been established and the losses of civil airliners due to bird strike are now very rare events. Bird strike-related losses account for a small proportion of the total of accidental aircraft losses. The control measures fall into two categories as follows:

- Airfield bird hazard management by the adoption of various measures including habitat management to make areas around airports unattractive to birds and active dispersion; and
- Technological measures to make aircraft more resilient to bird strike.

8.7.21 Modern aircraft standards are such that aircraft can usually withstand a bird strike without a catastrophic loss. Aircraft engines are built to withstand the ingestion of individuals of larger species and several individuals of smaller species without failure. Aircraft can fly safely following the loss of one engine. Catastrophic losses in the event of bird strike are therefore limited essentially to events involving multiple strikes of larger species that affect more than one engine. Effective bird hazard management that is based on an understanding of bird movements and the local environment around airports can ensure that such events are very rare.

8.7.22 In accordance with international good practice, bird hazard management measures are in place under the wildlife and habitat management section of the Aerodrome Manual[18] which include the following:

- Bird detection and dispersal activities;
- Habitat management to make the airfield less attractive to birds;
- Land use planning controls in the areas surrounding the airport to avoid bird attraction;
- Bird activity and bird strike recording and monitoring; and
- Action to disrupt bird flight lines and bird concentrations both on the airfield and in the surrounding countryside.

The airport is currently being operated safely and daa have implemented an effective bird hazard management programme.

8.7.23 The proposed Relevant Action will therefore have no significant implications for future bird strike management requirements and bird strike risk. An extended bird hazard management programme formed part of the North Runway Planning Permission and this programme will be implemented when North Runway becomes operational. This programme will be able to effectively address bird hazard management for operations under the proposed Relevant Action. The measures adopted to ensure that the proposed Relevant Action is safe should ensure that any operations from the runway system will be safe in this respect, regardless of the level of activity. It can therefore be concluded that the proposed Relevant Action raises no additional issues in respect of bird strike-related risk than those already addressed by the risk assessment set out earlier.

Wake Vortex

8.7.24 Aircraft in flight creates vortices, circulating currents of air that are shed from the aircraft wings. For the most part, these vortices are dissipated by the effects of the wind and atmospheric turbulence before they reach the ground and, whilst they may more often be heard after an aircraft has passed, they seldom have any physical impact at ground level. Occasionally, however, vortices may persist long enough to make contact with buildings underneath the flight path. In extreme cases, the variation in pressure within these vortices can cause some damage to roofs if tiles or slates are not sufficiently firmly secured. In practice, such events may be encountered due to the passage of larger wide-bodied jets which create the largest vortices and during landing when aircraft are relatively close to the ground.

8.7.25 Wake vortex effects have been extensively studied in the context of operations at other major international airports. It has been established that building damage arising from wake vortices of the magnitudes encountered in practice can typically be eliminated by recovering of roofs in locations that are at risk to strengthen their resistance. Effective preventative measures can therefore be taken to mitigate wake vortex impacts. Once such mitigation measures have been implemented, they will be effective in respect of all future wake vortex events, regardless of frequency.

8.7.26 The issue of wake vortex damage was considered in some detail[19] prior to the North Runway Planning Permission being granted. In granting permission for North Runway, the wake vortex impacts of the number of operations that the permission provides for was evidently considered acceptable by the planning authorities. On that basis, the wake vortex impacts associated with the proposed Relevant Action can be expected similarly to be considered acceptable since it will not involve an increase in operations.

Emergency Fuel Dumping

8.7.27 It was recognised that emergency fuel dumping could theoretically impact on people and properties on the ground. However, the available statistics from the UK[20] indicate that there are very few suspected in-flight fuel loss incidents and the same can be expected to apply in the Republic of Ireland, given that civil aircraft operations in both countries are undertaken in accordance with common international

[18] Airport Direction D-O Wildlife/Habitat, Dublin Airport Aerodrome Manual, Part E – Operating procedures of the Aerodrome, its equipment and safety measures, February 2016

[19] Dublin Airport Environmental Impact Statement Northern Parallel Runway Part 2 – Text Mouchel Parkman December 2004 (Section 17.8)

[20] Dublin Airport Environmental Impact Statement Northern Parallel Runway Part 2 – Text Mouchel Parkman December 2004 (Table 17.7)

operating standards. Those incidents that were identified appear to have been related to relatively minor leakages and resulted in no more than minor impacts in terms of oil deposits.

8.7.28 If emergency fuel dumping takes place, it is expected that this will typically be undertaken in a controlled manner in an appropriately selected area. The jettisoning of fuel is a rare occurrence and will not arise in normal operations. Aircraft have two primary weight limits: the maximum take-off weight and the maximum landing weight, with the maximum landing weight generally being the lower of the two. Aircraft under normal operations will depart at not more than the maximum take-off weight which may, according to operational requirements, be more than the maximum landing weight. Normally, aircraft consume fuel en-route and arrive at their intended destinations below the maximum landing weight. The fuel load on departure will have been chosen to provide for an appropriate landing weight, taking account of the anticipated en-route fuel consumption.

8.7.29 In abnormal, non-routine flight when an aircraft must return to the departure airport or divert en-route, for example due to aircraft technical faults or a passenger medical problem, the aircraft weight may exceed the maximum landing weight at the time a landing is required. It is only under these types of non-routine circumstances that there will be an operational need for jettisoning fuel, in order to reduce the aircraft weight to an appropriate landing weight to allow return to Dublin Airport. If a decision were to be made to jettison fuel, this would normally be undertaken in a controlled manner in consultation with air traffic control such that the impacts on the ground were minimised. In any event, it is expected that fuel would normally be jettisoned under these circumstances at a sufficient altitude (5,000 to 6,000 feet above ground level) to allow for vaporisation and dispersion before reaching ground level.

8.7.30 The Dublin Airport database which dates back to 2014 identified only one relevant fuel dumping event that occurred on 30 September 2018 when the landing gear of an aircraft failed to retract after departure from South Runway (Runway 28L). The crew elected to hold and troubleshoot over the Irish Sea approximately 35 to 40 km to the northeast of the airport (aviation area known as KERAV), and then decided to return to Dublin. Fuel was jettisoned in a controlled manner over the sea at a sufficient altitude to allow for vaporisation and dispersion in that area for 5 minutes to reduce landing weight without any identified significant adverse impacts.

8.7.31 It should also be noted that a significant proportion of aircraft are not fitted with fuel jettison systems. Modern aircraft design and manufacturing allows aircraft to land at maximum take-off weight. In the event of an emergency, requiring a return to the departure airport, these aircraft will circle nearby in order to consume sufficient fuel to get down to the required landing weight limit.

8.7.32 The possibility of a pilot of an aircraft that is fitted with a fuel jettison system deciding to jettison fuel over land at a low altitude in an emergency situation cannot be discounted entirely. However, based on the historical evidence and current operating practices, the jettisoning of fuel under circumstances that would result in any material impact on land in the vicinity of Dublin Airport can be seen to be very unlikely. Overall, it can therefore be concluded that impacts associated with emergency fuel dumping and possible in-flight accidental losses of fuel or oil can be considered to be not significant.

Effects on Other Environmental Receptors

8.7.33 The risk of an accident occurring within the study area in the Proposed Scenario is defined in the previous section in terms of a crash rate per annum. There is no methodology for calculating risk to other environmental receptors amongst the environmental factors defined in the EIA Directive such as watercourses, biodiversity, cultural heritage or material assets. If an accident were to occur, the location of that accident would be a key factor in determining whether there was an impact on other environmental receptors. Given the relative scarcity of these receptors in the study area it is clear that the chances of other environmental receptors being affected by an accident is smaller than the assessed risk of such an accident occurring in the first place. The magnitude of change in risk as a result of the proposed Relevant Action is therefore considered imperceptible and not significant.

8.8 Mitigation and Monitoring

8.8.1 As the risk of major accidents and disasters occurring as a result of the proposed Relevant Action is assessed as not significant, no additional mitigation and monitoring measures are proposed.

8.9 Residual Effects and Conclusions

8.9.1 The assessment indicates that there is a third-party risk impact associated with the operations at Dublin Airport associated with each of the operational scenarios that cannot be regarded to be negligible. Neither should this risk be regarded to be in any way exceptional when assessed against quantitative criteria developed by reference to risks associated with a wide range of activities that are undertaken in modern society. Whilst it is to be expected that there will be some additional risk associated with the proposed Relevant Action, the increase can be seen from the detailed assessment against objective criteria set out earlier in this chapter to be modest when set in the context of the increased level of activity that would be supported and the risk remains well within the level that is considered acceptable.

8.9.2 Accidents cannot be eliminated entirely, and risks are typically accepted in return for the benefits that the activities giving rise to those risks provide. Such risks must be managed to be as low as reasonably practicable and are subject to regulatory scrutiny. As noted earlier in Section 8.2, a very considerable amount of effort is directed towards ensuring the safety of air transport operations, primarily from the perspective of the safety of passengers. These efforts similarly limit the risk to third parties on the ground. In that respect, risks are mitigated effectively by ensuring that aircraft accident rates are minimised such that they can be considered as low as reasonably practicable.

8.9.3 The adverse impacts associated with operations are limited due to the high safety standards of modern civil aviation and further limited by the location of flight paths relative to areas of development which means that risks to third parties on the ground are low in the unlikely event of an aircraft accident on take-off or landing. The majority of crashes can be expected to involve impact in unpopulated areas, given the runway and flight path layout with respect to areas of development. A comparison with other airports indicates[21] that the residual risks associated with operations at Dublin Airport are relatively small when compared with those at some major airport locations. As discussed in Section 8.6, the parallel runway configuration will be operated in a manner that can be expected to further minimise the extent to which third parties are exposed to risks, by concentrating operations at those runway ends that leads to the least exposure.

8.9.4 The residual individual risk impacts for the 2022, 2025 and 2035 Permitted Scenarios have been assessed as being within the “slight” to moderate “effects” category, according to the impact significance classification summarised in Table 8-1. For the Proposed Scenarios, the residual impacts are predicted to increase slightly, in accordance with the anticipated increase in movement numbers but the impact significance is predicted to remain within the same category.

8.9.5 In summary, the assessment indicates that there will be a relatively small increase in the residual risk impacts as a result of the proposed Relevant Action**.** These residual impacts cannot be mitigated and must therefore be tolerated, in accordance with established practice.

8.9.6 The scale of the risk associated with the Proposed Scenario can be put in perspective by a comparison between the risk contours for those operations and the contours identified for the parallel runway configuration in the DoEHLG study, shown in Figure 8-1 (*EIAR Volume 3: Figures*), that informed the Northern Runway planning permission. In the context of PSZ policy, the DoEHLG study contours are considered to be acceptable. The predicted contours for the Proposed Scenario are considerably smaller overall than those identified in the DoEHLG study and may therefore be considered acceptable also.

[21] This judgement is based on experience gained over nearly thirty years by the authors of this report when undertaking similar assessments of numerous other airports across Europe and elsewhere internationally.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections and additions, the chapter has been revised to:

- Address an additional assessment year requested by the Council
- Set out more clearly the scenarios for assessment in the EIAR
- Respond to the latest passenger growth forecasts at Dublin Airport

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

9. Traffic & Transport

9.1 Introduction

9.1.1 This chapter of the revised EIAR reports the findings of an assessment of the potential traffic and transport impact of the proposed Relevant Action, which will be an operational change, to remove the numerical cap on the average number of flights permitted between the hours of 23:00 and 07:00 in the Permitted Scenario, replacing it with an annual night-time noise quota, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00.

9.1.2 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2027 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario. Around 7.1 million additional passengers will have used the airport in in the period 2022-2026 in the Proposed Scenario.

9.1.3 The proposed Relevant Action is an operational change only and involves no demolition or construction phases. Accordingly, this chapter deals with operational traffic only.

9.2 Planning Policy Context

9.2.1 The following lists the relevant policy guidance used to inform the traffic and transport assessment:

- ‘Traffic and Transport Assessment Guidelines’ (Transport Infrastructure Ireland (TII), 2014); and
- Draft ‘Guidelines on the Information to be Contained in Environmental Impact Assessment Reports’ (EPA, 2017).

9.3 Assessment Methodology

9.3.1 The methodology used to assess the potential impact of the proposed Relevant Action for the Assessment Years of 2022, 2025 and 2035 is described in this section.

Assessment Scenarios

9.3.2 Air traffic forecasts and associated annual passenger numbers for 2022, 2025 and 2035 have been developed, as detailed in *Chapter 1: Introduction*. For each of these future years, two scenarios have been assessed:

- Permitted Scenario
- Proposed Scenario

9.3.3 The Permitted and the Proposed Scenarios result in different total annual passenger numbers. Details of the scenarios used in the assessment are summarised in Table 9-1, below.

Table 9-1 Assessment Scenarios and forecast passenger growth

	2022		2025		2035	
	Permitted	**Proposed**	**Permitted**	**Proposed**	**Permitted**	**Proposed**
Flight Profile	Without RA	With RA	Without RA	With RA	Without RA	With RA
mppa	19.6	21	30.4	32	32	32

Local Area Model

9.3.4 A Local Area Model (LAM) of the road network in the vicinity of the Airport has been developed to assess future projects at Dublin Airport, which are discussed in Chapter 22 Future Development Plans. The extent of the LAM is illustrated in Plate 9-1.

Plate 9-1 LAM Extent

9.3.5 Since this model provides forecasts of future year traffic conditions on the road network in the vicinity of the Airport, it was used to assess the potential impact of the proposed Relevant Action in the assessment years.

9.3.6 The LAM has been built using VISUM modelling software. It is calibrated and validated to a 2019 Base (pre Covid-19 pandemic), to the standards outlined in TII's Project Appraisal Guidelines for National Roads Unit 5.1 -Construction of Transport Models[1].

9.3.7 The future year LAM has been informed by a 2031 run of the National Transport Authority's (NTA) Eastern Regional Model (ERM)[2]. The ERM is a multi-modal model and consists of four input elements; Public Transport (PT); Walking and Cycling; Highways; and Demand.

9.3.8 The NTA ERM is centred on Dublin City and comprises 1,854 zones (1,844 internal zones, 7 external zones and 3 special zones). Demand in the model is built up based on CSO POWSCAR, NTA Household Travel Surveys, Transport Surveys and other transport related datasets. The staff demand at the Airport is based on CSO data with distribution based on CSO POWSCAR and NTA Household Surveys. The passenger demand distribution is based on data collected as part of the NTA Airport Surveys for Irish

[1] https://www.tiipublications.ie/library/PE-PAG-02015-01.pdf
[2] https://www.nationaltransport.ie/planning-and-investment/transport-modelling/regional-modelling-system/regional-multi-modal-models/east-regional-model/

residents and a bespoke distribution model that links passengers to hotels/offices based on density for non-Irish passengers

9.3.9 The future year ERM run includes a number of committed public transport schemes such as MetroLink and BusConnects, which have informed the mode share[3] and subsequent traffic flows in the LAM. Effectively, the LAM future year reflects a situation where Airport growth remains static, but background growth and committed public transport and road schemes within the region have been delivered. The future year LAM therefore represents traffic conditions with the current 32 mppa Cap and the Proposed Scenario air traffic forecasts in place. As such, it has been used as a proxy to develop future year traffic flows for the Proposed Scenario.

Extent of Assessment

9.3.10 The extent of the assessment is the external road network in the vicinity of the Airport. The road links included in the assessment, as illustrated in Plate 9-2, below, are:

- M1 Airport Link;
- M1 J1-J2;
- M1 J2-J3;
- M50 J2-J3;
- M50 J3-J4;
- M50 J4-J5;
- R132 North;
- R132 South;
- Old Airport Road;
- R108 North;
- R108 South; and
- Naul Road.

9.3.11 The assessment does not include examination of road accident data.

Assessment Methodology

9.3.12 The following methodology was used to assess the impact of the proposed Relevant Action on traffic:

Proposed Scenario

- Both the 2019 Base (using 2019 pre Covid-19 traffic flows) and 2031 LAM represent traffic conditions where the airport is operating at approximately 32mppa and with a flight profile that is not restricted by the conditions of the previously North Runway Planning Permission operations. As such, they provide a proxy for the Proposed Scenario;
- Since the Airport is projected to achieve 32mppa again in 2025[4] (post Covid-19 pandemic), and the 32mppa Cap is assumed to still be in place in 2035, the growth in traffic flows between the "2019 Base" and 2031 models was used as a proxy to determine the 2025 and 2035 proposed traffic flows for the assessment;
- While 2025 and 2035 Proposed Scenarios assume 32mppa is reached, 2022 assumes 21mppa, reflecting the drop off in passenger numbers after 2019 as a result of the Covid-19 pandemic. A slightly different method was therefore developed to determine the 2022 Proposed Scenario flows:

[3] The percentage of travellers using a particular type of transportation, e.g. walking, cycling, bus, train, car etc.
[4] Dublin Airport Operating Restrictions Quantification of Impacts on Future Growth Updated analysis in response to the ANCA RFI, Mott MacDonald, June 2021

- There are a number of TII permanent traffic counters on the road network in the vicinity of the Airport[5]. Although the coverage of these sites is not as extensive as the surveys undertaken in 2021, they were used to obtain actual traffic flows on a number of adjacent road links from May 2021.
- These flows were compared to flows from the same period in 2019 and 2020 and as a proxy to determine that traffic on the surrounding road network has increased compared to Covid-19 related low levels of 2020, but is still below the levels recorded in 2019, which is the base year of the model.
- Based on the trends outlined above, it was assumed that traffic will continue to grow back towards base year pre Covid-19 pandemic levels. At the same time, passenger will also levels grow towards the 32mppa Cap in 2025.
- A straight-line growth profile was therefore inferred between the recorded 2021 actual flows and the 2025 Proposed Scenario flows, from which an annual growth rate was determined and used to estimate the 2022 Proposed Scenario flows.

Permitted Scenario

- To derive the Permitted Scenario traffic flows[6], the Permitted / Proposed Scenario passenger flight schedules for 2022, 2025 and 2035 were compared, to determine the difference in the number of passengers arriving and departing (airside) on an hourly basis;
- Based on recorded passenger arrival / departures lag times[7], the change in the number of passengers entering and exiting the Airport (landside) on an hourly basis, was determined;
- Based on existing passenger mode shares[8] and existing vehicle occupancies[9], the change in the number of vehicle trips generated by the different schedules was determined; and
- Using recorded origin-destination (O-D) data[10] for existing Airport traffic, the changes in vehicle trips were distributed on to the surrounding road network, on an hourly basis.

Impact of Proposed Relevant Action on Network Capacity

9.3.13 The impact of the proposed Relevant Action is therefore represented by the difference between the Proposed and Permitted Scenario traffic flows.

9.3.14 The difference between the Proposed and Permitted Scenario traffic flows were therefore quantified and compared against the Permitted Scenario traffic flows to assess whether or not they will have significant impacts in terms of road network capacity.

Trip Generation and Distribution

9.3.15 To derive the number of vehicle trips generated by each flight profile a number of steps were followed.

Conversion of Airside Profiles to Landside Profiles

9.3.16 The future year Airport flight profiles, referenced in *Chapter 1: Introduction*, represent the airside passenger arrival and departures i.e. they detail the number of passengers on each flight as well as the arrival/departure times of the flights. To determine the potential traffic and transport impact of the proposed Relevant Action, it was necessary to convert the airside passenger profiles for the Permitted and Proposed Scenarios to landside passenger profiles.

[5] https://trafficdata.tii.ie/gmapbasic.asp?sgid=ZvyVmXU8jBt9PJE$c7UXt6
[6] This is necessary because Proposed Scenario flows are derived from the future year LAM. However, there is no equivalent Permitted Scenario traffic model, so Permitted Scenario flows were determined by pivoting off the proposed model flows based on the difference between Proposed and Permitted flight profiles.
[7] Source: daa Passenger Show Up Profiles and Passenger Leaving Profiles
[8] Source: Mobility Management Update (Dublin Airport, 2019)
[9] Source: Vehicle Occupancy surveys at Dublin Airport, May 2019
[10] Source: Origin-Destination surveys at Dublin Airport, May 2019

9.3.17 To accomplish this, the following average standard passenger dwell times, based on recorded passenger arrival / departures lag times[11], and determined through discussions with The Applicant, were used:

- Passengers enter the Airport on the landside two hours before their flight is due to depart; and
- Passengers exit the Airport on the landside one hour after the flight arrives.

Conversion of Passenger Trips to Vehicle Trips

9.3.18 A number of factors were used to convert passenger trips to vehicle trips, as detailed below.

9.3.19 Mode share data from daa's Mobility Management Update 2019, provided in Appendix 9A and outlined in Table 9-2, was used to determine the number of landside passengers that would use each mode to travel to the Airport for the Permitted and Proposed Scenarios.

Table 9-2 2019 Passenger Mode Share at Dublin Airport

Mode	Percentage of Passengers
Car Private	35%
Car Rental	6%
Bus	35%
Taxi	22%
Other	2%

9.3.20 As well as the mode shares outlined above, recorded vehicle occupancies from surveys undertaken in May 2019, outlined in Table 9-3, were used to determine the number of vehicle movements generated by each profile.

Table 9-3 Recorded Average 2019 Vehicle Occupancies at Dublin Airport

	Location	Average Occupancy (Passengers)
Car	Combined Terminal 1 (T1) & Terminal 2 (T2) kerbside set-down	1.33
	Short-stay car park	1.19
	Long-stay car park	1.46
Taxi	Combined T1&T2 kerbside set-down	1.42

9.4 Current State of the Environment

Existing Traffic Flows

9.4.1 Traffic count data from surveys undertaken in May 2019 was used to determine the existing traffic flows on the surrounding road network. The surveys undertaken were a mixture of Automatic Traffic Counts (ATCs) and Junction Turning Counts (JTCs). ATCs were undertaken for a full 7-day period, and, JTCs were undertaken on a single day recording traffic flows during the periods 05:00 hrs – 10:00 hrs and 16:00 hrs – 19:00 hrs, to cover the background peak periods, as well as the airport-related pre-morning peak. Data from JTCs was extrapolated to develop 24-hour traffic flows based on information from recorded 24-hour flows at appropriate nearby ATCs or TII permanent traffic counters. Plate 9-2 outlines the traffic survey locations. The recorded 2019 two-way background traffic flows are summarised in Table 9-4.

[11] Source: daa Passenger Show Up Profiles and Passenger Leaving Profiles

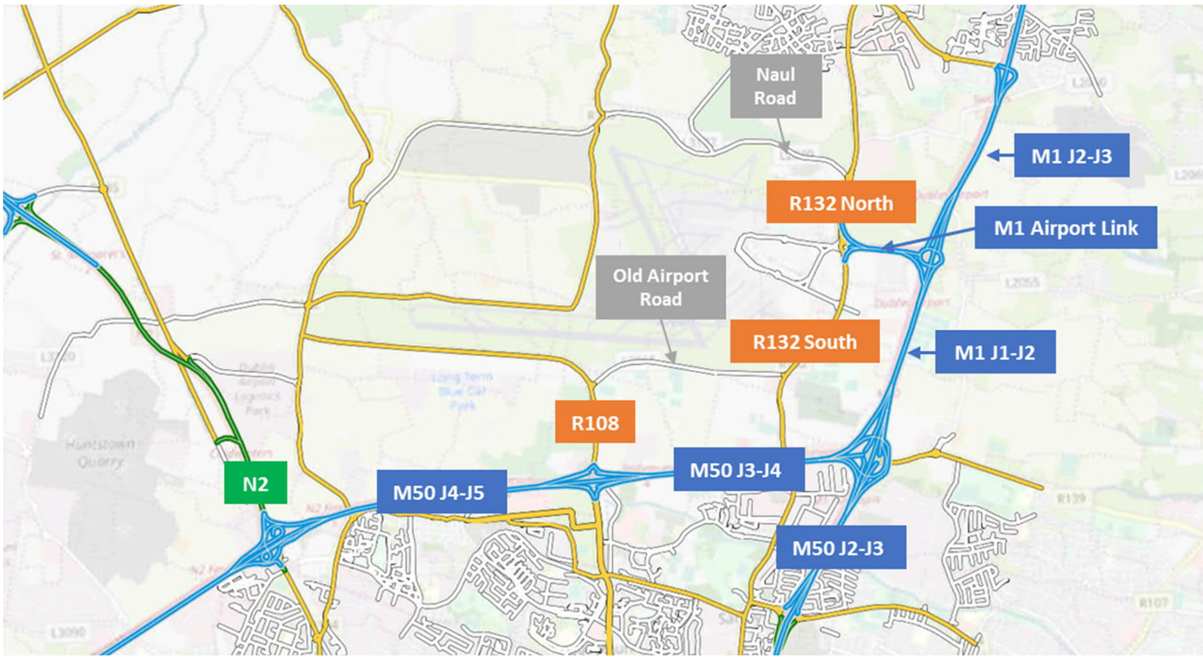


Plate 9-2 Traffic Survey Locations

Table 9-4 Recorded Existing Two-Way Background Traffic Flows on Surrounding Road Network (May 2019)

Hour Commencing	M1 Airport Link	M1 J1-J2	M1 J2-J3	M50 J2-J3	M50 J3-J4	M50 J4-J5	R132 North	R132 South	Old Airport Road	R108	Naul Road
00:00 hrs	1,318	1,755	892	1,110	1,220	1,527	332	407	300	350	203
01:00 hrs	607	965	561	569	639	822	181	239	175	202	111
02:00 hrs	335	521	371	350	369	513	124	152	114	135	76
03:00 hrs	878	994	510	571	633	815	222	296	200	214	136
04:00 hrs	2,022	2,178	860	1,153	1,256	1,632	440	553	397	451	269
05:00 hrs	3,077	3,900	1,966	2,318	2,577	3,004	761	843	614	692	311
06:00 hrs	2,843	8,017	6,575	5,215	7,506	8,006	1,073	967	733	907	603
07:00 hrs	3,464	10,579	8,781	6,553	11,182	11,758	1,633	1,556	1,080	1,165	999
08:00 hrs	4,032	10,415	8,598	5,908	10,509	11,051	1,969	1,792	1,129	1,258	1,236
09:00 hrs	3,745	9,078	6,860	5,784	9,056	9,782	1,680	1,630	1,009	1,150	908
10:00 hrs	3,554	7,831	5,520	5,539	7,602	8,398	1,468	1,450	999	1,089	897
11:00 hrs	3,414	7,586	5,413	5,262	7,225	8,194	1,533	1,571	1,061	1,132	937
12:00 hrs	3,536	7,873	5,718	5,606	7,618	8,469	1,552	1,598	1,104	1,206	949
13:00 hrs	3,825	8,671	6,436	5,958	8,440	9,353	1,817	1,653	1,219	1,423	1,111
14:00 hrs	3,768	8,555	6,389	5,635	8,307	9,118	1,788	1,641	1,178	1,339	1,093
15:00 hrs	3,893	9,857	7,532	6,507	9,752	10,826	1,994	1,692	1,252	1,465	1,219
16:00 hrs	3,928	11,071	9,114	6,591	11,330	12,107	2,194	1,815	1,358	1,511	1,271
17:00 hrs	3,827	10,918	9,397	6,790	10,740	11,436	2,154	1,868	1,380	1,542	1,580
18:00 hrs	3,383	9,695	7,855	6,154	9,233	10,000	1,687	1,319	1,051	1,150	1,130
19:00 hrs	2,648	7,217	5,678	4,984	6,540	7,188	1,304	1,005	755	896	797
20:00 hrs	2,348	5,530	4,049	3,722	4,841	5,411	1,052	895	692	841	643
21:00 hrs	2,197	4,657	3,265	2,883	4,019	4,501	870	747	516	563	532
22:00 hrs	2,051	3,692	2,233	2,341	2,825	3,207	634	664	439	456	388
23:00 hrs	1,910	2,921	1,630	1,906	1,952	2,246	477	561	380	406	292
Total	**66,603**	**154,476**	**116,203**	**99,409**	**145,371**	**159,364**	**28,939**	**26,914**	**19,133**	**21,543**	**17,688**

9.5 Future Receiving Environment

9.5.1 As described previously, the 2022, 2025 and 2035 traffic flows derived from the LAM have been used as a proxy for the proposed traffic flows for the environmental impact assessment. The future receiving environment is represented by the Permitted Scenario traffic flows. Since the Permitted Scenario results in fewer daily passengers, it generates fewer vehicle trips. The reduction in the number of trips generated by the Permitted flight profile compared to the proposed profile was therefore applied to the Proposed Scenario traffic flows to determine the Permitted Scenario traffic flows, which were lower.

9.6 Assessment of Effects and Significance

Vehicle Trip Generation

2022

9.6.1 Using the data outlined in the methodology above, the number of vehicle trips generated by the Permitted and Proposed Scenario flight profiles was calculated. Plate 9-3 below compares the hourly vehicle trips generated by each flight profile in 2022. The corresponding hourly difference in vehicle-trip generation in 2022 is illustrated in Plate 9-4 below.

9.6.2 Plate 9-3 indicates substantially higher vehicle trip generation with the Proposed Scenario flight profile in the periods 00:00 hrs - 02:00 hrs and 04:00 hrs - 05:00 hrs (reflecting average standard passenger dwell times), although there are fewer vehicle trips generated in other periods. The analysis indicated that, over a 24-hour period, there are an additional 2,569 vehicle trips generated by the Proposed Scenario flight profile, reflecting the fact that this profile will result in a higher number of annual passengers in 2022.

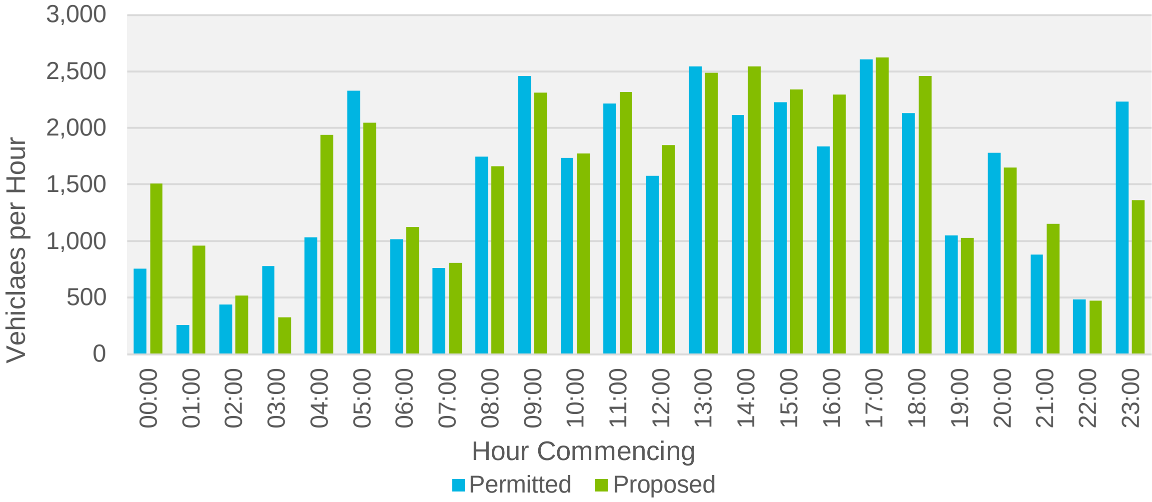


Plate 9-3 2022 Profiles of Vehicle Trips Generated – Permitted & Proposed Scenarios

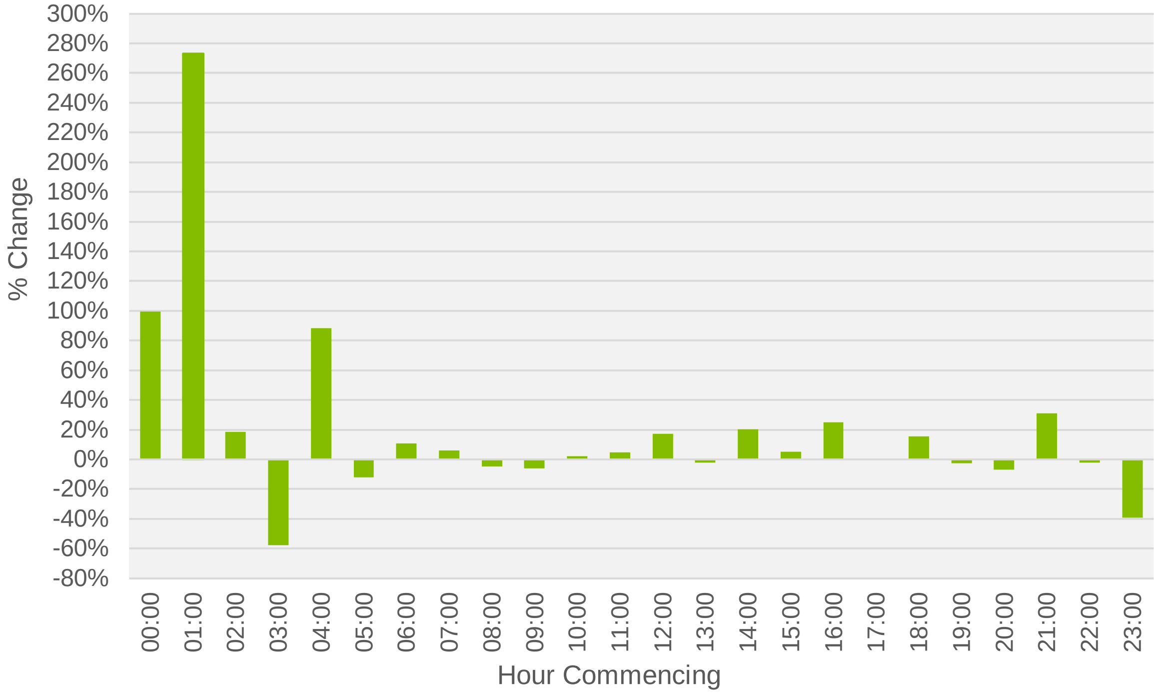


Plate 9-4 2022 Difference in Vehicle Trips Generated – Proposed vs Permitted Scenarios

2025

9.6.3 Plate 9-5 below compares the hourly vehicle trips generated by each flight profile in 2025. The corresponding hourly difference in vehicle-trip generation in 2025 is illustrated in Plate 9-6, below.

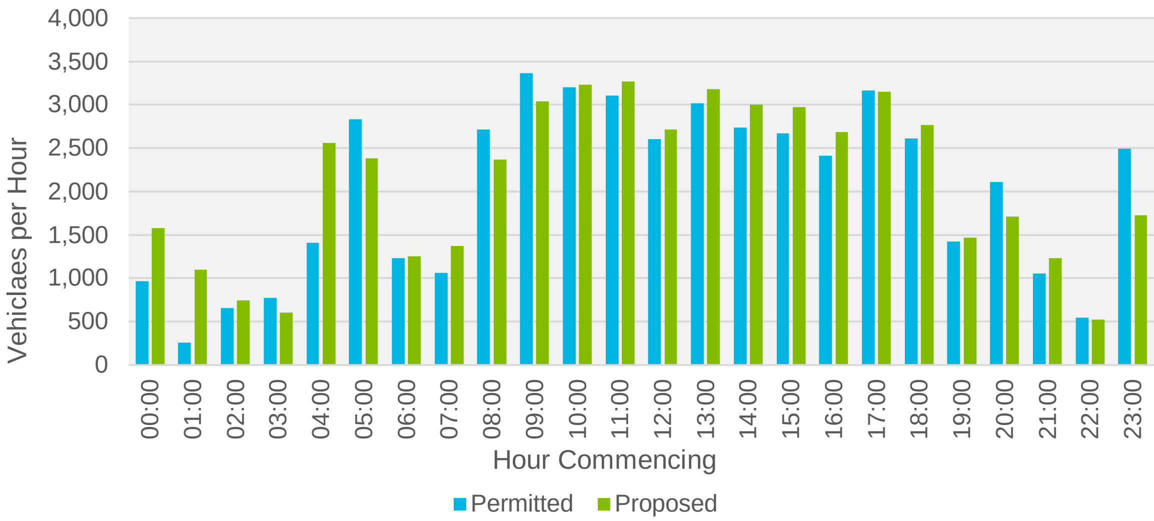


Plate 9-5 2025 Profiles of Vehicle Trips Generated – Permitted & Proposed Scenarios

9.6.4 Plate 9-6 indicates substantially higher vehicle trip generation with the Proposed Scenario flight profile over the periods 00:00 hrs - 02:00 hrs and 04:00 hrs - 05:00 hrs, although there are fewer vehicle trips generated in other hours, as in 2022. The analysis indicates that, over a 24-hour period, there are an additional 2,198 vehicle trips generated by the Proposed Scenario flight profile, reflecting the fact that this profile will result in a higher number of annual passengers in 2025.

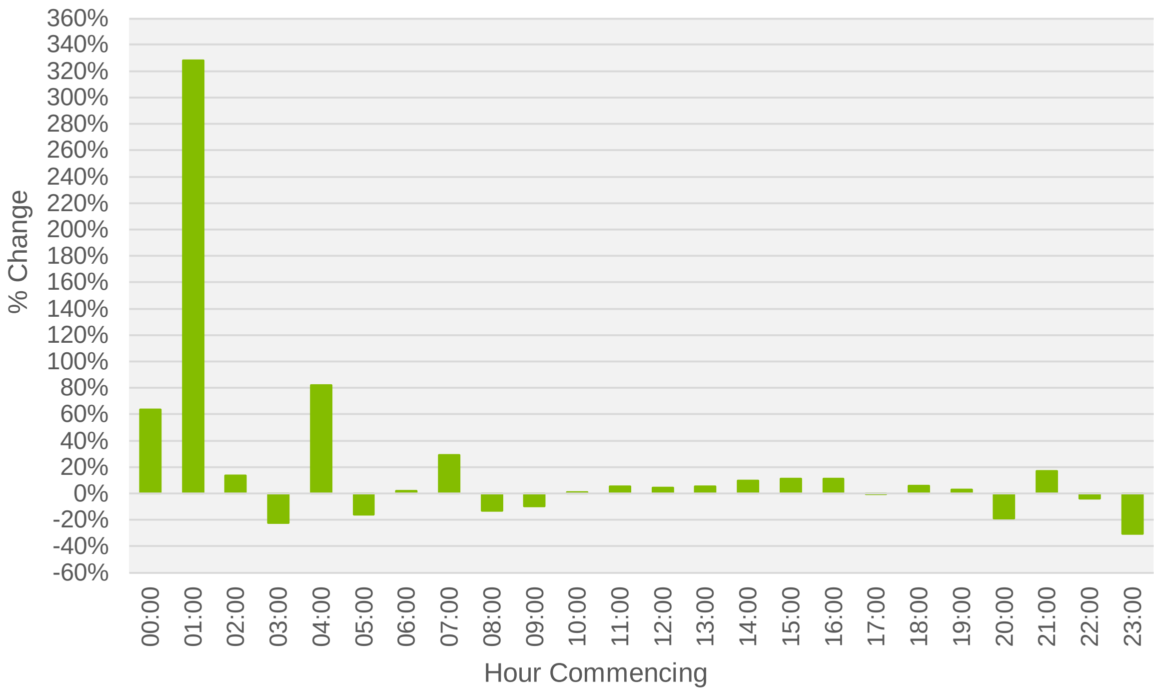


Plate 9-6 2025 Difference in Vehicle Trips Generated – Proposed vs Permitted Scenarios

2035

9.6.5 Plate 9-7 below compares the hourly vehicle trips generated by each flight profile in 2035. The corresponding hourly difference in vehicle-trip generation in 2035 is illustrated in Plate 9-8, below.

9.6.6 Plate 9-8 indicates similar higher vehicle trip generation with the Proposed Scenario flight profile over the periods 00:00 hrs - 02:00 hrs and 04:00 hrs - 05:00 hrs, although there are fewer vehicle trips generated in other hours, as in previous years. The analysis indicates that, over a 24-hour period, there are an additional 230 vehicle trips generated by the Proposed Scenario flight profile, reflecting the fact that both profiles reach the 32mppa Cap in 2035.

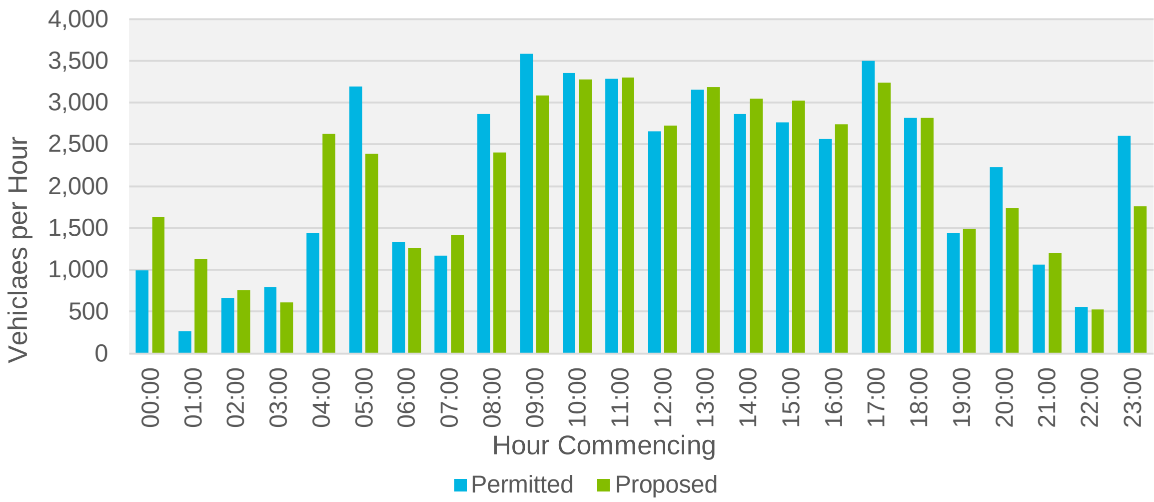


Plate 9-7 2035 Profiles of Vehicle Trips Generated – Permitted & Proposed Scenarios

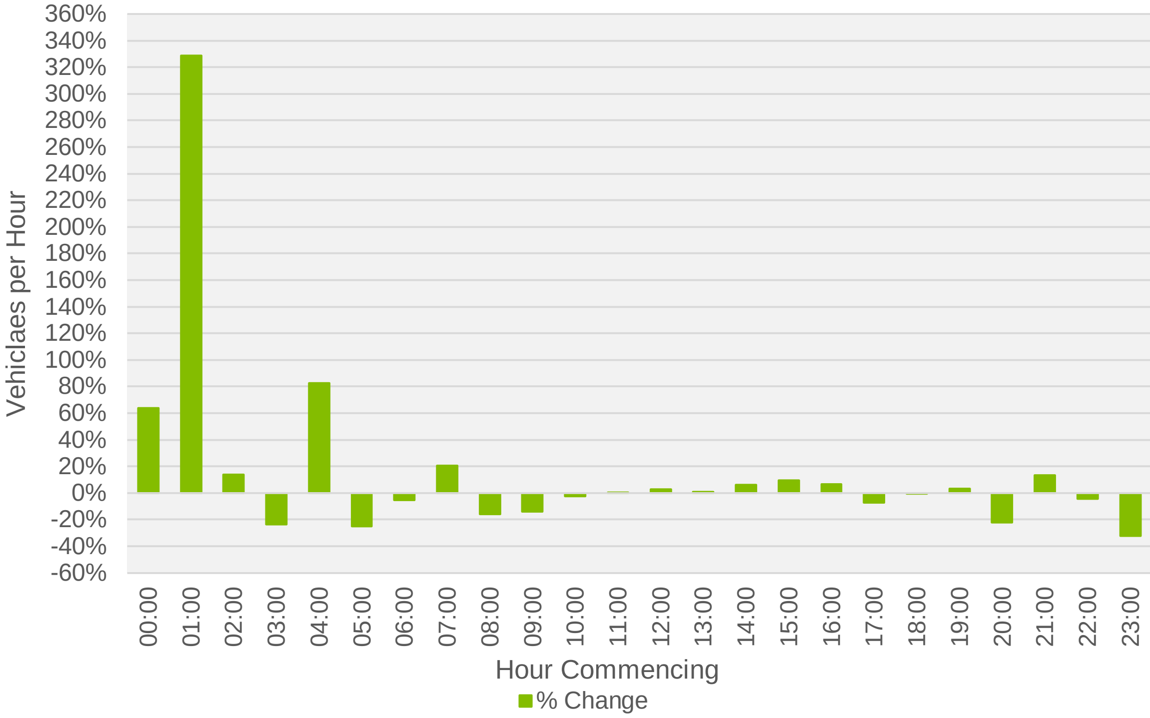


Plate 9.8 2035 Difference in Vehicle Trips Generated – Proposed vs Permitted Scenarios

Vehicle Trip Distribution

9.6.7 The two-way hourly difference in vehicle-trip generation between the Proposed and Permitted Scenarios was distributed on to the road network in the vicinity of the Airport, using passenger O-D data from Automatic Number Plate Registration (ANPR) surveys undertaken in May 2019, as summarised in Table 9-5, 9-6, and 9-7. In these tables, a positive value implies a higher number of trips generated in the Proposed Scenario, while a negative value implies a lower number.

Table 9-5 Estimated Difference in Airport-Generated Two-Way Traffic Between Proposed and Permitted Scenarios 2022

Hour Commencing	M1 Airport Link	M1 J1-J2	M1 J2-J3	M50 J2-J3	M50 J3-J4	M50 J4-J5	R132 North	R132 South	Old Airport Road	R108	Naul Road
00:00 hrs	506	420	86	98	315	412	75	171	143	118	15
01:00 hrs	472	391	80	91	294	384	70	160	133	110	14
02:00 hrs	54	45	9	10	34	44	8	18	15	13	2
03:00 hrs	-303	-251	-52	-59	-189	-247	-45	-103	-86	-70	-9
04:00 hrs	611	507	104	118	380	497	90	207	173	142	18
05:00 hrs	-189	-157	-32	-37	-118	-154	-28	-64	-53	-44	-6
06:00 hrs	72	60	12	14	45	59	11	24	20	17	2
07:00 hrs	30	25	5	6	19	25	4	10	9	7	1
08:00 hrs	-56	-46	-10	-11	-35	-45	-8	-19	-16	-13	-2
09:00 hrs	-99	-82	-17	-19	-62	-81	-15	-34	-28	-23	-3
10:00 hrs	25	21	4	5	15	20	4	8	7	6	1
11:00 hrs	69	57	12	13	43	56	10	23	19	16	2
12:00 hrs	181	150	31	35	113	147	27	61	51	42	5
13:00 hrs	-36	-30	-6	-7	-22	-29	-5	-12	-10	-8	-1
14:00 hrs	289	240	49	56	180	235	43	98	82	67	8
15:00 hrs	79	66	14	15	49	64	12	27	22	18	2
16:00 hrs	307	255	52	59	191	250	45	104	87	71	9
17:00 hrs	10	8	2	2	6	8	1	3	3	2	0
18:00 hrs	220	183	38	43	137	179	33	75	62	51	6
19:00 hrs	-17	-14	-3	-3	-11	-14	-3	-6	-5	-4	0
20:00 hrs	-85	-70	-14	-16	-53	-69	-12	-29	-24	-20	-2
21:00 hrs	182	151	31	35	113	148	27	62	51	42	5
22:00 hrs	-8	-6	-1	-2	-5	-6	-1	-3	-2	-2	0
23:00 hrs	-587	-487	-100	-114	-365	-478	-87	-199	-166	-136	-17
Total	**1,729**	**1,434**	**295**	**335**	**1,076**	**1,407**	**255**	**585**	**488**	**402**	**50**

Table 9-6 Estimated Difference in Airport-Generated Two-Way Traffic Between Proposed and Permitted Scenarios 2025

Hour Commencing	M1 Airport Link	M1 J1-J2	M1 J2-J3	M50 J2-J3	M50 J3-J4	M50 J4-J5	R132 North	R132 South	Old Airport Road	R108	Naul Road
00:00 hrs	412	341	70	80	256	335	61	139	116	96	12
01:00 hrs	567	470	97	110	353	461	84	192	160	132	16
02:00 hrs	60	50	10	12	37	49	9	20	17	14	2
03:00 hrs	-117	-97	-20	-23	-73	-95	-17	-39	-33	-27	-3
04:00 hrs	775	643	132	150	482	631	114	262	219	180	23
05:00 hrs	-304	-252	-52	-59	-189	-247	-45	-103	-86	-71	-9
06:00 hrs	15	12	3	3	9	12	2	5	4	3	0
07:00 hrs	209	174	36	41	130	170	31	71	59	49	6
08:00 hrs	-237	-197	-40	-46	-148	-193	-35	-80	-67	-55	-7
09:00 hrs	-218	-181	-37	-42	-136	-178	-32	-74	-62	-51	-6
10:00 hrs	20	17	3	4	12	16	3	7	6	5	1
11:00 hrs	108	90	18	21	67	88	16	37	31	25	3
12:00 hrs	76	63	13	15	47	62	11	26	21	18	2
13:00 hrs	106	88	18	20	66	86	16	36	30	25	3
14:00 hrs	179	149	31	35	112	146	26	61	51	42	5
15:00 hrs	203	168	35	39	126	165	30	69	57	47	6
16:00 hrs	184	153	31	36	114	150	27	62	52	43	5
17:00 hrs	-14	-12	-2	-3	-9	-12	-2	-5	-4	-3	0
18:00 hrs	101	84	17	19	63	82	15	34	28	23	3
19:00 hrs	28	23	5	5	17	23	4	9	8	7	1
20:00 hrs	-268	-222	-46	-52	-167	-218	-40	-91	-76	-62	-8
21:00 hrs	121	101	21	24	76	99	18	41	34	28	4
22:00 hrs	-14	-12	-2	-3	-9	-11	-2	-5	-4	-3	0
23:00 hrs	-513	-425	-87	-99	-319	-417	-76	-173	-145	-119	-15
Total	**1,479**	**1,227**	**252**	**286**	**920**	**1,203**	**218**	**500**	**418**	**344**	**43**

Table 9-7 Estimated Difference in Airport-Generated Two-Way Traffic Between Proposed and Permitted Scenarios 2035

Hour Commencing	M1 Airport Link	M1 J1-J2	M1 J2-J3	M50 J2-J3	M50 J3-J4	M50 J4-J5	R132 North	R132 South	Old Airport Road	R108	Naul Road
00:00 hrs	428	355	73	83	266	348	63	145	121	99	12
01:00 hrs	584	485	100	113	364	476	86	198	165	136	17
02:00 hrs	63	52	11	12	39	51	9	21	18	15	2
03:00 hrs	-125	-104	-21	-24	-78	-102	-18	-42	-35	-29	-4
04:00 hrs	800	664	136	155	498	651	118	271	226	186	23
05:00 hrs	-540	-448	-92	-104	-336	-439	-80	-183	-152	-125	-16
06:00 hrs	-47	-39	-8	-9	-29	-38	-7	-16	-13	-11	-1
07:00 hrs	163	135	28	32	101	133	24	55	46	38	5
08:00 hrs	-306	-254	-52	-59	-190	-249	-45	-104	-86	-71	-9
09:00 hrs	-336	-279	-57	-65	-209	-273	-50	-114	-95	-78	-10
10:00 hrs	-53	-44	-9	-10	-33	-43	-8	-18	-15	-12	-2
11:00 hrs	9	8	2	2	6	8	1	3	3	2	0
12:00 hrs	47	39	8	9	29	38	7	16	13	11	1
13:00 hrs	23	19	4	4	14	19	3	8	7	5	1
14:00 hrs	122	101	21	24	76	100	18	41	35	28	4
15:00 hrs	179	148	30	35	111	145	26	60	50	41	5
16:00 hrs	117	97	20	23	73	95	17	39	33	27	3
17:00 hrs	-177	-147	-30	-34	-110	-144	-26	-60	-50	-41	-5
18:00 hrs	-3	-3	-1	-1	-2	-3	0	-1	-1	-1	0
19:00 hrs	32	27	5	6	20	26	5	11	9	7	1
20:00 hrs	-331	-275	-56	-64	-206	-269	-49	-112	-93	-77	-10
21:00 hrs	96	79	16	19	60	78	14	32	27	22	3
22:00 hrs	-16	-14	-3	-3	-10	-13	-2	-6	-5	-4	0
23:00 hrs	-568	-472	-97	-110	-354	-463	-84	-192	-160	-132	-17
Total	**159**	**132**	**27**	**31**	**99**	**130**	**24**	**54**	**45**	**37**	**5**

Vehicle Trip Impact

9.6.8 To determine the impact caused by the proposed Relevant Action, the percentage difference in hourly two-way traffic flows between the Permitted Scenario and Proposed Scenario was examined, as outlined in Table 9-8, Table 9-9, and Table 9-10.

9.6.9 The potential of impact of the relevant action was assessed on an escalating scale, as described below.

1. Road links on which the Proposed Scenario traffic flows were less than 5%[12] greater than the equivalent Permitted Scenario flows were considered to be not significant and were excluded from any further analysis

   Proposed scenario traffic flows that were greater than 5% higher than the equivalent Permitted Scenario flows were considered to have the potential to have a significant impact and are therefore highlighted in the tables below. These road links were then subjected to further analysis.

2. Each individual Proposed Scenario traffic flow that was more than 5% greater than its equivalent Permitted Scenario traffic flow was then compared to the maximum individual hourly Permitted Scenario flow on the same road link, in any hour. Where the Proposed Scenario traffic flow was identified to be lower than the recorded maximum hourly Permitted Scenario traffic flow, the impact was considered to be not significant and these road links were excluded from any further analysis.

   Where the Proposed Scenario traffic flow was identified to be greater, this represented a ‘new’ maximum hourly traffic flow on that particular road link and further analysis was undertaken to determine the scale of impact of this new maximum flow.

3. Road link capacity analysis was carried out on any road links where the Proposed Scenario traffic flows represented a new maximum hourly traffic flow, to determine if the road link could cater for the new maximum flow.

9.6.10 The pollutant effects of increased vehicle traffic which may result from the proposed Relevant Action are addressed in *Chapter 10: Air Quality*.

[12] Threshold based on TII Traffic and Transport Assessment Guidelines: https://www.tiipublications.ie/library/PE-PDV-02045-01.pdf

Table 9-8 Percentage Difference in Hourly Two-Way Traffic Flows (Proposed vs Permitted Scenarios) 2022

Hour Commencing	M1 Airport Link	M1 J1-J2	M1 J2-J3	M50 J2-J3	M50 J3-J4	M50 J4-J5	R132 North	R132 South	Old Airport Road	R108	Naul Road
00:00 hrs	267%	45%	19%	13%	51%	51%	37%	122%	129%	94%	10%
01:00 hrs	7%	111%	31%	26%	149%	142%	86%	688%	929%	362%	18%
02:00 hrs	44%	13%	4%	4%	13%	12%	8%	19%	19%	15%	3%
03:00 hrs	-40%	-25%	-14%	-12%	-28%	-28%	-19%	-31%	-34%	-32%	-7%
04:00 hrs	134%	43%	25%	15%	65%	62%	33%	96%	106%	83%	9%
05:00 hrs	-10%	-5%	-3%	-2%	-6%	-6%	-4%	-9%	-9%	-8%	-1%
06:00 hrs	5%	1%	0%	0%	1%	1%	1%	3%	3%	3%	0%
07:00 hrs	2%	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%
08:00 hrs	-3%	-1%	0%	0%	0%	0%	0%	-1%	-2%	-1%	0%
09:00 hrs	-5%	-1%	0%	0%	-1%	-1%	-1%	-3%	-3%	-3%	0%
10:00 hrs	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%
11:00 hrs	4%	1%	0%	0%	1%	1%	1%	2%	2%	2%	0%
12:00 hrs	11%	3%	1%	1%	2%	2%	2%	5%	6%	5%	1%
13:00 hrs	-2%	0%	0%	0%	0%	0%	0%	-1%	-1%	-1%	0%
14:00 hrs	17%	4%	1%	1%	3%	3%	3%	8%	9%	8%	1%
15:00 hrs	4%	1%	0%	0%	1%	1%	1%	2%	2%	2%	0%
16:00 hrs	17%	3%	1%	1%	2%	3%	3%	8%	8%	7%	1%
17:00 hrs	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
18:00 hrs	14%	3%	1%	1%	2%	2%	2%	8%	8%	7%	1%
19:00 hrs	-1%	0%	0%	0%	0%	0%	0%	-1%	-1%	-1%	0%
20:00 hrs	-6%	-2%	-1%	-1%	-1%	-2%	-1%	-4%	-4%	-3%	0%
21:00 hrs	19%	4%	2%	2%	4%	4%	4%	12%	13%	12%	1%
22:00 hrs	-1%	0%	0%	0%	0%	0%	0%	-1%	-1%	-1%	0%
23:00 hrs	-37%	-18%	-9%	-7%	-20%	-21%	-18%	-32%	-34%	-33%	-7%
Total	**4%**	**1%**	**0%**	**0%**	**1%**	**1%**	**1%**	**3%**	**3%**	**3%**	**0%**

Table 9-9 Percentage Difference in Hourly Two-Way Traffic Flows (Proposed vs Permitted Scenarios) 2025

Hour Commencing	M1 Airport Link	M1 J1-J2	M1 J2-J3	M50 J2-J3	M50 J3-J4	M50 J4-J5	R132 North	R132 South	Old Airport Road	R108	Naul Road
00:00 hrs	42%	24%	9%	8%	27%	28%	20%	52%	54%	54%	6%
01:00 hrs	813%	93%	21%	25%	129%	123%	74%	409%	491%	491%	16%
02:00 hrs	21%	10%	3%	4%	12%	10%	7%	15%	16%	16%	2%
03:00 hrs	-11%	-9%	-4%	-4%	-10%	-10%	-7%	-12%	-13%	-13%	-2%
04:00 hrs	58%	41%	19%	16%	65%	61%	31%	90%	100%	100%	9%
05:00 hrs	-9%	-6%	-3%	-3%	-7%	-7%	-5%	-11%	-11%	-11%	-2%
06:00 hrs	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%
07:00 hrs	6%	2%	0%	1%	1%	1%	2%	5%	5%	5%	1%
08:00 hrs	-5%	-2%	0%	-1%	-1%	-2%	-2%	-4%	-5%	-5%	-1%
09:00 hrs	-5%	-2%	-1%	-1%	-2%	-2%	-2%	-4%	-5%	-5%	-1%
10:00 hrs	1%	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%
11:00 hrs	3%	1%	0%	0%	1%	1%	1%	2%	3%	3%	0%
12:00 hrs	2%	1%	0%	0%	1%	1%	1%	2%	2%	2%	0%
13:00 hrs	3%	1%	0%	0%	1%	1%	1%	2%	2%	2%	0%
14:00 hrs	5%	2%	0%	1%	1%	2%	1%	4%	4%	4%	0%
15:00 hrs	5%	2%	0%	1%	1%	2%	1%	4%	4%	4%	0%
16:00 hrs	5%	1%	0%	1%	1%	1%	1%	4%	4%	4%	0%
17:00 hrs	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
18:00 hrs	3%	1%	0%	0%	1%	1%	1%	3%	3%	3%	0%
19:00 hrs	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%
20:00 hrs	-10%	-4%	-1%	-1%	-3%	-4%	-3%	-9%	-9%	-9%	-1%
21:00 hrs	6%	2%	1%	1%	2%	2%	2%	6%	6%	6%	1%
22:00 hrs	-1%	0%	0%	0%	0%	0%	0%	-1%	-1%	-1%	0%
23:00 hrs	-20%	-13%	-5%	-5%	-14%	-15%	-13%	-24%	-26%	-26%	-5%
Total	**2%**	**1%**	**0%**	**0%**	**1%**	**1%**	**1%**	**2%**	**2%**	**2%**	**0%**

Table 9-10 Percentage Difference in Hourly Two-Way Traffic Flows (Proposed vs Permitted Scenarios) 2035

Hour Commencing	M1 Airport Link	M1 J1-J2	M1 J2-J3	M50 J2-J3	M50 J3-J4	M50 J4-J5	R132 North	R132 South	Old Airport Road	R108	Naul Road
00:00 hrs	45%	24%	9%	8%	28%	27%	19%	48%	52%	34%	6%
01:00 hrs	1103%	93%	22%	25%	137%	119%	67%	303%	407%	152%	16%
02:00 hrs	22%	11%	3%	4%	12%	10%	7%	15%	15%	11%	2%
03:00 hrs	-12%	-9%	-4%	-4%	-11%	-11%	-7%	-11%	-13%	-11%	-2%
04:00 hrs	60%	41%	19%	16%	67%	60%	29%	80%	94%	59%	9%
05:00 hrs	-14%	-10%	-5%	-4%	-12%	-12%	-8%	-16%	-18%	-14%	-3%
06:00 hrs	-2%	0%	0%	0%	0%	0%	-1%	-1%	-1%	-1%	0%
07:00 hrs	5%	1%	0%	0%	1%	1%	1%	3%	4%	3%	0%
08:00 hrs	-6%	-2%	-1%	-1%	-2%	-2%	-2%	-5%	-6%	-5%	-1%
09:00 hrs	-8%	-3%	-1%	-1%	-2%	-3%	-2%	-6%	-7%	-6%	-1%
10:00 hrs	-1%	-1%	0%	0%	0%	0%	0%	-1%	-1%	-1%	0%
11:00 hrs	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
12:00 hrs	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%
13:00 hrs	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
14:00 hrs	3%	1%	0%	0%	1%	1%	1%	2%	3%	2%	0%
15:00 hrs	5%	1%	0%	1%	1%	1%	1%	3%	4%	3%	0%
16:00 hrs	3%	1%	0%	0%	1%	1%	1%	2%	2%	2%	0%
17:00 hrs	-5%	-1%	0%	-1%	-1%	-1%	-1%	-3%	-3%	-2%	0%
18:00 hrs	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
19:00 hrs	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%
20:00 hrs	-12%	-5%	-1%	-2%	-4%	-4%	-4%	-10%	-10%	-8%	-1%
21:00 hrs	4%	2%	1%	1%	2%	2%	1%	4%	5%	4%	0%
22:00 hrs	-1%	0%	0%	0%	0%	0%	0%	-1%	-1%	-1%	0%
23:00 hrs	-22%	-13%	-6%	-6%	-16%	-16%	-13%	-24%	-26%	-23%	-5%
Total	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**

9.6.11 As illustrated in the tables above, there are a number of road links and time periods on the surrounding network on which the two-way Proposed Scenario traffic flows are more than 5% higher than the corresponding Permitted Scenario traffic flows. It is noted that none of these instances occur during the background road traffic peak hours (08:00 hrs - 09:00 hrs and 17:00 hrs - 18:00 hrs).

9.6.12 To further assess the potential impact on these road links, each individual Proposed Scenario traffic flow that was more than 5% greater than its equivalent Permitted Scenario traffic flow was compared to the maximum individual hourly Permitted Scenario flow on the same road link, in any hour.

9.6.13 Table 9-11, Table 9-12 and Table 9-13, below summarise this analysis and highlights, for each road link, the largest of the hourly Proposed Scenario traffic flows that were greater than 5% higher than their corresponding Permitted Scenario traffic flow, and compares this to the overall maximum hourly Permitted Scenario flow on the same road link.

Table 9-11 Proposed Scenario Traffic Flows vs Maximum Hourly Permitted Scenario Traffic Flows – 2022

Road Link	Proposed Scenario		Permitted Scenario		Proposed Max. Flow >5% Exceeds Overall Max. Hourly Permitted Flow?
	Largest Hourly Flow (>5% Higher than Permitted Scenario)	Time Period	Max. Overall Hourly Flow	Time Period	
M1 Airport Link	2,072	16:00-17:00	2,230	08:00-09:00	**No**
M1: J1-J2	1,677	04:00-05:00	8,346	08:00-09:00	**No**
M1: J2-J3	539	00:00-01:00	5,604	17:00-18:00	**No**
M50: J2-J3	891	04:00-05:00	5,119	17:00-18:00	**No**
M50: J3-J4	964	04:00-05:00	8,527	07:00-08:00	**No**
M50: J4-J5	1,301	04:00-05:00	9,400	16:00-17:00	**No**
R132 North	367	04:00-05:00	1,785	16:00-17:00	**No**
R132 South	423	04:00-05:00	1,431	17:00-18:00	**No**
Old Airport Road	1,112	16:00-17:00	1,175	17:00-18:00	**No**
R108	1,047	01:00-02:00	1,029	17:00-18:00	**Yes**
Naul Road	220	04:00-05:00	1,771	17:00-18:00	**No**

Table 9-12 Proposed Scenario Traffic Flows vs Maximum Hourly Permitted Scenario Traffic Flows - 2025

Road Link	Proposed Scenario		Permitted Scenario		Proposed Max. Flow >5% Exceeds Overall Max. Hourly Permitted Flow?
	Largest Hourly Flow (>5% Higher than Permitted Scenario)	Time Period	Max. Overall Hourly Flow	Time Period	
M1 Airport Link	4,084	15:00-16:00	4,562	08:00-09:00	**No**
M1: J1-J2	2,205	04:00-05:00	11,109	08:00-09:00	**No**
M1: J2-J3	875	00:00-01:00	9,094	17:00-18:00	**No**
M50: J2-J3	1,117	04:00-05:00	6,422	17:00-18:00	**No**
M50: J3-J4	1,229	04:00-05:00	10,973	16:00-17:00	**No**
M50: J4-J5	1,658	04:00-05:00	12,151	16:00-17:00	**No**
R132 North	479	04:00-05:00	2,363	16:00-17:00	**No**
R132 South	552	04:00-05:00	1,878	17:00-18:00	**No**
Old Airport Road	1,181	16:00-17:00	1,542	17:00-18:00	**No**
R108	588	21:00-22:00	1,560	17:00-18:00	**No**
Naul Road	287	04:00-05:00	1,538	17:00-18:00	**No**

Table 9-13 Proposed Scenario Traffic Flows vs Maximum Hourly Permitted Scenario Traffic Flows - 2035

Road Link	Proposed Scenario		Permitted Scenario		Proposed Max. Flow >5% Exceeds Overall Max. Hourly Permitted Flow?
	Largest Hourly Flow (>5% Higher than Permitted Scenario)	Time Period	Max. Overall Hourly Flow	Time Period	
M1 Airport Link	2,123	04:00-05:00	4,794	08:00-09:00	**No**
M1: J1-J2	2,269	04:00-05:00	11,439	16:00-17:00	**No**
M1: J2-J3	880	00:00-01:00	8,969	16:00-17:00	**No**
M50: J2-J3	1,134	04:00-05:00	6,457	16:00-17:00	**No**
M50: J3-J4	1,237	04:00-05:00	11,187	08:00-09:00	**No**
M50: J4-J5	1,734	04:00-05:00	12,772	16:00-17:00	**No**
R132 North	524	04:00-05:00	2,639	17:00-18:00	**No**
R132 South	609	04:00-05:00	2,121	17:00-18:00	**No**
Old Airport Road	467	04:00-05:00	1,689	17:00-18:00	**No**
R108	502	04:00-05:00	1,699	17:00-18:00	**No**
Naul Road	295	04:00-05:00	1,810	17:00-18:00	**No**

9.6.14 Table 9-12 and Table 9-13 indicate that, although the Proposed Scenario traffic flows are 5% greater than Permitted Scenario traffic flows on certain road links at certain times, in all of these instances in 2025 and 2035, the proposed flows do not exceed the maximum hourly Permitted Scenario flows on the affected road links. In these cases, the impact of the Relevant Action was considered to be not significant and these road links were excluded from any further analysis.

9.6.15 Table 9-11, however, indicates that the Proposed Scenario traffic flow on the R108 between 01:00 hrs and 02:00 hrs, as well as being greater than 5% higher than the corresponding Permitted Scenario traffic flow, is also greater than the overall maximum hourly Permitted Scenario flows on that road link. As such, it represents a 'new' maximum hourly traffic flow on this road link and was therefore subjected to further analysis, as described below.

9.6.16 To further understand and assess the potential impact of the increase on the R108, road link capacity analysis was undertaken. The capacity of the R108 was determined, based on established road link capacity standards[13]. The overall two-way road link flows were then compared to the established road link capacity, as summarised in Table 9-14, to determine the Volume to Capacity (V/C) ratio for each.

9.6.17 Generally, a V/C ratio above 0.80 suggests that a road link is approaching capacity and is likely to experience congestion. A V/C ratio over 1.0 suggests significant congestion and the need for capacity increase or demand management.

9.6.18 The results indicated that the maximum increased Proposed Scenario traffic flow is not sufficiently excessive to cause significant impact on the capacity or operation of the R108.

Table 9-14 Road Link Capacity Analysis

Road Link	Road Link Capacity	Max. Permitted Flow	Max. Hourly Flow >5% Higher than Permitted Scenario	Max. Permitted V/C Ratio	Max. V/C Ratio where Hourly Flow >5% Higher than Permitted
R108	1,800 Veh/Hour	1,029	1,047	**0.57**	**0.57**

9.6.19 Based on the above assessment, it is considered that the proposed Relevant Action will not result in any significant effect on the operation of the surrounding road network.

9.7 Mitigation and Monitoring

9.7.1 The assessment of effects and significance has indicated that the proposed Relevant Action will not result in any significant effect on the operation of the surrounding road network, as such, mitigation and monitoring are considered not to be required.

9.8 Residual Effects and Conclusions

9.8.1 An assessment of the potential road traffic and transport impacts of the proposed Relevant Action was undertaken.

9.8.2 Two-way traffic flows from an existing LAM were used to inform the traffic and transport assessment.

9.8.3 Flight profiles and associated annual passenger numbers for 2022, 2025 and 2035 have been developed. For each of these future years, two scenarios have been assessed:

- Permitted Scenario; and
- Proposed Scenario.

9.8.4 The LAM has a base year of 2019 and a future year of 2031. Both years assume 32mppa at the Airport and the proposed passenger profile. As such, the LAM represents the Proposed Scenario.

9.8.5 Differences between the 2019 Base and 2031 modelled two-way flows were used to interpolate the 2025 and 2035 Proposed Scenario traffic flows.

9.8.6 Differences between recorded 2021 actual flows and interpolated 2025 flows were used to interpolate the 2022 Proposed Scenario traffic flows.

9.8.7 Since the Permitted Scenario results in fewer daily passengers, it generates fewer vehicle trips. The reduction in trip generation from Proposed to Permitted flight profiles was therefore applied to the Proposed Scenario traffic flows to determine the Permitted Scenario traffic flows, which were lower.

[13] *DMRB Volume 5, Section 1, Part 3, TA 79/99 Traffic Capacity of Urban Roads* (TII)

9.8.8 A trip generation exercise was undertaken to determine the difference between the proposed and Permitted Scenarios in terms of vehicle trips on the surrounding road network. This exercise utilised:

- Permitted and Proposed Scenario flight schedules for 2022, 2025 and 2035;
- Established passenger lag/dwell times[14];
- Recorded passenger landside mode shares[15] and vehicle occupancies[16]; and
- Recorded O-D data for passengers travelling to the Airport[17].

9.8.9 The Permitted and Proposed Scenario traffic flows were then compared to determine the percentage increase/decrease caused by the proposed Relevant Action.

9.8.10 The assessment indicated that:

- Broken down by hour, the proposed Relevant Action will result in an increase in two-way traffic flows on some adjacent road links, and a decrease on others. For the majority of the 24-hour period, increases in traffic flows caused by the proposed Relevant Action were estimated to be less than 5%, comparing the Proposed Scenario and Permitted Scenario, and are therefore considered to have a slight effect;
- During some hourly periods, however, significant increases in traffic (i.e. greater than 5%) would occur on a number of road links in the vicinity of the Airport. These were generally during the early morning period (04:00 hrs to 05:00 hrs), when background traffic flows are low and, as such, more susceptible to large percentage increases as a result of additional trip generation. None of the increases greater than 5% occurred during the background road traffic peak periods (08:00 hrs – 09:00 hrs and 17:00 hrs – 18:00 hrs);
- Further analysis indicated that in 2025 and 2035, for all of the instances where the estimated increase was greater than 5%, the Proposed Scenario traffic flows were less than the overall maximum hourly Permitted Scenario traffic flows on those road links during any other time period. As such, in these instances, the proposed Relevant Action is considered to have a slight effect; and
- In 2022, the Proposed Scenario traffic flow on the R108 during the period 01:00 hrs – 02:00 hrs was shown to exceed the maximum hourly Permitted Scenario traffic flow at any time on the same road link. Further capacity analysis, however, indicated that the maximum V/C ratio on the R108 was the same for both the proposed and Permitted Scenarios, with both estimated to operate well within practical capacity. In this regard, the proposed Relevant Action is considered to have a slight effect.

9.8.11 Taking the above into account, it is considered that the proposed Relevant Action will not result in any significant impact on the surrounding road network. No mitigation measures are therefore required as a result of the Relevant Action.

[14] Source: daa Passenger Show Up Profiles and Passenger Leaving Profiles
[15] Source: Mobility Management Update (Dublin Airport, 2019)
[16] Source: Vehicle Occupancy surveys at Dublin Airport, May 2019
[17] Source: Origin-Destination surveys at Dublin Airport, May 2019

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections and additions, the chapter has been revised to:

- Address an additional assessment year requested by the Council
- Amend and clarify the baseline traffic forecasts for the assessment
- Set out more clearly the scenarios for assessment in the EIAR
- Respond to the latest passenger growth forecasts at Dublin Airport

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the proposed Relevant Action

10. Air Quality

10.1 Introduction

10.1.1 This chapter of the EIAR considers the likely effects on air quality as a result of the proposed Relevant Action. The impact of the proposed Relevant Action will be an operational change to remove the numerical cap on the average number of flights permitted between the hours of 23:00 and 07:00 in the Permitted Scenario, replacing it with an annual night-time noise quota between 2330 and 0600, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00.

10.1.2 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2027 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario. Around 7.1 million additional passengers will have used the airport in in the period 2022-2026 in the Proposed Scenario.

10.1.3 The proposed Relevant Action therefore has the potential for a short-term impact on local air quality at nearby sensitive receptors during the operational phase, primarily due to the proposed change in aircraft movements but also including changes in traffic flow on the local road network. A full description of the proposed Relevant Action is provided in EIAR *Chapter 2: Characteristics of the Project* and *Chapter 3: Need for the Project.* As the proposed Relevant Action entails no changes to the design or construction methodology of North Runway, there will be no construction phase environmental effects.

Scope of Assessment

10.1.4 The assessment focuses on the impact and effect of changes to long-term and short-term concentrations of nitrogen dioxide (NO_2) and Particulate Matter (PM_{10} and $PM_{2.5}$), considered the pollutants of greatest concern from aircraft emissions, at nearby human health sensitive receptors. Consideration is also given to the potential for odour nuisance associated with aircraft operations, following it being raised as a concern during public consultation.

10.1.5 The air quality assessment is predominantly concerned with the impact and effect of emissions associated with a change in aircraft movements. However, the proposed Relevant Action will also have an effect on traffic movements on the public road network, and where this occurs to the extent that it could influence the determination of significance, the combined impact of aircraft and road traffic emissions has been considered. Therefore, the study area (see Figure 10-1, *EIAR Volume 3: Figures*) covers an area to include the locations of maximum combined impact from aircraft and road traffic emissions, extending 6km from north to south and 12km from east to west. These emission sources combined account for NO_2, PM_{10} and $PM_{2.5}$ concentrations, while hydrocarbon (HC) emissions have been derived based on the anticipated aircraft operations in idle mode (HC not being generally associated with emissions from aircraft under motion).

10.1.6 Following the compilation of a comprehensive emissions inventory of all significant airport sources of emissions to air, including airside and landside sources, representative air quality sensitive receptors within the study area, such as residential properties, schools and hospitals, have been identified on Figure 10-1 (*EIAR Volume 3: Figures*). This information has been incorporated within an ADMS (Advanced Dispersion Modelling System) airport dispersion model, along with road traffic emissions data, to predict future changes to air quality between the Permitted and Proposed Scenarios, which relate to the amendment of condition no. 3(d) and the replacement of condition no. 5 of the North Runway Planning Permission (discussed in detail in EIAR *Chapter 2: Characteristics of the Project* and *Chapter 3: Need for the Project*), for the following Assessment Years:

- 2022;

- 2025; and
- 2035.

10.1.7 The assessment takes into account relevant national policies, and statutory guidance. Where guidance and/or data required to inform the assessment is not available in Ireland, representative data sources and guidance published within the UK have been used and referred to.

10.2 Legislation and Planning Policy Context

National Legislation

Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011)

10.2.1 The Air Quality Standard Regulations 2011[1] implement the European Union Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe (CAFE)[2] and designate the EPA as the competent authority responsible for assessing ambient air quality in the territory of the State. The standards also establish Limit Values for concentrations of certain pollutants in ambient air, to prevent or reduce harmful effects on human health and the environment.

10.2.2 The Air Quality Limit Values as set out in the regulations and considered within this assessment are provided in Table 10-1.

Table 10-1: Air Quality Limit Values

Pollutant	Averaging Period	Concentration ($\mu g/m^3$)	Permitted Exceedances
NO_2	Annual mean	40	None
	1-hour mean	200	Not to be exceeded more than 18 times a year
PM_{10}	Annual mean	40	None
	24-hour mean	50	Not to be exceeded more than 35 times a year
$PM_{2.5}$	Annual Mean	25	None

Air Pollution Act 1987 (Number 6 of 1987)

10.2.3 The Air Pollution Act 1987 provides local authorities with the primary responsibility for monitoring air quality, including the nature, extent, and effects of emissions within their administrative area.

10.2.4 Local authorities are also given powers under the Act to take measures to prevent or limit air pollution in their administrative area. Owners of certain industrial activities must have an air pollution licence from either the local authority or the EPA, to run industries that are responsible for emissions.

Environmental Protection Agency Act 1992 (Number 7 of 1992)

10.2.5 The Environmental Protection Agency Act 1992 established the remit of the environmental regulator in Ireland to make further and better provision for the protection of the environment and the control of pollution.

10.2.6 Amongst the many duties of the EPA is the monitoring of local air quality across the country, including multiple locations in the Dublin region, and the regulation of licenced activities with emissions to air.

[1] Ireland's Statutory Instruments (2011); S.I. No. 180/2011 - Air Quality Standards Regulations 2011.
[2] European Parliament and Council (2008); Ambient Air Quality and Cleaner Air for Europe (CAFE) EU Directive 2008/50/EC.

Protection of the Environment Act 2003

10.2.7 The Protection of the Environment Act 2003 was implemented to account for the European Union Directive 96/61/EC, of 24 September 1996, concerning Integrated Pollution Prevention and Control (and amendments); this amends the Environmental Protection Agency Act 1992.

National Planning Policy

National Aviation Policy (2015)

10.2.8 The National Aviation Policy sets out the Government's goals and commitments to the aviation industry in Ireland[3]. Whereas the focus of this Policy in on the reduction of Greenhouse Gases (GHGs), the following points are of relevance to this assessment:

"Ireland is committed to working with its EU and international partners to mitigate the impacts of aviation on the environment and facilitate the sustainable growth of the sector

…

2.3.1 Ireland will work with European partners to achieve the development of global international standards for market based measures on aircraft emissions.

2.3.2 Ireland will develop its aviation emissions reporting capability in support of ICAO's evolving environmental policies.

…

2.3.4 Ireland will encourage research and development in Ireland of clean engine technologies and sustainable fuels."

Project Ireland 2040

10.2.9 Project Ireland 2040 is the Government's long-term overarching strategy for future development and infrastructure in Ireland[4]. It consists of several documents, including the National Planning Framework, which is the Government's high-level strategic Plan for shaping the future growth and development of Ireland up to 2040.

The National Planning Framework includes the following overarching aims with regards to National Policy Objective 52, that is relevant to this assessment:

"Creating a Clean Environment for a Healthy Society:

…

Promoting Cleaner Air: Addressing air quality problems in urban and rural areas through better planning and design."

10.2.10 For National Policy Objective 52 itself it is stated that:

"The planning system will be responsive to our national environmental challenges and ensure that development occurs within environmental limits, having regard to the requirements of all relevant environmental legislation and the sustainable management of our natural capital."

10.2.11 The National Planning Framework includes National Policy Objective 64, which stresses the importance of improving ambient air quality:

"National Policy Objective 64: Improve air quality and help prevent people being exposed to unacceptable levels of pollution in our urban and rural areas through integrated land use and spatial planning that supports public transport, walking and cycling as more favourable modes of transport to the private car, the promotion of energy efficient buildings and homes, heating systems with zero local emissions, green infrastructure planning and innovative design solutions."

10.2.12 Project Ireland 2040 also includes the Government's National Development Plan[5]. This document is focused on Ireland's long-term economic, environmental and social progress up to 2027, and references

[3] Department of Transport, Tourism and Sport (2015); National Aviation Policy
[4] Department of Housing, Planning and Local Government (2018); National Planning Framework 2040.
[5] Government of Ireland (2017); National Development Plan 2018-2027.

improvements in air quality as an additional benefit to improving energy efficiency for the primary purpose of reducing carbon emissions.

Local Planning Policy

Fingal Development Plan 2017-2023

10.2.13 The Fingal Development Plan 2017-2023 (Development Plan) sets out Fingal County Council's (FCC) proposed policies and objectives for the development of the County over the period of 2017 to 2023[6]. The Development Plan seeks to develop and improve, in a sustainable manner, the social, economic, environmental and cultural assets of the county.

10.2.14 The Development Plan includes multiple objectives that target the improvement of ambient air quality, including:

*"**Objective AQ01** - Implement the provisions of EU and National legislation on air, light and noise and other relevant legislative requirements, as appropriate and in conjunction with all relevant stakeholders."*

10.2.15 The Development Plan states that FCC has adopted the Dublin Regional Air Quality Management Plan (DRAQMP):

*"**Objective AQ02** - Implement the recommendations of the Dublin Regional Air Quality Management Plan (or any subsequent plan) and any other relevant policy documents and legislation in order to preserve good air quality where it exists or aim to improve air quality where it is unsatisfactory."*

10.2.16 With relation to the DRAQMP, the Development Plan states that the long-term monitoring of air quality at Dublin Airport and nearby major roads should continue and that as the airport expands, the objectives of the DRAQMP and its monitoring network should be revised to ensure appropriate coverage.

10.2.17 Some of the Development Plan objectives also relate specifically to Dublin Airport. Of relevance to air quality is:

*"**Objective DA18** - Ensure that every development proposal in the environs of the Airport takes account of the current and predicted changes in air quality, greenhouse emissions and local environmental conditions."*

Dublin Airport Local Area Plan 2020

10.2.18 The Dublin Airport Local Area Plan (LAP) sets out how airport growth can be achieved sustainably[7].

10.2.19 The LAP includes the following objectives relating to air quality, not including those already listed within the Development Plan:

*"**Objective AQ04** - Take account of the global and local impacts of aviation as well as the likelihood of international action to limit greenhouse gas emissions from aviation through action at the International Civil Aviation Organisation (ICAO)as mandated in the Kyoto Protocol when evaluating any proposals to significantly increase the use of Dublin Airport."*

*"**Objective AQ05** - Undertake a review of existing air quality monitoring (and associated appropriate remedial action in the case of breaches) within and surrounding the Airport (including changes in Particulate Matter (PM) at relevant locations). Where relevant, such a review should identify additional monitoring proposals, remedial actions and implementation systems – such needs shall be provided for by Fingal County Council and/or daa."*

10.2.20 The LAP also acknowledges that the Airport impacts on air quality from the following activities:

- Emissions associated with ongoing operations of the Airport, such as aircraft and support services, and surrounding areas as a result of traffic accessing the Airport.

[6] Fingal County Council (FCC) (2017); Fingal Development Plan 2017 – 2023.
[7] Fingal County Council (2020); Dublin Airport Local Area Plan 2020

Dublin Regional Air Quality Management Plan 2009-2012

10.2.21 The DRAQMP[8] is referred to in both the Development Plan and the LAP. The DRAQMP acknowledges that NO_2 and PM_{10} are the pollutants of most concern in the Dublin region, which covers the areas of Dublin City Council, Dun Laoghaire / Rathdown, Fingal County, Dublin City and South Dublin.

10.2.22 It lists the following strategies that local authorities in the region should consider to improve local air quality:

- Improve coordination of efforts and build on the good work to date;
- Mainstream air quality management into all major Policy areas;
- Strengthen evidence-based decision making by improving how information is shared on air quality;
- Lead by example with measures related to local authority activities that will reduce emissions;
- Identify and prioritise tackling main potential threats to air quality; and
- Provide clear time-bound criteria for the achievement of objectives.

10.2.23 Following the publication of the Air Quality Management Plan 2009-2012, a subsequent Air Quality Management Plan was published focusing on improving levels of NO_2 in the Dublin region. This document was prepared following a reported exceedance of annual mean air quality standard for NO_2 within the Dublin region in 2010[9].

10.2.24 The document analyses and considers the reason for the exceedance and responsible sources, as well as summarising existing (at the time of publication) national, regional and local Policy for improving air quality.

10.2.25 It goes on to suggest measures that could be implemented in the future to improve air quality conditions, nationally, regionally and locally. These include improved emissions technology within the power sector, the publication of regional development plans with greater emphasis on improving air quality and the promotion and implementation of sustainable transport.

Other Relevant Policy, Standards and Guidance

Airport Air Quality Manual 2016

10.2.26 Published by the International Civil Aviation Organization (ICAO), the Airport Air Quality Manual[10] provides internationally recognised guidance on how to compile emissions inventories associated with airport sources and how to use dispersion modelling to estimate the contribution of these emissions to local ambient concentrations.

10.2.27 This guidance has been used both for the compilation of the emissions inventory and to inform dispersion modelling method, as set out in Technical Appendix 10A.

Local Air Quality Management Technical Guidance 2016

10.2.28 The UK Department for Environment, Food and Rural Affairs published their Local Air Quality Management Technical Guidance[11] to assist local authorities in the UK with their responsibilities to review and assess local air quality in their administrative areas. The technical guidance provides methods and tools that can be applied for air quality assessment, including an approach to dispersion model verification and the conversion of nitrogen oxides (NO_X) to NO_2 for road traffic sources.

[8] Dublin City Council (2009); Dublin Regional Air Quality Management Plan 2009-2012
[9] Dublin Regional Councils (2010), Dublin Regional Air Quality Management Plan for Improvement in Levels of Nitrogen Dioxide in Ambient Air Quality. https://www.dlrcoco.ie/sites/default/files/atoms/files/media7432en.pdf
[10] International Civil Aviation Organization (ICAO) (2016); Carbon Offsetting and Reduction Scheme for International Aviation.
[11] Department for Environment, Food and Rural Affairs UK (2018); Local Air Quality Management Technical Guidance (TG16).

Land-Use Planning & Development Control: Planning for Air Quality 2017

The Institute of Air Quality Management and Environmental Protection UK provide guidance for the consideration of air quality within the land-use planning and development control process[12]. The guidance sets out a means of describing air quality impacts based on the relationship between the magnitude of change and total pollutant concentration experienced, relative to the air quality standards. Therefore, a smaller magnitude of change could potentially have a greater impact, where total concentrations are close to or above an air quality standard, when compared to a larger magnitude of change, where total concentrations are below and not at risk of exceeding the standard.

10.3 Assessment Methodology

10.3.1 This section of this EIAR Chapter presents the following:

- Information sources that have been consulted throughout the preparation of this chapter;
- Details of consultation undertaken concerning air quality and odour;
- The methodology for the assessment of air quality effects, including the criteria for the determination of the sensitivity of receptors and magnitudes of change from the Permitted Scenario;
- An explanation as to how the identification and assessment of potential air quality effects has been reached; and
- The significance criteria and terminology for the assessment of air quality residual effects.

10.3.2 The following sources of information with relation to the proposed Relevant Action have been reviewed and form the basis of the assessment of likely significant effects on air quality:

- Detailed plans and airport building elevations;
- Current and forecast data was supplied by the Applicant for the following sources:
  - Aircraft emissions (main engines operating within the Landing and Take-off (LTO) Cycle and the use of aircraft Auxiliary Power Units (APUs) (airside)
  - Aircraft handling emissions (Ground Support Equipment (GSE) including airside vehicles and mobile ground power units) (airside)
  - Infrastructure and stationary sources (such as energy plant) (airside); and
  - Vehicle traffic sources (landside)
- Local air quality monitoring data sourced from the Applicant and the EPA; and
- Hourly sequential meteorological data sourced from Met Eireann.

Methodology for Baseline Conditions and Sensitive Receptors

10.3.3 The study area (see Figure 10-1, *EIAR Volume 3: Figures*) has been defined based on ICAO's Airport Air Quality Manual taking into account a geographical area where there is a potential for a change in air quality with the proposed Relevant Action and the extent of the road transport network considered. The study area includes all areas where the combined impact of aircraft emissions and road traffic emissions is likely to have the maximum effect, extending 6km from north to south and 12km from east to west.

10.3.4 2018 air quality conditions have been identified and reviewed for both total and background concentrations for all of the pollutants of interest. Further information is provided in Section 10.4.

[12] Environmental Protection UK (EPUK) – Institute of Air Quality Management (IAQM), (2017); Land-Use Planning & Development Control: Planning for Air Quality.

10.3.5 Sensitive receptors have been identified according to National Roads Authority Guidance[13]. Receptors are classified as locations where members of the public are likely to be regularly present. These include residential housing, schools, hospitals, places of worship, sports centres and shopping areas. In selecting relevant receptors for assessment, consideration has been given to locations that are most likely to be affected by the operation of the North Runway and wider runway system, and the impact of addition traffic movements on the public road network.

10.3.6 Further details concerning sensitive receptors can be found in Section 10.4.

Methodology for Construction Effects

10.3.7 The proposed Relevant Action will result in no changes to the design or construction methodology of the North Runway. On that basis, the assessment of construction phase impacts on air quality does not require further assessment.

Methodology for Operational Effects

10.3.8 The contribution of emissions associated with the permitted and Proposed Scenarios in 2022, 2025 and 2035 have been predicted using the detailed methodology described in Technical Appendix 10A, including the selection of air quality sensitive receptors, representative meteorological data, representative background pollutant concentration data and the treatment of emission sources within the model. This has included the contribution of emissions from modelled airside sources (as summarised in Section 10.3.2) and landside road traffic emissions.

10.3.9 Operational effects have been determined based on the descriptors included within the guidance (see Table 10-2) issued by Environmental Protection UK and the Institute of Air Quality Management. The impact descriptors express the magnitude of incremental change as a proportion of the relevant assessment level and then examine this change in the context of the new, total concentration, and its relationship to the assessment criterion. More information can be found in "Significance Criteria" below.

10.3.10 Some key aspects of the assessment method are summarised below and described in more detail in Technical Appendix 10A.

Conversion of NO_x to NO_2

10.3.11 The proportion of NO_2 in NO_x varies greatly with location and time according to several factors, including the amount of oxidant available and the distance from the emission source. NO_x concentrations are expected to decline in future years due to falling emissions associated with improving and evolving emissions technology, however this would mean that the NO_2/NO_x ratio will likely increase. Also, a trend has been noted in recent years whereby roadside NO_2 concentrations have been increasing at specific roadside monitoring sites, despite emissions of NO_x falling. The direct NO_2 phenomenon is having an increasingly marked effect at many urban locations and must be considered when undertaking modelling studies.

10.3.12 For this assessment, modelled road-NO_x concentrations were converted to total NO_2 concentrations using Defra's 'NO_x to NO_2' calculator (V7.1), released in April 2019[14]. This calculator requires an estimate of the proportion of primary NO_2 (f-NO_2). This was calculated individually for each receptor based on the relative contribution of different sources to total locally generated NO_x concentrations. For road vehicles, representative values of f-NO_2 are contained within the 'NO_2 from NO_x calculator'. For aircraft, f-NO_2 values obtained from the National Atmospheric Emissions Inventory were used. For all other sources (APUs, GSE and terminal boiler plant), f-NO_2 values of either 5% or 15% were assumed.

10.3.13 The year, region and background NO_2 concentrations were specified in the calculator, as was the selection of "Newry and Morne" as a local authority to derive default values. It was also necessary to specify the "representative traffic mix"; this was assumed to be "all UK traffic". These assumptions have been based on guidance issued by National Roads Authority, which suggests using values for Northern

[13] National Roads Authority / Transport Infrastructure Ireland (2011), Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes. https://www.tii.ie/technical-services/environment/planning/Guidelines-for-the-Treatment-of-Air-Quality-during-the-Planning-and-Construction-of-National-Road-Schemes.pdf

[14] NO_X to NO_2 Calculator (Department for Environment, Food and Rural Affairs, 2019) <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOXNO2calc > accessed on July 2020

Ireland local authorities as there are no such mapped background values available for local authorities in Ireland.

Model Verification

10.3.14 When using modelling techniques to predict concentrations, it is necessary to make a comparison between the modelling results and available measured monitoring data. This is to check if the model is reasonably reproducing actual observations and if necessary, allow the adjustment of modelled results to more closely match the monitoring data. The accuracy of the future year modelling results is relative to the accuracy of the model base year results, therefore greater confidence can be placed in the future year concentrations if a good agreement is found for the model base year.

10.3.15 The model has been run to predict the annual mean NO_x concentrations during 2018 at the Dublin Airport automatic monitor and the network of diffusion tube monitoring sites (see Figure 10-2, *EIAR Volume 3: Figures*). 2018 has been selected as the year to represent conditions for model verification for the following reasons:

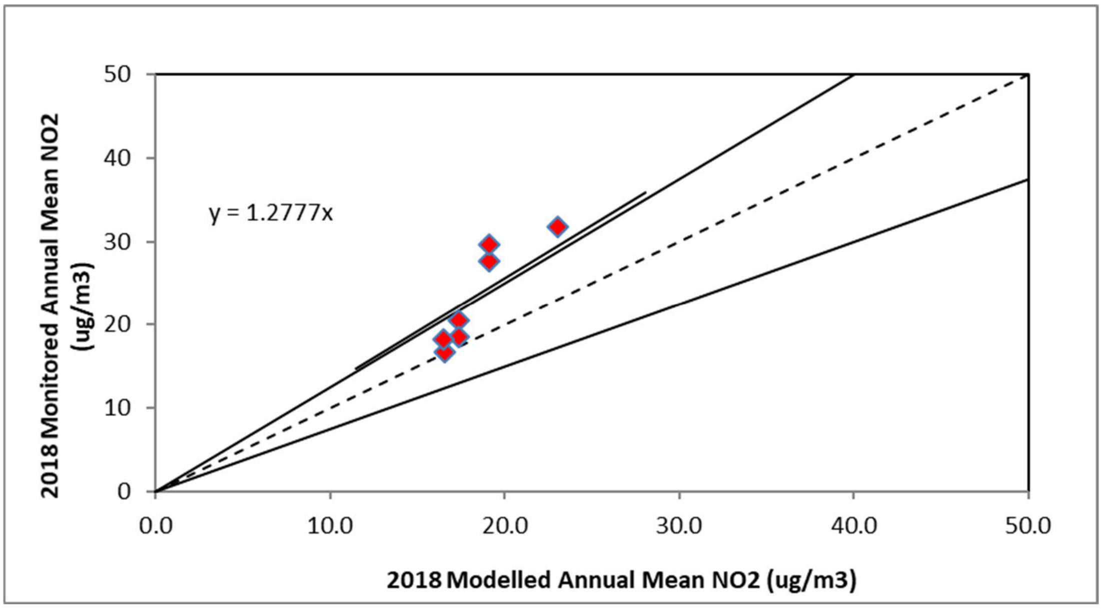
- Full datasets of emissions data (both airside and landside), air quality monitoring data and meteorological monitoring data were available; and
- Passenger throughput at the airport was at 32mppa.

10.3.16 Concentrations have been modelled at 2.4 m, the height of the monitors. A summary of the 2018 measured NO_2 concentrations is shown in Table 10-3.

10.3.17 Monitoring sites A9, A10, A3 and A7, have been excluded from the verification procedure. The first two are located in background locations further away from major airport or road emissions, and the measured concentrations for 2018 are slightly lower than the background concentrations measured at EPA's Swords automatic monitoring station. The latter two have also been excluded as A3 is at a background location where the model over-predicts concentrations before any adjustment and site A7 is very close to the R108, which is not included in the model domain.

10.3.18 An initial comparison of the predicted NO_2 levels (based on combined "road-NO_x" and "airport-NO_x" emissions, which were converted into NO_2 using Defra's NO_x:NO_2 calculator and added to background values, with the measured NO_2 concentrations) show an average under-prediction of 27.8% compared to measured concentrations, as can be seen in Plate 10-1:

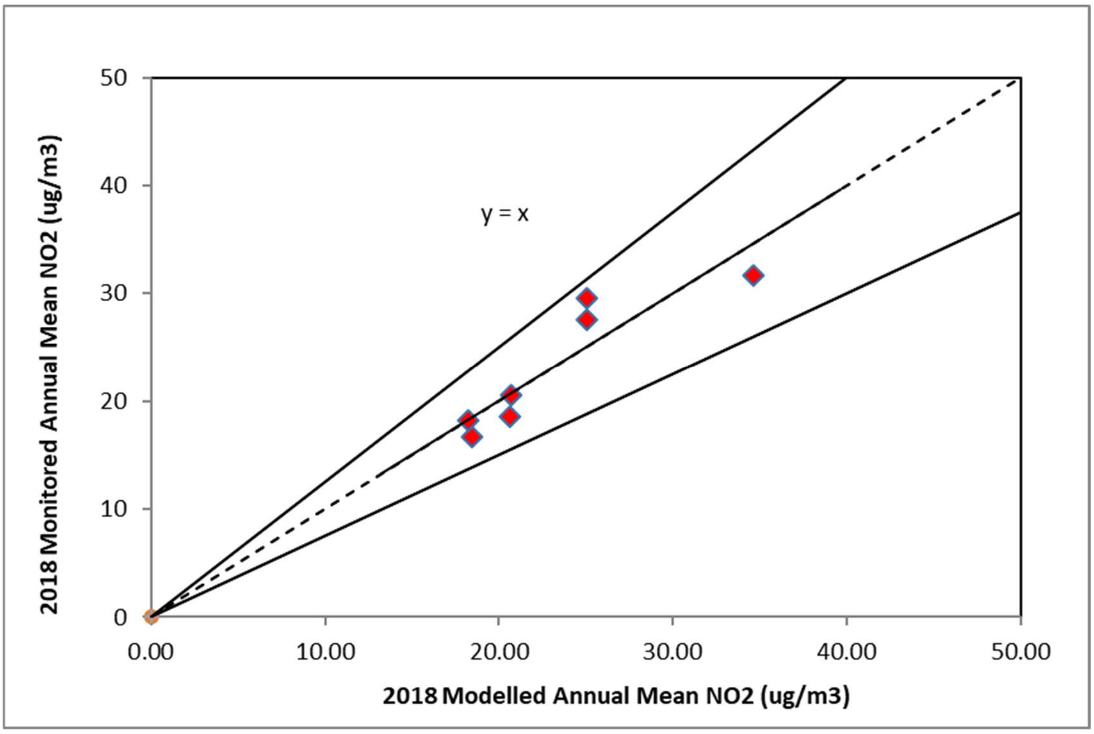
Plate 10.1 Modelled Vs Measured NO_2



10.3.19 Due to the level of under-prediction of annual mean NO_2 concentrations, guidance requires a comparison of modelled and monitored road NO_X contributions and all modelled source NO_X outputs, then adjusted by the factor calculated from that comparison. The adjustment factor between modelled and monitored concentrations was found to be 2.551 to adjust the combined predicted "road-NO_x" and predicted "airport-NO_x". The factor was then applied to the modelled road-NO_x contribution at all receptor locations considered in this assessment, before being converted into total NO_2 concentrations, again using the NO_x:NO_2 calculator. A comparison of predicted NO_2 with measured NO_2 indicates a secondary NO_2 adjustment of 1.06 is required.

10.3.20 LAQM.TG16 provides guidance on the evaluation of model performance. Model outputs where the Root Mean Square Error (RMSE) is above 25% of the Limit Value 10 µg/m^3 should be checked for improvements. It further notes that "ideally, an RMSE value with 10% of the Limit Value (4 µg/m^3) should be achieved" and the ideal value for the Fractional Bias is 0.0. Based on the final adjusted modelled NO_2 concentrations, the RMSE is 2.5 µg/m^3 (6.25% of the air quality standard), the Fractional Bias is 0.0, and the correlation coefficient is 0.9. Based on the aforementioned guidance, the model performance is considered to be good. The final adjusted modelled vs measured NO_2 comparison is shown in Plate 10.2.

Plate10.2: Adjusted Model Comparison



Odour Impacts

10.3.21 There is no standard assessment approach to quantify the potential odour effects associated with airport operations. A commonly applied methodology is to define the odour levels based on the change in aircraft-related volatile organic compounds (VOC) emissions. Due to uncertainties in the representativeness of VOCs to represent the human perception of odour, this approach has been enhanced with use of odour emission factors from published literature[15], based on the relationship between Odour Units (OU_E) and hydrocarbons emissions from aircraft engines.

10.3.22 Determining whether an odour impact is acceptable or not is difficult, due to the subjectivity of odour, whether it is offensive or not and the level of offensiveness[16].

10.3.23 UK Environment Agency guidance[17] provides the following benchmark criteria with regards to considering odour emissions, based on the 98th percentile of hourly average concentrations over a modelled year. Odour concentrations above these values may indicate the likelihood of unacceptable odour pollution relative to perceived offensiveness:

- 1.5 ou_E/m^3 for the most offensive of odours (examples given are decaying animal or fish remains, septic effluent or sludge, and biological landfill odours);

[15] Winther M, Kousgaard U and Oxbol A (2006), Calculation of odour emissions from aircraft engines at Copenhagen Airport. Sci Tot Env, 366, 218-232
[16] Environmental Protection Agency (Office of Environmental Enforcement) (2019), Air Guidance Note 5 (AG5) Odour Impact Assessment Guidance for EPA Licensed Sites
[17] Environment Agency (2011), Additional guidance for H4 Odour Management How to comply with your environmental permit

- 3 ou_E/m^3 for moderately offensive odours (examples given are intensive livestock rearing, fat frying (food processing), sugar beet processing, and well aerated green waste composting odours);
- 6 ou_E/m^3 for less offensive odours (examples given are brewery, confectionery, coffee roasting, and bakery odours); and
- 1 odour unit (ou_E/m^3) equates to the point of detection, irrespective of how offensive the odour is.

Significance Criteria

10.3.24 The assessment refers to the 2017 EPA Draft Guidelines[18]. It also takes into account the quality of effect (positive, negative or neutral), the duration of effect, the extent and context of the effect, the significance of effect, the probability of effect, duration and frequency.

10.3.25 The assessment refers to guidance issued by Environmental Protection UK and the Institute of Air Quality Management, which provides a means to describe the impact of a proposed scheme at individual receptors based on dispersion model outputs. The Environmental Protection UK and the Institute of Air Quality Management guidance uses the term “impact” to describe a change in pollutant concentration at a specific location, and the term “effect” to describe an environmental response resulting from the impact.

10.3.26 Receptors associated with human health impacts are selected based on the likely exposure of the public to the pollutants of concern for periods that are representative of the air quality standards, such as residential properties, schools and hospitals. Land uses are, therefore either sensitive or not sensitive to air quality impacts. Where sensitive receptors are identified, all are considered to be as highly sensitive as each other.

10.3.27 The Environmental Protection UK and the Institute of Air Quality Management guidance states that an air quality impact can be expressed as the magnitude of change in pollutant concentration (i.e. the change between the Permitted Scenario and the Proposed Scenario) as a proportion of the relevant assessment level (for example the relevant air quality standards), and then to examine this change in the context of the total pollutant concentration with the proposed Relevant Action in place. This is summarised in Table 10-2.

Table 10-2: Air Quality Impact Descriptors at Individual Receptors

Long-term Average Concentration	% Change in Concentration Relative to Air Quality Assessment Level				
	<1	1 – 2	2 – 5	6 – 10	>10
75% or less of Limit Value	Negligible	Negligible	Negligible	Slight	Moderate
76% - 94% of Limit Value	Negligible	Negligible	Slight	Moderate	Moderate
95% - 102% of Limit Value	Negligible	Slight	Moderate	Moderate	Substantial
103% - 109% of Limit Value	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more of Limit Value	Negligible	Moderate	Substantial	Substantial	Substantial

Source: EPUK/IAQM 'Land-Use Planning & Development Control: Planning for Air Quality,2017'

10.3.28 The Environmental Protection UK and the Institute of Air Quality Management guidance includes seven explanatory notes to accompany the terminology for the descriptors listed in Table 10-2. It is noted that the descriptors are for individual receptors only and that overall significance is determined using professional judgement. Additionally, it is also noted that it is unwise to ascribe too much accuracy to incremental changes or background concentrations; this is especially important when total concentrations are close to the Limit Value. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the Limit Value for annual mean NO_2 (and annual mean PM_{10}), rather than being precisely equal to it.

[18] Environmental Protection Agency (2017), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft August 2017.

10.3.29 A change in predicted annual mean concentrations of NO_2 or PM_{10} of less than 0.5% (0.2 µg/m^3) is considered to be imperceptible. A change (impact) that is imperceptible, given reasonable bounds of variation, would not be capable of having a direct effect on local air quality that could be considered to be significant. Likewise, a change in predicted annual mean concentrations of $PM_{2.5}$ of less than 0.5% (0.12 µg/m^3) is also considered to be imperceptible.

10.3.30 Additionally, the guidance also includes the potential for slight air quality impacts as a result of changes in pollutant concentrations between 2% and 5% of relevant air quality standards. For annual average NO_2 and PM_{10} concentrations, this relates to changes in concentrations ranging from 0.6 – 2.1 µg/m^3. In practice, changes in concentration of this magnitude at the lower end of this band are likely to be very difficult to distinguish through any post-operational monitoring regime, due to the number of sources of NO_2 in an urban environment and the interannual effects of varying meteorological conditions. In the overall evaluation of significance, the potential for significant air quality impacts within this band is, therefore, considered in this context.

10.3.31 Changes in concentration of more than 5% (moderate and substantial, the two highest bands) are considered to be of a magnitude which is far more likely to be discernible and as such carry additional weight within the overall evaluation of significance for air quality.

10.3.32 It should be noted that the impact descriptors in Table 10-2, are intended for application at individual modelled sensitive receptors. While there may be a ‘slight’, ‘moderate’ or ‘substantial’ impact at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances. The overall significance of effects is determined using professional judgement, taking this into account and the EPA draft Guidelines criteria described above.

Assumptions, Limitations and Uncertainty

10.3.33 All model assumptions used during the air quality assessment are presented in Appendix 10A, where the inputs to the model as well as their limitations are described in detail. This includes assumptions associated model input data, such as informed assumptions on the type, number, frequency, duration, and location of emissions sources, and other informed assumptions on the processing of model outputs, such as the conversion of NO_X to NO_2. Where possible, assumptions made have been precautionary.

10.3.34 Potential uncertainty may be associated with the accuracy of assumptions, including those for future aircraft and road traffic forecast data, the accuracy of emissions data and emissions characteristics, the representativeness of baseline monitoring data and meteorological data, and the appropriateness of other model assumptions. To reduce uncertainty, the assessment has followed relevant industry-standard guidance, made use of data sources specifically made available for this assessment, and has verified modelled outputs using air quality monitoring data and meteorological data gathered locally to the airport and representative of the study area.

10.4 Current State of the Environment

Monitoring Data

10.4.1 Existing monitoring data made available by the Applicant[19] and the EPA allow for a general discussion of current and historic air quality in the vicinity of the airport.

Dublin Airport Authority Pollutant Monitoring

10.4.2 Over the past few years, the Applicant has undertaken the monitoring of a range of pollutants at a continuous monitoring station located on the grounds of Dublin Airport. The concentrations measured for NO_2 and PM_{10} are reported quarterly by the Applicant. The annual data are summarised in Table 10-3. This data demonstrates that annual mean NO_2 and PM_{10} concentrations monitored at Dublin Airport are consistently below relevant air quality standard values, typically representing around 50 - 60% of those values. It should be noted that the continuous monitoring station moved locations in 2019, and prior to that, activity around the former location increased significantly in recent years with a construction compound being located close to it.

19 Dublin Airport Authority (DAA) (2019); Dublin Airport Air Quality Monitoring Annual Report.

Table 10-3: Continuous NO_2 Measurement Data – Dublin Airport

Pollutant and Averaging Period	Concentration / Number of Exceedances of Short-Term Air Quality Limit									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
NO_2 - µg/m^3 (Annual Mean) Limit Value **40 µg/m^3**	16	19	19	22	22	23	20	28	28	22
PM_{10} - µg/m^3 (Annual Mean) Limit Value **40 µg/m^3**	18	20	23	21	20	23	21	20	18	16
PM_{10} - Days (Daily Mean) Limit Value **35 Days**	0	2	3	4	6	8	4	0	5	0

Notes: Concentrations rounded to whole numbers
2020 concentrations influenced by Covid-19 restrictions
Source: Dublin Airport Air Quality Monitoring – Annual Report 2019

10.4.3 In addition to the continuous monitoring data gathered within the Dublin Airport grounds, the Applicant has also undertaken the measurements of NO_2, sulphur dioxide (SO_2) and benzene (C_6H_6) using passive sampling by diffusion tubes at several offsite locations in the vicinity of Dublin Airport (see Figure 10-2, *EIAR Volume 3: Figures*). The concentrations measured for NO_2 and C_6H_6 are also reported quarterly, and the annual data are summarised in Table 10-4 and Table 10-5.

10.4.4 The data presented in these tables demonstrate that the Air Quality Limit Values for the pollutants monitored are not being exceeded. Annual mean concentrations of NO_2 are notably higher at locations closest to roads where the primary source of air pollution is the road network itself (A5 to A7). It is also noted that NO_2 concentrations have been steadily increasing over the last eight years. Locations A5 and A6 are site boundary locations, and A11 represent the airport bus station and do not represent relevant air quality sensitive exposure. They either comprise part of the airport area and thus are not representative of sensitive receptor locations, or are sited explicitly to support local initiatives, such as monitoring the effects of buses switching engines on/off when idling. Some of the locations also changed position over the ten-year monitoring period shown in the table.

Table 10-4: Passive NO_2 Measurement Data – Dublin Airport

Location	Concentration (µg/m^3)									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
A1 - Forrest Little Golf Club	10	12	18	18	18	18	18	20	18	17
A2 - Kilreesk Lane, St. Margaret's	8	8	12	12	13	12	12	16	16	12
A3 - Ridgewood Estate West, Swords	9	9	17	n/a	n/a	20	17	17	16	13
A4 - St. Margaret's School and Parish House	10	11	16	15	16	16	16	19	17	17
A5 - Fire Station, Huntstown, Dublin Airport	11	13	18	19	20	22	24	29	25	17
A6 - Southern Boundary Fence, Dublin Airport	16	23	29	26	28	30	29	32	29	23
A7 - Western Boundary Fence, Dublin Airport	20	17	24	26	25	27	25	30	30	23
A8 - St. Nicholas of Myra School, Malahide Road	10	10	14	14	16	15	19	19	19	16

Location	Concentration (µg/m³)									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
A9 - Naomh Mearnóg GAA Club Portmarnock	7	9	15	14	14	13	15	15	15	15
A10 - Oscar Papa Site, Portmarnock	9	10	15	14	14	15	15	16	17	12
A11 - Airport Bus Depot	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**43**	**30**
A12 - Portmellick House, Dunbro Lane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	23	21
Air Quality Standard	**40**									

Notes: Concentrations rounded to whole numbers
2020 concentrations influenced by Covid-19 restrictions
Source: Dublin Airport Air Quality Monitoring – Annual Report 2019

Table 10-5: Passive Benzene Measurement Data – Dublin Airport

Location	Concentration (µg/m³)									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
A1 - Forrest Little Golf Club	0.5	0.2	0.6	n/a	n/a	0.8	0.5	0.6	0.5	0.5
A2 - Kilreesk Lane, St. Margaret's	0.5	0.3	0.5	n/a	n/a	0.4	0.3	0.4	0.4	0.4
A3 - Ridgewood Estate West, Swords	0.3	0.2	0.6	n/a	n/a	0.6	0.4	0.5	0.4	0.4
A4 - St. Margaret's School and Parish House	0.4	0.3	0.5	n/a	n/a	0.4	0.4	0.5	0.4	0.5
A5 - Fire Station, Huntstown, Dublin Airport	0.4	0.3	0.5	n/a	n/a	0.8	0.4	0.5	0.6	0.4
A6 - Southern Boundary Fence, Dublin Airport	0.4	0.3	0.5	n/a	n/a	0.5	0.6	0.4	0.4	0.4
A7 - Western Boundary Fence, Dublin Airport	0.6	0.2	0.5	n/a	n/a	0.5	0.4	0.3	0.3	0.3
A8 - St. Nicholas of Myra School, Malahide Road	0.6	0.2	0.5	n/a	n/a	0.5	0.5	0.5	0.5	0.4
A9 - Naomh Mearnóg GAA Club Portmarnock	0.4	0.6	0.5	n/a	n/a	0.5	0.5	0.4	0.5	0.4
0.4A0.410 - Oscar Papa Site, Portmarnock	0.8	0.4	0.5	n/a	n/a	0.6	0.5	0.4	0.4	0.4
A11 - Airport Bus Depot	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.6	0.4
A12 - Portmellick House, Dunbro Lane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.3	0.5
Air Quality Standard	**5**									

Source: Dublin Airport Authority, Dublin Airport Air Quality Monitoring – Annual Report 2019

EPA Pollutant Monitoring

10.4.5 The EPA measure annual mean concentrations of numerous pollutants in the Dublin region, including annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$. None of these monitoring locations are located close to Dublin Airport. The monitoring location in Swords is the closest, which is over 2 km to the north of the airport. The data gathered over recent years are summarised in Table 10-6 to Table 10-8. Location-specific data available for the most recent years demonstrates further compliance with the air quality standard values for these pollutants at the majority of areas considered by the EPA, with the exception of recent NO_2 monitoring on Pearse Street and St. Johns Road. Neither of these monitoring sites are in close proximity to Dublin Airport. The range in concentrations between measurement sites is likely due to their location and proximity to sources of existing emissions to air, such as busy roads and/or industrial stacks.

Table 10-6: Annual Mean NO_2 Monitoring Results (µg/m^3)

Location	2012	2013	2014	2015	2016	2017	2018	2019
Ballyfermot	-	16	16	16	17	17	17	20
Blanchardstown	-	-	-	-	-	-	25	31
Coleraine Street	-	-	-	-	28	26	-	-
Davitt Road	-	-	-	-	-	-	26*	24
Dun Laoghaire	18	16	15	16	19	17	19	15
Pearse St	-	-	-	-	-	-	-	**49**
Rathmines	21	19	17	18	20	17	20	22
Ringsend	-	-	-	-	-	22	27	24
St. Anne's Park	-	12	14	14	-	-	-	-
St. Johns Road	-	-	-	-	-	-	**44***	**43**
Swords	15	15	14	13	16	14	16	15
Winetavern St	29	31	31	31	37	27	29	28
Air Quality Standard					**40**			

Notes: Concentrations rounded to whole numbers
2020 data not yet published by EPA
* Monitoring undertaken for less than a year and may not comparable to the annual mean air quality standard.
Source: EPA, Air Quality in Ireland 2019

Table 10-7: Annual Mean PM_{10} Monitoring Results (µg/m^3)

Location	2012	2013	2014	2015	2016	2017	2018	2019
Ballyfermot	-	12	11	12	11	12	16	14
Blanchardstown	-	-	-	-	18	15	17	19
Davitt Road	-	-	-	-	-	-	14*	15
Dun Laoghaire	-	17	14	13	13	12	13	12
Finglas	-	15	-	-	-	-	11*	13
Marino	-	-	-	-	-	-	12*	14
Phoenix Park	11	14	12	12	11	9	11	11
Rathmines	14	17	14	15	15	13	15	15
Ringsend	-	-	-	-	-	13	20	19
St. Anne's Park	-	19	17	15	-	-	11*	12
St. Johns Road	-	-	-	-	-	-	14*	14
Tallaght	-	-	-	-	14	12	15	12
Winetavern St	13	14	14	14	14	13	14	15
Air Quality Standard					**40**			

Notes: Concentrations rounded to whole numbers
2020 data not yet published by EPA
* Monitoring undertaken for less than a year and may not comparable to the annual mean air quality standard.
Source: EPA, Air Quality in Ireland 2019

Table 10-8: Annual Mean $PM_{2.5}$ Monitoring Results (µg/m³)

Location	2012	2013	2014	2015	2016	2017	2018	2019
Ballyfermot	-	-	-	-	-	-	7*	10
Coleraine Street	-	-	-	-	9	8	-	10
Davitt Road							8*	11
Finglas	-	-	7	8	9	7	8	9
Marino	8	9	8	8	7	7	6	9
Phoenix Park	-	-	-	-	-	-	6	8
Rathmines	11	11	9	10	10	9	9	8
Ringsend							8*	10
St. Anne's Park	-	-	-	-	-	-	7*	8
St. Johns Road	-	-	-	-	-	-	9*	9
Air Quality Standard				**25**				

Notes: Concentrations rounded to whole numbers
2020 data not yet published by EPA
* Monitoring undertaken for less than a year and may not comparable to the annual mean air quality standard.
Source: EPA, Air Quality in Ireland 2019

Background Concentrations

10.4.6 Model outputs are combined with background concentrations to predict total pollutant concentrations at modelled receptors. Background concentrations are those from many sources which individually may not be significant, but collectively, over a large area, need to be considered.

10.4.7 The EPA monitor background pollutant concentrations at some locations in the Fingal and Dublin area, including Swords and Ballyfermot. Annual mean concentration for the pollutants of concern at these sites are provided in Table 10-6 to Table 10-8 and demonstrate that existing background concentrations are well below the respective air quality standards.

Receptors

10.4.8 Receptors considered in the detailed modelling study include a selection of residential properties and other sensitive locations such as schools and a public house. A total of 52 existing receptors were modelled that may be affected by the proposed Relevant Action, details of which can be found in Table 10-9 and Figure 10-1 (*EIAR Volume 3: Figures*). There are no existing exceedances of the air quality standards in the study area.

10.4.9 In some instances, a single receptor location has been selected to represent a group of residential properties, as the predicted concentrations would tend to be similar within the cluster of properties.

Table 10-9: Modelled Receptor Information

Receptor	Coordinate X	Coordinate Y	Height Z	Receptor Type
R1	318798	243360	1.5	Residential
R2	319033	244780	1.5	Residential
R3	318630	242250	1.5	Residential
R4	317726	241372	1.5	Residential
R5	313514	241030	1.5	Residential
R6	315562	242290	1.5	Residential
R7	317519	242579	1.5	Residential
R8	317729	243939	4.5	Public House
R9	315763	244749	1.5	Residential
R10	323880	243429	1.5	Residential

Receptor	Coordinate X	Coordinate Y	Height Z	Receptor Type
R11	313298	244155	1.5	Residential
R12	312909	244952	1.5	Residential
R13	312469	244492	1.5	Residential
R14	311160	244610	1.5	Residential
R15	318102	244515	1.5	Residential
R16	317888	243916	1.5	Residential
R17	318032	243850	1.5	Residential
R18	320013	243349	1.5	Residential
R19	312827	243360	1.5	Residential
R20	312430	243045	1.5	Residential
R21	312467	242503	1.5	Residential
R22	311268	242704	1.5	Residential
R23	317492	242531	1.5	Residential
R24	318874	242268	1.5	Residential
R25	319541	242373	1.5	Residential
R26	313730	243918	1.5	Residential
R27	314205	243834	1.5	Residential
R28	313642	243728	1.5	Residential
R29	314338	243623	1.5	Residential
R30	313862	243591	1.5	Residential
R31	315095	244802	1.5	Residential
R32	316326	244488	1.5	Residential
R33	315883	242339	1.5	Residential
R34	313373	242465	1.5	Residential
R35	312699	243059	1.5	Residential
R36	314546	243128	1.5	Residential
R37	317082	240657	1.5	Residential
R38	311841	243162	1.5	Residential
R39	313017	243550	1.5	School
R40	315404	243316	1.5	Residential
R41	316456	245336	1.5	Residential
R42	317203	245096	1.5	Residential
R43	313483	246051	1.5	School
R44	316850	246041	1.5	School
R45	319651	245565	1.5	School
R46	321294	242722	1.5	School
R47	319361	240790	1.5	School
R48	315022	240425	1.5	School
R49	316502	241030	1.5	Residential
R50	315409	246163	1.5	Residential
R51	313841	241050	1.5	Residential
R52	318690	244991	1.5	Residential

Source: AQC (2021) - Dublin Airport North Runway: Relevant Action Application - Technical Report

10.5 Future Receiving Environment

10.5.1 Background pollutant concentrations have been extrapolated from the latest available local monitoring data. Even though the national network consists of a variety of background monitoring locations for NO_2 and PM_{10}, there are only limited data to describe $PM_{2.5}$ background concentrations. The approach taken to estimate $PM_{2.5}$ concentrations was to use the UK Government's background pollutant concentrations maps[20] to calculate the average ratio between PM_{10} and $PM_{2.5}$ concentrations across the whole of Northern Ireland (mapped background data are not available for the Republic of Ireland) and apply this ratio to the measured PM_{10} background concentrations. The monitoring location considered to be representative of ambient background concentrations at Dublin Airport is Swords for NO_2 and Phoenix Park for PM_{10}. The assessment year background pollutant levels can be seen below in Table 10-10.

Table 10-10: Background Concentrations (µg/m³)

Pollutant	Year		
	2022	2025	2035
NO_2	13.7	12.4	11.6
PM_{10}	10.5	10.2	10.1
$PM_{2.5}$	6.4	6.1	6.0

Sources: EPA, Air Quality in Ireland 2018 Defra, 2019

10.5.2 Future background concentrations are well below the respective air quality standard values (see Table 10-1).

10.6 Assessment of Effects and Significance

Effects During Operation of Proposed Relevant Action

Nitrogen Dioxide (NO_2)

10.6.1 Predicted annual mean NO_2 concentrations for the permitted and Proposed Scenarios and associated impacts are provided in Table B1 of Appendix 10B (and Section A3 of the Technical Appendix 10A (Table A3.2 and Table A3.4)).

10.6.2 Table 10-11 summarises the number of receptors that are predicted to fall within the stated concentrations bands for NO_2. A concentration of less than 32 µg/m³ annual mean NO_2 (<20% of the air quality standard) is predicted at all of the modelled receptors.

Table 10-11: Air Quality Statistics for NO_2 Concentrations at Assessed Receptor Locations

Annual Mean NO_2 (µg/m³)	Number of Receptors in Each Concentration Band					
	2022		2025		2035	
	Permitted	Proposed	Permitted	Proposed	Permitted	Proposed
<32	52	52	52	52	52	52
32 to 36	0	0	0	0	0	0
36 to 40	0	0	0	0	0	0
>40 (Limit Value)	0	0	0	0	0	0

[20] Background Mapping data for local authorities (Department for Environment, Food and Rural Affairs, 2019) < https://uk-air.defra.gov.uk/data/laqm-background-home > accessed on July 2020

10.6.3 The highest predicted concentrations for the Proposed Scenario in assessment years 2022, 2025 and 2035 are respectively 27.3 µg/m^3 (R5 at Creston Ave ~1.5km south of Dublin Airport), 25.9 µg/m^3 (R8 at The Coachman's Inn ~500m east of Dublin Airport) and 25.8 µg/m^3 (R32 at Forest Rd ~200m north of Dublin Airport). All of the predicted NO_2 levels fall well below the Limit Values (40µg/m^3).

10.6.4 Annual mean concentrations of NO_2 for the Proposed Scenario in assessment years 2022, 2025 and 2035 increase in comparison with the Permitted Scenarios at the worst affected location (i.e. which experiences the greatest magnitude of change between permitted and Proposed Scenarios) (R32) by 1.0 µg/m^3 (2022), +0.6 µg/m^3 (2025) and +0.3 µg/m^3 (2035) respectively.

10.6.5 In line with the criteria set out in Section 10.3 and Table 10-2 an impact that accounts for an increase of 3% of the air quality standard (see Table 10-1), at a location where total concentrations in the Proposed Scenario amount to <75% of the air quality standard, equated to a negligible impact that is not considered significant.

Particulate Matter (PM)

10.6.6 Predicted annual mean PM_{10} and $PM_{2.5}$ concentrations for the Permitted and Proposed Scenarios and associated impacts are provided in Table B2 (PM_{10}) and Table B3 ($PM_{2.5}$) of Appendix 10B (and Section A3 of the Technical Appendix 10A (PM_{10}: Table A3.6 and Table A3.8; $PM_{2.5}$: Table A3.10 and Table A3.12)).

10.6.7 Table 10-12 and Table 10-13 summarise the number of receptors that are predicted to fall within concentrations bands for PM_{10} and $PM_{2.5}$. No exceedances of the annual mean Limit Values for PM_{10} and $PM_{2.5}$ are predicted at any receptor locations across the detailed model area, and the values are all well below the annual mean Limit Values.

Table 10-12: Air Quality Statistics for PM_{10} Concentrations at Assessed Receptor Locations

Annual Mean PM_{10} (µg/m^3)	Number of Receptors in Each Concentration Band					
	2022		2025		2035	
	Permitted	Proposed	Permitted	Proposed	Permitted	Proposed
<10	0	0	0	0	0	0
10 to 20	52	52	52	52	52	52
20 to 30	0	0	0	0	0	0
30 to 40	0	0	0	0	0	0
>40 (Limit Value)	0	0	0	0	0	0

Table 10-13: Air Quality Statistics For $PM_{2.5}$ Concentrations at Assessed Receptor Locations

Annual Mean $PM_{2.5}$ (µg/m^3)	Number of Receptors in Each Concentration Band					
	2022		2025		2035	
	Permitted	Proposed	Permitted	Proposed	Permitted	Proposed
<5	0	0	0	0	0	0
5 to 10	52	52	52	52	52	52
10 to 15	0	0	0	0	0	0
15 to 20	0	0	0	0	0	0
20 to 25	0	0	0	0	0	0
>25 (Limit Value)	0	0	0	0	0	0

10.6.8 All 52 receptors are predicted to experience PM_{10} concentrations falling within the annual mean range of 10 to 20 µg/m^3. For $PM_{2.5}$, all 52 receptors lie within the annual mean range of 5 to 10 µg/m^3.

10.6.9 In both cases of pollutants, there is no change in the number of receptors in the concentration bands when passing from the permitted to the Proposed Scenarios. Predicted concentrations for both PM_{10} and $PM_{2.5}$ fall well below Limit Values for annual mean levels of 40 and 25 µg/m^3 respectively at all assessed receptor locations.

10.6.10 The highest predicted PM_{10} concentrations for the Proposed Scenario in assessment years 2022, 2025 and 2035 are respectively 11.1 µg/m^3, 10.9 and 10.9 µg/m^3 at location R5 (Creston Ave ~1.5km south of Dublin Airport). The biggest increase with the Proposed Scenario in 2022, 2025 and 2035 are +0.04 µg/m^3 (R32 at Forest Rd ~200m north of Dublin Airport), +0.03 µg/m^3 (R32) and <+0.01 µg/m^3 (R8 at The Coachman's Inn ~500m east of Dublin Airport) respectively.

10.6.11 In line with the criteria set out in Section 10.3 and Table 10-2 a PM_{10} impact that accounts for an increase of <1% of the air quality standard (see Table 10-1), at a location where total concentrations in the Proposed Scenario amount to <75% of the air quality standard, equated to a negligible impact that is not considered significant.

10.6.12 The worst affected location for $PM_{2.5}$ was receptor (R8) with the predicted annual mean concentrations for the Proposed Scenario in 2022, 2025 and 2035 reaching 6.8 µg/m^3, 6.7 µg/m^3 and 6.5 respectively. The highest observed increase with the Proposed Scenario in 2022, 2025 and 2035 was +0.04 µg/m^3 (R32 at Forest Rd ~200m north of Dublin Airport), +0.03 µg/m^3 (R32) and <+0.01 µg/m^3 (R8 at The Coachman's Inn ~500m east of Dublin Airport) respectively.

10.6.13 In line with the criteria set out in Section 10.3 and Table 10-2 a $PM_{2.5}$ impact that accounts for an increase of <1% of the air quality standard (see Table 10-1), at a location where total concentrations in the Proposed Scenario amount to <75% of the air quality standard, equated to a negligible impact that is not considered significant.

Odour

10.6.14 Potential odour nuisance due to aircraft fuels has also been modelled, and the results can be seen in Table C-1 in Technical Appendix 10C.

10.6.15 It becomes clear that according to the 98th percentile of the 1-hour mean exposure (OUe/m^3), no receptor is anticipated to experience levels > 1 OUe/m^3, thus the potential of odour nuisance occurring is low. The highest predicted odour levels with the Proposed Scenario is 0.7 OUe/m^3, 0.6 OUe/m^3 and 0.4 OUe/m^3 for years 2022, 2025 and 2035 respectively, all observed at receptor R8 (The Coachman's Inn ~500m east of Dublin Airport).

10.6.16 An odour concentration of less than 1 OU_E/m^3 is below the point of detection, irrespective of the potential offensiveness of the odour. The resulting levels are therefore considered not significant.

10.7 Mitigation and Monitoring

Mitigation During Operation of Proposed Relevant Action

10.7.1 No significant effects have been identified; therefore, additional mitigation measures are not required during the operation of the proposed Relevant Action. No monitoring measures are proposed.

10.8 Residual Effects and Conclusions

10.8.1 The results of the assessment demonstrate that annual mean concentrations of all the pollutants considered are below the relevant Limit Values for all of the assessed receptor locations.

10.8.2 Concentration changes between the permitted and Proposed Scenarios in all assessment years show residual effects to be Not Significant, due to the magnitude of change predicted at locations where total concentrations in the Proposed Scenario are well below the air quality standards. A summary of the potential effect on air quality is shown in Table 10-14.

Table 10-14: Air Quality Summary of Potential Effects

Description of Effect	*Sensitivity of Receptor*	*Nature of Effect / Geographic Scale*	*Magnitude of Impact*	*Initial Classification of Effect (With Embedded Mitigation)*	*Additional Mitigation*	*Residual Effect Significance*
Changes in annual mean nitrogen dioxide (NO_2) concentrations	High	Permanent	Imperceptible	Not Significant	N/A	Not Significant
Changes in annual mean Particulate Matter (PM_{10}) concentrations	High	Permanent	Imperceptible	Not Significant	N/A	Not Significant
Changes in annual mean Particulate Matter ($PM_{2.5}$) concentrations	High	Permanent	Imperceptible	Not Significant	N/A	Not Significant
Changes in 98th percentile of 1-hour mean odour concentrations	High	Permanent	Imperceptible	Not Significant	N/A	Not Significant

Likely Significant Environmental Effects

10.8.3 The proposed Relevant Action is unlikely to generate any significant effects on air quality, with limited impacts predicted and total pollutant concentrations remaining well below the air quality standard values.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections and additions, the chapter has been revised to:

- Address additional assessment years requested by the Council;
- Set out more clearly the scenarios for assessment in the EIAR; and
- Respond to the latest passenger growth forecasts at Dublin Airport.

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the proposed Relevant Action

11. Climate and Carbon

11.1 Introduction

11.1.1 The EIA Directive 2014/52/EU[1] describes the importance of considering climate change and on greenhouse gas (GHG) emissions within EIAs: "*Climate change will continue to cause damage to the environment and compromise economic development. In this regard, it is appropriate to assess the impact of projects on climate (for example greenhouse gas emissions) and their vulnerability to climate change.*"

11.1.2 This chapter of the EIAR reports the findings of an assessment of the likely significant effects on GHG emissions as a result of the proposed Relevant Action, which will be an operational change, to remove the numerical cap on the average number of flights permitted between the hours of 23:00 and 07:00 in the Permitted Scenario, replacing it with an annual night-time noise quota between 2330 and 0600, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00.

11.1.3 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2027 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario. Around 6.9 million additional passengers will have used the airport in in the period 2022-2026 in the Proposed Scenario.

11.1.4 The scope of the GHG assessment includes additional GHG emissions resulting from the variation in Air Traffic Movements (ATMs) reported in the aircraft schedule developed by Mott MacDonald[2]. GHG emissions from ATMs that have been considered within this assessment include those from the Landing and Take-Off (LTO) cycle (i.e. activities including approach/ landing, taxiing, take-off and climb (up to 3,000 feet), including Auxiliary Power Units (APUs)[3] where applicable, and also during the Climb, Cruise and Descent (CCD) phase for departing flights. Additional surface access passenger journeys (i.e. ground travel to and from the airport) as a result of the proposed Relevant Action are also included within the scope of the assessment. Indirect impacts, such as the potential increase in emissions associated with airport operation, have been considered but not modelled in this assessment, as outlined in Section 11.3.

11.2 Legislation and Planning Policy Context

11.2.1 The various policies, standards and guidance described in this section outline national and international ambitions and targets for reducing GHG emissions and demonstrate the need for effective GHG reduction measures to be built into future development.

11.2.2 In line with these ambitions and targets, this assessment evaluates the GHG impact of the proposed Relevant Action in the context of the projected National Emissions Inventories for Ireland[4] to provide some context and scale in relation to Ireland's trajectory towards decarbonisation.

11.2.3 Section 11.6 outlines the ways in which GHG emissions as a result of the proposed Relevant Action have been or will be avoided, prevented, reduced and offset by various means.

[1] European Union (EU), (2014); Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014: Amending Directive 2011/92/EU on the Assessment of the Effects of Certain Public and Private Projects on the Environment.
[2] Mott MacDonald, (2021); Dublin Airport Operating Restrictions: Quantification of Impacts on Future Growth May 2021 Update – 2022-2025 Period
[3] An APU is a device on an aircraft that provides power for functions other than propulsion, allowing the aircraft to operate autonomously without reliance on ground support equipment such as a ground power unit, an external air-conditioning unit or a high-pressure air start cart.
[4] Environmental Protection Agency (EPA), (2019); Ireland's GHG Emissions Projections 2018 – 2040.

11.2.4 As outlined in the Climate Action and Low Carbon Development Act 2015[5], "A relevant body shall, in the performance of its functions, have regard to-

a) *the most recent approved national mitigation plan,*

b) *the most recent approved national adaptation framework and approved sectoral adaptation plans,*

c) *the furtherance of the national transition objective, and*

d) *the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State*."

National Planning Policy

Climate Action and Low Carbon Development (Amendment) Act 2021

11.2.5 The new Climate Action Act[6] contains a National Climate Objective to '*pursue and achieve, by no later than the end of the year 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy*'. The Bill also seeks to achieve a 51% reduction in Ireland's emissions by the end of the decade (2030).

11.2.6 The projected National Emissions Inventories for Ireland[7], used within this assessment to evaluate the impact of GHG emissions associated with the proposed Relevant Action on Ireland's ability to meet its carbon reduction targets, were developed in line with the previous target of 80% reduction (compared to 1990 levels) in GHG emissions, from the Climate Action and Low Carbon Development Act 2015. These are the most recent projections available.

11.2.7 The new Climate Action Act introduces;

- Ireland's 5 yearly carbon budgets, to start in 2021;
- A sectoral emissions ceiling within the limits of the carbon budget;
- The preparation of a climate action plan;
- The preparation of a national long-term climate action strategy;
- The preparation of a national adaptation framework; and
- An expectation for local authority to develop Climate Action Plans for 5-year periods which specify the mitigation and adaptation measures to be adopted by the local authority.

Project Ireland 2040: National Planning Framework (2018)

11.2.8 The National Planning Framework[8] discusses the need to reduce GHG emissions.

11.2.9 The Framework also describes the importance of progressively electrifying mobility systems, moving away from "*polluting and carbon intensive propulsion systems to new technologies*".

National Development Plan 2018 - 2027

11.2.10 The National Development Plan 2018 - 2027[9] sets out the investment priorities that will underpin the implementation of the National Planning Framework (above). The Development Plan emphasises the need for "*investment to support the achievement of climate action objectives and discourage investment in high-carbon technologies*".

[5] Government of Ireland, (2015); Climate Action and Low Carbon Development Act 2015.
[6] Department of the Environment, Climate and Communications, (2021); Climate Action and Low Carbon Development (Amendment) Act 2021.
[7] Environmental Protection Agency (EPA), (2019); Ireland's GHG Emissions Projections 2018 – 2040.
[8] Department of Communications, Climate Action and Environment, (2018); Project Ireland 2040: National Planning Framework.
[9] Department of Public Expenditure and Reform, (2018); National Development Plan 2018 – 2027.

National Aviation Policy 2015

11.2.11 The National Aviation Policy[10] describes GHG emissions as a key issue in relation to aviation and states that while fuel efficiency has increased significantly in recent decades (70% increase in the last 40 years), these improvements are being "*offset by the increase in activity over the period*".

11.2.12 It is recognised that aviation emissions will need to be limited in the future in line with European and global emissions trading/offsetting initiatives, and "*measures such as technology improvements in aircraft and engine design will continue to play an important role in combatting aviation emissions*".

Climate Action Plan (2019)

11.2.13 The objective of the Climate Action Plan[11] is to enable Ireland to meet its EU targets to reduce its carbon emissions by 30% between 2021 and 2030 and lay the foundations for achieving net zero carbon emissions by 2050. The Plan outlines 180 actions that need to be taken across all the key sectors.

11.2.14 Specifically, in relation to the transport sector, key actions include encouraging the uptake of biofuels, among others. Non transport-specific targets include increasing carbon tax.

11.2.15 While the Climate Action Plan is described as 'laying the foundations' for net zero carbon emissions by 2050, an official net zero target has not yet been set. Therefore, the net zero target does not supersede the 80% GHG emissions reduction target outlined within the National Policy Position on Climate Action and Low Carbon Development, described above. The 80% emissions reduction target has therefore been used for the purposes of this assessment. While the assessment undertaken within this chapter does not include 2050, Ireland's 2050 carbon reduction target demonstrates Ireland's carbon reduction ambitions.

11.2.16 The Climate Action Plan (2019) is currently being reviewed, and a Climate Action Plan (2021) is being prepared by the Department of the Environment, Climate and Communications, which will supersede this version.

National Mitigation Plan (2017)

11.2.17 The National Mitigation Plan[12] is seen as a "*critical first step towards decarbonising [Ireland's] economy*". The Plan outlines the overall framework for policy on climate action in Ireland, before then reviewing and outlining mitigation measures for the following key sectors:

- Electricity generation;
- The built environment;
- Transport; and
- Agriculture, forest and land use.

Local Planning Policy

Fingal Development Plan 2017 - 2023

11.2.18 The Fingal Development Plan[13] describes the need to "*minimise the County's contribution to climate change*", with particular reference to the transport sector, among others.

Dublin Airport Local Area Plan 2020

11.2.19 The Local Area Plan (LAP)[14] sets out the main challenges and opportunities faced by the airport over the plan period. Within Chapter 5: Transition to a Low Carbon Economy, the LAP highlights the importance of the role of International Civil Aviation Organisations (ICAO) and the Carbon Offset and Reduction Scheme for International Aviation (CORSIA), among other key policy documents, in addressing carbon emissions. The LAP "*seeks to pursue climate mitigation in line with global and*

[10] Department of Transport, Tourism and Sport, (2015); A National Aviation Policy for Ireland.
[11] Department of Environment, Climate and Communications, (2019); Climate Action Plan 2019: To Tackle Climate Breakdown.
[12] Department of Environment, Climate and Communications, (2017); National Mitigation Plan.
[13] Fingal County Council, (2017); Fingal Development Plan 2017 – 2023
[14] Fingal county Council, (2020); Dublin Airport Local Area Plan 2020.

national targets and support the transition towards a low carbon economy by seeking to reduce CO_2 emissions at the Airport"

Fingal County Council Climate Change Action Plan 2019 - 2024

11.2.20 The FCC Climate Action Plan[15] looks at the current and future climate change impacts and GHG emissions levels within the county, and features a range of actions to reduce these impacts across five key areas - Energy and Buildings, Transport, Flood Resilience, Nature-Based Solutions and Resource Management. A key target of the Climate Action Plan is to achieve a 40% reduction in the Council's greenhouse gas emissions by 2030.

11.2.21 The Council also "*recognises the Climate Emergency as declared by the Dáil and commits itself in this plan to prioritising mitigation of, and adaptation to, climate change across its functions*".

Transport Strategy for the Greater Dublin Area 2016-2035

11.2.22 This Transport Strategy[16] emphasises Ireland's need to "*radically reduce dependence on carbon-emitting fuels in the transport sector*".

Other Relevant Policy, Standards and Guidance

The Paris Agreement

11.2.23 The Paris Agreement[17] is a legally binding international treaty on climate change, adopted in 2015 by 196 countries including Ireland. The goal of the Paris Agreement is to hold the "*increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels*". The Paris Agreement provides a framework for reducing GHG emissions and also increasing resilience to future climate change impacts.

The Greenhouse Gas Protocol

11.2.24 The Greenhouse Gas protocol[18] is a "*global standard for companies and organizations to measure and manage their GHG emissions and become more efficient, resilient, and prosperous*", providing a standardised methodology for GHG quantification and management. The GHG Protocol carbon quantification principles have been adhered to when undertaking the GHG calculations as part of the lifecycle GHG impact assessment presented within this chapter.

European Union Emission Trading Scheme

11.2.25 The aim of the European Union Emission Trading Scheme (EU ETS)[19] is to help EU Member States achieve their commitments to limit or reduce greenhouse gas emissions in a cost-effective way by allowing participating companies to buy or sell emissions credits. This means savings are made where it is most financially viable to do so.

11.2.26 CO_2 emissions from aviation have been included in the EU emissions trading scheme since 2012. Under the EU ETS all airlines operating in Europe (both European and non-European airlines) are required to monitor, report and verify their emissions, and to surrender allowances against those emissions. They receive tradeable allowances covering a certain level of permitted emissions from their flights each year.

11.2.27 The EU ETS is discussed further in Section 11.6 in relation to offsetting aviation emissions within the EU.

[15] Fingal County Council, (2019); Fingal County Council Climate Change Action Plan 2019-2024.
[16] National Transport Authority, (2016); Transport Strategy for the Greater Dublin Area (2016 – 2035).
[17] United Nations Framework Convention on Climate Change (UNFCCC), (2015); The Paris Agreement.
[18] World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD), (2004); The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard.
[19] European Union (EU), (2018); Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814 (Text with EEA relevance).

International Civil Aviation Organisation Carbon Offsetting Reduction Scheme for International Aviation

11.2.28 International Civil Aviation Organisation (ICAO) Carbon Offsetting Reduction Scheme for International Aviation (CORSIA)[20] has been developed to address the increase in total CO_2 emissions from international aviation, with the aim of achieving no net increase in aircraft CO_2 emissions from its implementation date of 2021.

11.2.29 As it currently stands, CO_2 emissions from international aviation in 2019 will be used to set the CORSIA baseline for carbon neutral growth post-2020[21]. In any year beyond this point, any international aviation CO_2 emissions covered by the scheme exceeding the baseline quantity will be required to be offset.

11.2.30 CORSIA will be implemented in phases, starting with participation of countries on a voluntary basis until 2026, followed by the second phase (from 2027 to 2035), whereby participation is mandatory for all countries except those which are exempt (i.e. Least Developed Countries (LDCs), Small Island Developing States (SIDS) and Landlocked Developing Countries (LLDCs)).

11.2.31 CORSIA is discussed further in 11.6 in relation to offsetting international aviation emissions.

European Green Deal

11.2.32 The European Green Deal[22] is a set of policy initiatives by the European Commission, with the aim of reducing climate change and environmental degradation across Europe. A set of actions have been identified across a number of key sectors, including 'Climate'. The European Green Deal "*aims to make Europe climate neutral by 2050*" and states that "*to achieve our decarbonisation objectives, emissions must be reduced in all sectors, from industry and energy, to transport and farming*".

11.3 Assessment Methodology

11.3.1 This section presents the following:

- Information sources that have been consulted throughout the preparation of this chapter;
- Details of consultation undertaken with respect to GHG emissions;
- The methodology behind the assessment of effects of GHG emissions, including the criteria for the determination of sensitivity of receptors and magnitude of change from the Permitted Scenario;
- An explanation as to how the identification and assessment of potential effects of GHG emissions has been reached; and
- The significance criteria and terminology for the assessment of residual effects of GHG emissions.

Methodology for Climate Change Adaptation

11.3.2 A climate change resilience review looks at the impact of climate change on the proposed Relevant Action and provides an evaluation of the resilience of the proposed Relevant Action to such impacts. However, climate change resilience review has not been undertaken as part of this chapter as there are no physical changes to the runway to evaluate the resilience of, and there will be no additional climate change impacts during operation beyond those already faced during permitted airport operations. Given that there are no physical changes to the North Runway as a result of the proposed Relevant Action, and no obvious means by which climate change would affect the Relevant Action, such an assessment is not necessary or appropriate.

[20] International Civil Aviation Organization (ICAO), (2016); Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).
[21] Initially, the intention was for the baseline to be set based on emissions from international aviation in 2020. However, due to the global COVID-19 pandemic resulting in significantly reduced international aviation operations in 2020, the CORSIA emissions baseline was adjusted to 2019 international aviation emissions. Without this adjustment, the baseline would have been much lower than expected, which would "*disrespect the originally-agreed intention and objectives of ICAO's 193 Member States when they adopted CORSIA in October 2016*", according to ICAO".
[22] European Commission, (2019); The European Green Deal.

Methodology for Determining Baseline Conditions and Sensitive Receptors

11.3.3 The GHG assessment study area considers all GHG emissions from fuel used by aircraft during the LTO and CCD phases (collectively referred to as ATMs) and GHG emissions from surface access passenger journeys under the Permitted and Proposed Scenarios for each of the assessment years.

11.3.4 As defined by ICAO, the LTO cycle consists of four phases of aircraft operations: approach/ landing, taxi, take-off and climb (up to 3,000 feet), while the CCD phase consists of the climb, cruise and descent stages for departing flights only (Plate 11-1).

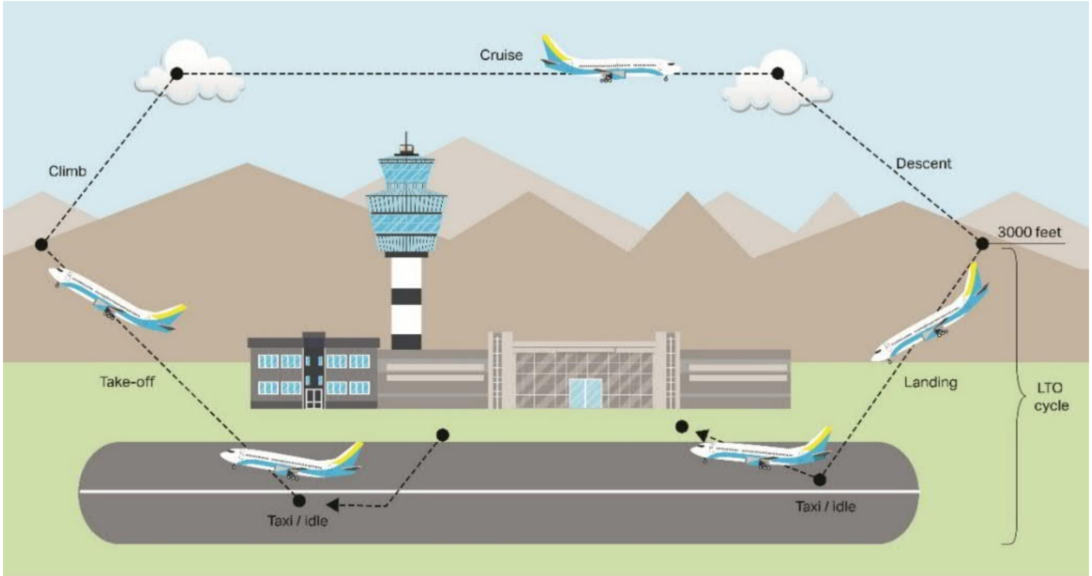


Plate 11-1: Air Traffic Movement Phases, including Landing and Take-Off and Climb, Cruise and Descent Phases

11.3.5 Only the ATMs (LTO and CCD phases) of departure flights are considered within this assessment, and not the ATMs of arriving flights, to avoid double counting of aviation emissions between airports. It is assumed that the emissions associated with the arriving flights will be accounted for within the carbon accounts of the airports of origin.

11.3.6 The baseline for the GHG emissions assessment is the Permitted Scenario for each assessment year (i.e. the GHG emissions associated with the forecast ATMs and surface access passenger journeys), without the proposed Relevant Action.

11.3.7 The global climate has been identified as the receptor for the purposes of the GHG emissions assessment. However, there is no specific criteria for determining the significance of GHG emissions.

11.3.8 There is currently no published standard definition for receptor sensitivity to GHG emissions. For the purposes of this assessment, the sensitivity of the receptor has been defined as 'high' (the Irish National Emissions Inventory[23], used here as a proxy for the global climate to contextualise the scale of the GHG impact). The rationale for this approach is as follows:

- The extreme importance of limiting global warming to below 2°C this century is broadly asserted by the International Paris Agreement and the climate science community. Additionally, a recent report by the Intergovernmental Panel on Climate Change (IPCC) highlighted the importance of limiting global warming below 1.5°C[24].

[23] While it is recognised that the Irish National Emissions Inventory does not include emissions from international aviation, it has been used here as a proxy for the global climate to contextualise the scale of the GHG impact in relation to Ireland's projected trajectory towards decarbonisation.
[24] The Intergovernmental Panel on Climate Change (IPCC), (2018); Global warming of 1.5°C. An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.

Methodology for Determining Construction Effects

11.3.9 The proposed Relevant Action will result in no changes to the design or construction methodology of the North Runway, the construction of which is already underway. On that basis, the assessment of construction phase impacts on GHG emissions is not assessed further within this EIAR.

Methodology for Determining Operational Effects

11.3.10 There is an increase in Air Traffic Movements (ATMs) and passenger numbers under the Proposed Scenario relative to the Permitted Scenario in the 2022 and 2025 Assessment Years. This reflects a faster recovery back to the 32mppa Cap which would occur under the Proposed Scenario and merely brings forward by approximately two years the increase which would happen anyway in the Permitted Scenario. In the 2035 Assessment Year, the passenger numbers are the same.

11.3.11 There is no new airport infrastructure proposed as part of the proposed Relevant Action. Emissions from the operation of airport buildings and assets are therefore assumed to remain similar to the current operations. It is expected that any increase in emissions from the operation of airport buildings and assets due to the short-term increase passenger numbers as a result of the proposed Relevant Action will be counterbalanced by the decarbonisation of the national grid and further carbon reductions realised in line with the Applicant's energy reduction targets.

11.3.12 The Applicant's draft Carbon Reduction Strategy[25] sets out how GHG emissions will be reduced on an airport-wide basis[26]. However, for the purposes of the EIAR it is assumed that any changes to building emissions as a result of the proposed Relevant Action will not have a material impact on the overall carbon footprint and the outcome of this assessment, given that heating and lighting will still be required for the whole airport, irrespective of the precise number of passengers using the airport each year. Emissions associated with operation of airport buildings are therefore not assessed any further within this EIAR.

11.3.13 Based on the scope of the proposed Relevant Action, the assessment of the impacts of ATMs and additional surface access passenger journeys on GHG emissions have been included in the assessment.

11.3.14 In line with the approach adopted for the Aviation Emissions Calculator by the European Monitoring and Evaluation Programme (EMEP) and the European Environment Agency (EEA)[27], the GHG emissions associated with ATMs will be reported as tonnes of carbon dioxide (tCO_2). However, the GHG emissions associated with the additional surface access passenger journeys will be reported as tonnes of carbon dioxide equivalent (tCO_2e), accounting for the following seven Kyoto Protocol GHGs in line with The GHG Protocol:

1. Carbon dioxide (CO_2).
2. Methane (CH_4).
3. Nitrous oxide (N_2O).
4. Sulphur hexafluoride (SF_6).
5. Hydrofluorocarbons (HFCs).
6. Perfluorocarbons (PFCs).
7. Nitrogen trifluoride (NF_3).

11.3.15 Other aircraft engine emissions (oxides of nitrogen (NO_x) and methane (CH_4)), and contrail and cirrus cloud formation have a climate change effect when released at high altitudes[28]. It has been suggested by researchers that this additional effect almost doubles aviation's contribution to climate change

[25] https://www.dublinairport.com/corporate/corporate-social-responsibility/sustainability
[26] Fingal County Council has a duty under the Climate Action and Low Carbon Development Act 2015 to have regard to the most recent approved national mitigation plan.
[27] EMEP/ EEA, (2019); Aviation Emissions Calculator (accompaniment to the EMEP/ EEA air pollutant emission inventory guidebook, 2019, chapter 1.A.3.a Aviation).
[28] Lee, D., Fahey, D., Forster, P. et al., (2009); Aviation and Global Climate Change in the 21st Century. Atmospheric Environment 35: 3520-3537.

compared to the CO_2 emissions alone[29]. However, the science is uncertain, and these additional impacts are not included in EU or international policy making at present. Therefore, these effects are not considered when calculating ATM emissions.

11.3.16 Projected ATM data developed by Mott MacDonald (shown in Table 11-1) have been provided for 2022, 2025 and 2035 for the Proposed Scenario and Permitted Scenario. Emissions from ATMs have been calculated for each of these assessment years using the Aviation Emissions Calculator, based on the specific flight schedule and aircraft mix provided. As the aircraft schedules provided contain the projected mix of aircraft models for each of the assessment scenarios, future efficiency gains due to new aircraft models have been accounted for.

11.3.17 The calculator draws on the ICAO *Aircraft Engine Emissions Databank*, which contains information on exhaust emissions from various aircraft engines (provided by engine manufacturers). The calculator models emissions from various aircraft types based on their most frequently used engine types and average European taxi times provided by EUROCONTROL's Central Office of Delay Analysis (CODA).

Table 11-1: Permitted and Proposed Annual ATM Projections for each Assessment Year

Year	Scenario		
	Permitted	Proposed	Variation
2022	166,000	176,000	10,000
2025	227,000	236,000	9,000
2035	236,000	236,000	0

11.3.18 The Aviation Emissions Calculator methodology does not account for APU use as the use of APUs is highly variable between airports. APU usage at individual airports may depend on site-specific APU restrictions, differences in fuel costs between APUs and alternative power sources, and availability of alternative power sources (e.g. due to proximity of the aircraft to the required airport infrastructure). To account for APU usage, a scaling factor[30] of 8% has been applied to the LTO emissions calculated using the Aviation Emissions Calculator. This scaling factor is a conservative estimate, based on the contribution of APU emissions to overall LTO emissions reported in Heathrow Airport's emissions inventory between 2013 and 2017[31].

11.3.19 Data from Heathrow Airport has been used here as the specific inventory data required for this calculation is not available for Dublin Airport over such a period (5 years), and there is very limited data or guidance available within the literature due to the high variability in APU usage between airports. As APU usage as a proportion of overall LTO emissions is publicly available for Heathrow Airport, this has been used as a proxy for Dublin. It is recognised that this may not be a completely accurate representation of the contribution of APU emissions at Dublin Airport, however both are major European, international airports, so it has been assumed that APU usage will be similar. As the APU usage only accounts for a small proportion of overall ATM emissions, it is not anticipated that any variation in APU use between Heathrow Airport and Dublin Airport will have an impact the overall outcome of the assessment.

11.3.20 The flight distance between Dublin Airport and each destination airport has been estimated for each flight route, and the emissions from each ATM modelled individually using the Aviation Emissions Calculator. To estimate the flight route distances, the direct distance was obtained from the Great Circle Mapper air distance calculator[32], and an 8% uplift was applied to CCD emissions to account for

[29] Sausen, R., Isaken, I., Grewe, V. et al., (2005); Aviation Radiative Forcing in 2000: An Update on IPCC (1999). Meteorologische Zeitschrift 14(4): 555-561.
[30] A scaling factor is a number which multiplies a quantity by a given amount to estimate another quantity based on the proportionate relationship between the two aspects. In this case, LTO emissions have been scaled up to include an additional 8% of total LTO emissions to account for emissions from APU usage. The 8% factor is based on the relationship between LTO and APU emissions at Heathrow Airport.
[31] Heathrow Airport Limited, (2018); Heathrow Airport 2017 Emissions Inventory.
[32] The Great Circle Mapper, (2020); Air Distance & Flight Time Calculation [online]. Available at: https://www.greatcirclemapper.net/

deviations from the direct route due to inclement weather conditions and stacking above airports, as per the Defra 2021 emissions factor calculation methodology[33].

11.3.21 The 8% scaling factor from the Defra 2021 guidance has been applied here as it is the most up-to-date source available, and the guidance states that following recent analysis, this factor is deemed the most appropriate for flights arriving and departing in the UK. It is assumed that in the context of worldwide airport operations, operations at Dublin Airport would be similar enough to UK airports for this to also be applicable here. An alternative to this scaling factor is a factor of 10% as reported in the IPCC Aviation and the Global Atmosphere report (1999)[34], however considering the age of the underlying data built into the IPCC scaling factor and how much the aviation industry has changed over the last 20 years, the Defra scaling factor is considered a more appropriate and accurate estimate.

11.3.22 Projected passenger numbers for each of the assessment years reported in the Dublin Airport Operating Restrictions report[35] have been used to estimate GHG emissions associated with additional surface access passenger journeys, based on assumptions[36] made around mode of travel and transportation distances, and applying the relevant Defra 2021 emissions factors[37].

Significance Criteria

11.3.23 The IEMA guidance on assessing GHG emissions in EIA[38], which states there are no pre-defined thresholds for assessing significance. Therefore, the application of the standard EIA significance criteria (as described in Chapter 1: Introduction) is not considered to be appropriate for climate change mitigation assessments.

11.3.24 The IEMA guidance states that ‘any GHG emissions or reductions from a project might be considered to be significant’. As such, the projected National Emissions Inventories for Ireland, as compiled by the EPA, have been used as a proxy for the level of effect of GHG emissions as a result of the proposed Relevant Action on the global climate. Consideration has also been given to the transportation sector within the projected National Emissions Inventories for Ireland to help contextualise the GHG emissions and provide an idea of scale. Additional GHG emissions as a result of the proposed Relevant Action have also been considered in the context of Ireland’s carbon reduction ambitions.

11.3.25 In the absence of specific criteria for defining the significance of GHG emissions, the IEMA guidance suggests that professional judgement should be used to contextualise the GHG impact. In GHG accounting it is common practice to consider exclusion of emission sources that are <1% of a given emissions inventory on the basis of a ‘de minimis’ contribution. The PAS 2050 Specification for the assessment of the life cycle GHG emissions of goods and services (2011), published by the British Standards Institute[39], allows emissions sources of <1% contribution to be excluded from emission inventories, and for these inventories to still be considered complete for verification purposes.

11.3.26 Therefore, for the purposes of this assessment, where total annual emissions from the operation of the proposed Relevant Action are equal to or more than 1% of the projected National Emissions Inventory for Ireland, the magnitude of effect will be considered to be major (significant). Where total annual emissions from the operation of the proposed Relevant Action are less than 1% of the projected National Emissions Inventory for Ireland, the magnitude of effect will be considered to be minor (not significant).

11.3.27 The sensitivity of the receptor (global climate) to increases in GHG emissions is always considered ‘High’. Therefore, the significance of effect will be determined using a boundary of less than, or equal to

[33] Department for Environment, Food and Rural Affairs and the Department of Business, Energy and Industrial Strategy, (2018); 2021 Government greenhouse gas conversion factors for company reporting - Methodology Paper for Conversion factors Final Report
[34] Intergovernmental Panel on Climate Change (IPCC), (1999); Aviation and the Global Atmosphere: A Special Report of IPCC Working Groups I and III.
[35] Mott MacDonald, Dublin Airport Operating Restrictions Quantification of Impacts on Future Growth Updated analysis in response to the ANCA RFI (2021)
[36] Specific assumptions are outlined in the *Limitations and Assumptions* section below.
[37] Department for Environment, Food and Rural Affairs and the Department of Business, Energy and Industrial Strategy, (2020); UK Government GHG Conversion Factors for Company Reporting.
[38] IEMA, (2017); Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance.
[39] British Standards Institution, (2011); PAS 2050:2011 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services.

or more than, 1% of the projected National Emissions Inventory for Ireland (i.e. minor or major), as described above for magnitude of effect.

Methodology to Assess the Significance of Effects

11.3.28 The significance of effect has been determined based on the variation of GHG emissions between the Permitted and Proposed Scenarios. The difference between the GHG emissions associated with these scenarios for each of the Assessment Years (2022, 2025 and 2035) is considered to represent the change in emissions arising as a result of the proposed Relevant Action and therefore equates to the GHG impact.

11.3.29 The GHG impact of the proposed Relevant Action has been compared against Ireland's projected total National Emissions Inventories for each of the assessment years, and further contextualised against Ireland's projected total Transport Emissions Inventory

11.3.30 It should be noted that these emissions inventories do not include emissions from international aviation. However, these figures help to contextualise the potential impact of the proposed Relevant Action by providing a sense of scale.

11.3.31 Specific mechanisms for reducing international aviation emissions (e.g. EU ETS and CORSIA) are described in 11-12.

Limitations and Assumptions

11.3.32 Only commercial flights have been included in the ATM GHG emissions calculations, while flights made by private aircraft have been excluded. It is anticipated that GHG emissions from private aircraft would not have a material impact on the overall GHG footprint.

11.3.33 Aircraft schedule forecasts (produced by Mott MacDonald) have been provided for a busy day (as defined within *Chapter 13: Aircraft Noise and Vibration*, and within the Mott MacDonald Report). The aircraft mix on the busy day schedule has been assumed to be representative of the aircraft mix throughout the year. To calculate annual emissions, the aircraft and ATM schedule produced by Mott MacDonald has been prorated up based on the number of ATMs for the busy day and the total annual ATMs.

11.3.34 Some aircraft models (typically newer models) were not available within the Aviation Emissions Calculator. For the A320neo and A321neo, the A320 and A321 models were used instead. These emissions were then pro rata-ed down based on the difference in emissions intensity between the relevant models, as calculated using the Atmosfair Flight Emissions Calculator[40]. Where certain aircraft models were not available within either the Aviation Emissions Calculator or the Atmosfair Flight Emissions Calculator the closest available model produced by the same manufacturer was selected as a proxy, for example the E190-2 aircraft has been modelled using the E190 aircraft (see Appendix 11A for a full list of aircraft model substitutions).

11.3.35 For some flights, the total journey length reported in the aircraft schedule exceeded the range limit of the proxy aircraft selected. In this instance, emissions were calculated for the maximum available journey length for the proxy aircraft within the Aviation Emissions Calculator, then scaled up proportionately to account for the total journey distance.

11.3.36 For some flights, the total journey length reported in the aircraft schedule was shorter than the available range limit of the aircraft selected in the Aviation Emissions Calculator. In this instance, the journey length was doubled for the aircraft, and the associated emissions for this doubled journey length were calculated using the Aviation Emissions Calculator. These emissions were then halved to provide the emissions for the original journey length.

11.3.37 As APU usage is difficult to estimate accurately for individual airports due to the highly variable nature, the calculations for the GHG emissions associated with APU usage assume an 8% uplift on total LTO emissions excluding APU (as calculated using the Aviation Emissions Calculator). This uplift is considered to represent a conservative approach (i.e. the 5-year average APU uplift from the Heathrow Airport data has been rounded up, so may be over-estimating APU emissions).

[40] Atmosfair, (2020); Calculate Flight Emissions [online]. Available at: https://www.atmosfair.de/en/offset/flight/

11.3.38 An 8% uplift has also been applied to CCD emissions to account for deviations from the ideal flight route due to inclement weather conditions and stacking above airports. This is in line with the methodology described by Defra.

11.3.39 No assumptions regarding future biofuel use have been factored into the ATM GHG emissions calculations due to uncertainty around the future supply and level of uptake of biofuels[41,42]. This is considered to represent a conservative approach.

11.3.40 Table 11-2 outlines the mode share percentages (in line with the mode shares used for the transport modelling presented in *Chapter 9: Traffic & Transport*), journey distances assumed, and Defra 2021 emissions factors applied for the calculation of GHG emissions associated with surface access passenger journeys. The mode share percentages reported are assumed to be the same for each of the Assessment Years. Any variation between these figures and actual mode share figures for each of the Assessment Years is not anticipated to have a material impact in the context of the overall footprint and is therefore not anticipated to affect the overall outcome of the assessment.

Table 11-2: Assumptions Made for the Calculation of GHG Emissions Associated with Surface Access Passenger Journeys

Transport mode	Assumptions		
	Mode share	Assumed 2-way distance (km)	Emissions factor applied
Bus	32.6%	60	Defra 2021 - Local bus (not London)
Taxi	25.3%	100	Defra 2021 - Large car - Unknown fuel
Car private	14%	100	Defra 2021 - Average car - Unknown fuel
Car rental	6.4%	100	Defra 2021 - Average car - Unknown fuel
Transfer	4.2%	60	Defra 2021 - Local bus (not London)
Other	1.4%	100	Defra 2021 - Average van (up to 3.5 tonnes) - Unknown fuel

11.4 Current State of the Environment

11.4.1 The current receiving environment is the global climate. For the purposes of the GHG impact assessment, the Irish National Emissions Inventory has been used as a proxy for the global climate to contextualise the scale of the GHG impact in relation to Ireland's contribution to global emissions.

11.4.2 The most recent emissions inventory for Ireland (2019), as reported in Ireland's National Inventory Report 2021[43] amounts to 59,778 kilotonnes of carbon dioxide emissions (ktCO_2e).

11.5 Future Receiving Environment

11.5.1 The Future Receiving Environment is the global climate during each of the assessment years. For the purposes of the GHG impact assessment, Ireland's projected National Emissions Inventories for each of the assessment years (under the With Additional Measures scenario[44]) have been used as a proxy for the global climate.

11.5.2 Ireland's projected National Emissions Inventories for 2022 (the year in which the North Runway is anticipated to become operational), 2025 (the first year in which 32mppa is expected to be reached with

[41] The International Energy Agency (IEA) states that while the aviation industry demonstrates a strong commitment to sustainable alternative fuels such as biofuels, further technological developments are required before widespread uptake is realistic: https://www.iea.org/commentaries/are-aviation-biofuels-ready-for-take-off

[42] Sustainable Aviation, (2020); Sustainable Aviation Fuels Road-Map: Fuelling the future of UK aviation.

[43] Environmental Protection Agency (EPA), (2021); Ireland's National Inventory Report 2021: Greenhouse Gas Emissions 1990-2019

[44] The 'With Additional Measures' scenario is a scenario used by the EPA for the modelling of Ireland's projected National Emissions Inventories.

North Runway operational) and 2035 (an assessment year 10-15 years later, as requested by Fingal County Council), are presented in Table 11-7 below.

11.6 Environmental Design and Management

11.6.1 This section identifies further ways in which GHG emissions from aircraft ATMs have been or will be avoided, prevented, reduced and offset by various means.

11.6.2 Efficiencies have historically reduced the CO_2 intensity of aircraft, and these efficiencies are expected to continue. The estimated fuel efficiency benefits from switching to more fuel-efficient aircraft models in the future have been incorporated into this GHG assessment.

11.6.3 Market based measures such as EU ETS and ICAO's CORSIA scheme will also impact international aviation emissions, with the ETS providing a cap on intra-EU aviation emissions to 2020 and post-2020 and CORSIA aiming for no net increase in aircraft CO_2 emissions from its implementation date of 2021.

11.6.4 The impacts of these market-based measures have not been incorporated into the GHG calculations presented within this chapter - all calculations are gross emissions prior to these measures reducing or off-setting the total emissions. However, the EU ETS and CORSIA will mean any emissions over the level permitted will be offset through those schemes.

11.6.5 Scope 3[45] (indirect) aircraft emissions are outside the Applicant's direct control but can be influenced by efficient airside infrastructure design, delivery and services such as Fixed Electrical Ground Power (provided by the Applicant) and how aircraft operate at the airport (influenced by airlines, the Air Navigation Service Provider and the Applicant). One such example is Airport Collaborative Decision Making (A-CDM) which Dublin Airport is implementing. This brings all stakeholders together to improve the efficiency of the airside operations at the airport. The Applicant is also certified under Level 3 of the Airport Carbon Accreditation scheme.

11.6.6 Within the draft Carbon Reduction Strategy the Applicant has stated they will "*work closely with our airlines participating in CORSIA to help stabilise their net carbon emissions by developing infrastructure which supports efficient operations of aircraft on the ground and encourages the introduction of new generation, fuel efficient aircraft*."

11.6.7 Further measures outlined in the Applicant's Draft Carbon Reduction Strategy include better surface transport access to the airport, facilitation of improved transport links to and from the airport, and for all traffic generating applications at the airport to demonstrate measures to maximise non-motorised and public transport use while minimising the use of the private car.

11.7 Assessment of Effects and Significance

Effects During Operation of Proposed Relevant Action

GHG Emissions for the Permitted and Proposed Scenarios

11.7.1 Table 11-3, Table 11-4, Table 11-5 and Table 11-6 present the projected CO2 emissions associated with the LTO cycle, CCD phase, surface access passenger journeys and total GHG emissions, respectively, for the Permitted and Proposed Scenarios for each of the assessment years. The variation in emissions between the Permitted and Proposed Scenarios represents the additional emissions as a result of the proposed Relevant Action.

[45] Scope 3 emissions are defined within the Greenhouse Gas Protocol corporate accounting and reporting standard as indirect GHG emissions that occur as "*a consequence of the activities of the company, but occur from sources not owned or controlled by the company*".

Table 11-3: LTO Emissions Projections – Permitted vs Proposed Scenarios

Year	LTO Emissions (tCO_2)			
	Permitted	Proposed	Variation	% Variation (permitted to proposed)
2022	226,292	240,108	**13,816**	6.11%
2025	314,268	326,482	**12,214**	3.89%
2035	314,316	314,560	**244**	0.08%

Table 11-4: CCD Emissions Projections – Permitted vs Proposed Scenarios

Year	CCD Emissions (tCO_2)			
	Permitted	Proposed	Variation	% Variation (permitted to proposed)
2022	1,704,567	1,794,200	**89,634**	5.26%
2025	2,501,563	2,578,157	**76,594**	3.06%
2035	2,569,313	2,510,681	**-58,633**	-2.28%

Table 11-5: Surface Access Passenger Journey Emissions Projections – Permitted vs Proposed Scenarios

Year	Surface Access Passenger Journey Emissions (tCO_2e)			
	Permitted	Proposed	Variation	% Variation (permitted to proposed)
2022	201,296	215,268	**13,972**	6.94%
2025	285,671	298,637	**12,966**	4.54%
2035	301,722	303,120	**1,398**	0.46%

Table 11-6:Total Annual GHG Emissions Projections – Permitted vs Proposed Scenarios

Year	Total Annual GHG Emissions (tCO_2e[46])			
	Permitted	Proposed	Variation	% Variation (permitted to proposed)
2022	2,132,154	2,249,576	**117,421**	5.51%

[46] Note: While this is reported in tCO_2e, the aviation emissions included within this total only account for CO_2 emissions.

Year	Total Annual GHG Emissions (tCO_2e*46*)			
	Permitted	Proposed	Variation	% Variation (permitted to proposed)
2025	3,101,502	3,203,276	**101,774**	3.28%
2035	3,185,352	3,128,361	**-56,991**	-1.79%

Assessment of Significance of Effects

11.7.2 Any additional GHG emissions arising as a result of the proposed Relevant Action are considered to have a direct, negative effect on the receptor. The effects of GHG emissions are also considered to be long term, irreversible and have the potential to be cumulative with other projects. In terms of effect significance, IEMA suggests that *"GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reduction from a project might be considered significant."*

11.7.3 Under the Proposed Scenario for 2022 and 2025, an increase in flights is expected to lead to an increase in GHG emissions compared to the Permitted Scenario. However, in 2035, a decrease in emissions is expected between the Permitted and Proposed Scenarios. While there are the same number of flights in each scenario, some of the short-haul night flights that have been modelled as part of the Proposed Scenario are lost under the Permitted Scenario (as per the Mott McDonald Impact of the Operating Restrictions Report which concludes that Permitted Scenario has a disproportionate impact on the base carriers with mostly short haul flights being affected) and are expected to be replaced with long-haul day flights, therefore leading to increased CCD emissions under the Permitted Scenario. This increase in short-haul flights and decrease in long-haul flights under the Proposed Scenario for 2035 (relative to the Permitted Scenario) results in fewer CCD emissions associated with these flights.

11.7.4 As described in 11-5, the impact of the proposed Relevant Action has been compared with Ireland's projected National Emissions Inventories for each of the assessment years (under the With Additional Measures scenario) to determine the magnitude of effect (see Table 11-7). The impact of the proposed Relevant Action has been further contextualised by comparing the CO_2 emissions with the projected Transport Emissions Inventories for each of the assessment years (under the With Additional Measures scenario).

Table 11-7: GHG Emissions Against Future National Emissions Inventory Scenarios

Year	Additional Annual GHG Emissions (kt CO_2e)	Projected National Emissions Inventory (kt CO_2e)	Emissions as a % of National Emissions Inventory	Significance
2022	117.4	61,510	0.191%	Minor Adverse
2025	101.8	61,430	0.166%	Minor Adverse
2035	-57.0	55,200	0.103%	Minor Beneficial

Note: While emissions are reported in $ktCO_2e$, the aviation emissions included within the total only account for CO_2 emissions.

Table 11-8: GHG Emissions Against Future Transport Emissions Inventory Scenarios

Year	Additional Annual GHG Emissions (kt CO_2e)	Projected National Emissions Inventory (kt CO_2e)	Emissions as a % of National Emissions Inventory
2022	117.4	12,970	0.91%
2025	101.8	12,490	0.81%
2035	-57.0	11,000	0.52%

Note: While emissions are reported in ktCO_2e, the aviation emissions included within the total only account for CO_2 emissions.

11.7.5 As the GHG emissions associated with the proposed Relevant Action do not represent $\geq$1% of the projected National Emissions Inventory for any of the assessment years, GHG emissions are considered to be not significant**.**

11.8 Mitigation and Monitoring

11.8.1 No additional mitigation and monitoring is proposed to offset the identified effects of the proposed Relevant Action. As described in Section 11.6, above, measures to offset GHG emissions and monitoring of those measures, is proposed on an airport-wide basis and set out in the Applicant's draft Carbon Reduction Strategy.

11.9 Residual Effects and Conclusions

11.9.1 This section identifies the residual effects, which following the implementation of mitigation and monitoring measures, cannot be eliminated through design changes or the application of standard mitigation measures.

11.9.2 There will be unavoidable GHG emissions resulting from the operational phase of the proposed Relevant Action. However, as the effects are considered to be minor, and therefore not significant, it is not appropriate to define any mitigation measures further to the ones detailed in Section 11-12.

Table 11-9: Climate Change Summary of Potential Effects

Description of Effect	Sensitivity of Receptor	Nature of Effect / Geographic Scale	Magnitude of Impact	Initial Classification of Effect (with embedded mitigation)	Additional Mitigation	Residual Effect Significance
Operational Phase						
GHG emissions	High	Long-term/ Global	Low	Minor	None	Minor (not significant)

Likely Significant Environmental Effects

11.9.3 The magnitude of effect of the GHG emissions impact of the proposed Relevant Action considering the receptor's sensitivity (global climate) will be minor, which is considered to be not significant.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections and additions, the chapter has been revised to:

- Address an additional assessment year requested by the Council
- Set out more clearly the scenarios for assessment in the EIAR
- Respond to the latest passenger growth forecasts at Dublin Airport

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the proposed Relevant Action.

12. Water

12.1 Introduction

12.1.1 This chapter of the EIAR reports the findings of an appraisal of the effects of the proposed Relevant Action on the water environment. It sets out the relevant aspects of the Current State of the Environment and the Future Receiving Environment and goes on to consider the impact of the proposed Relevant Action, which will be an operational change, to remove the numerical cap on the average number of flights permitted between the hours of 23:00 and 07:00 in the Permitted Scenario, replacing it with an annual night-time noise quota (2330 to 0600), and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00.

12.1.2 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2027 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario. Around 7.1 million additional passengers will have used the airport in in the period 2022-2026 in the Proposed Scenario.

12.2 Legislation, Policy and Guidance

12.2.1 The following legislation, policy and guidance is relevant to this chapter and has been considered during the assessment presented within it. General legislation, policy and guidance has also been considered but is not listed as this has been covered in the introductory chapters.

Legislation

12.2.2 The following legislation is relevant to this chapter and has been considered during the assessment presented within it:

- European Union Water Framework Directive (WFD) (2000/60/EC), which was adopted as a single piece of legislation covering rivers, lakes, groundwater and transitional (estuarine) and coastal waters. The WFD was given legal effect in Ireland under the:
  - o European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003)
  - o European Communities Environmental Objectives (Surface Water) Regulations, 2009 ('S.I. No. 272 of 2009) as amended in 2012 (by S.I. No. 327/2012), 2015 (by S.I. No. 386/2015) and 2019 (by S.I. No. 77/2019)
- The EU Floods Directive 2007/60/EC;
- European Communities (Assessment and Management of Flood Risks) Regulations, 2010 (S.I. No. 122 of 2010);
- River Basin Management Plan 2018-2021 (DHPLG, 2018);
- Fisheries Acts 1959 to 2019;
- Inland Fisheries Acts 1959 to 2017; and
- Local Government (Water Pollution Acts) 1977-2007.

National Planning Policy

12.2.3 The following national planning policy is also relevant to this chapter and has been considered throughout the assessment presented within it:

- Project Ireland 2040 – National Planning Framework (2018).

Regional and Local Planning Policy

12.2.4 The following regional and local planning policy is considered relevant to this assessment.

- Regional Spatial & Economic Strategy for the Eastern and Midland Region 2019-2031;
- Fingal Development Plan 2017-2023; and
- Dublin Airport Local Area Plan (2020).

Policy, Standards and Guidance

12.2.5 The following guidance documents are considered relevant to this assessment.

- Draft Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2017);
- Greater Dublin Strategic Drainage Study Final Strategy Report (Dublin Drainage, April 2005);
- Greater Dublin Strategic Drainage Study – Regional Drainage Policies – Volume 2 – New Development, (Dublin Drainage, March 2005); and
- Greater Dublin Regional Code of Practice for Drainage Works Version 6.0.

12.3 Assessment Methodology

12.3.1 The assessment has been carried out following the below methodology, and follows the EPA Draft Guidance;

- Identification of the characteristics of the Proposed Relevant Action;
- Identification and assessment of the receiving environment and receptor sensitivity;
- Identification of the potential impacts, and assessment of the magnitude of potential effects; and
- The consideration of whether mitigation measures or alternatives are required.

Study Area

12.3.2 The study area for the surface water receptors encompasses all catchments that receive stormwater and overland flows from the airport lands. For groundwater, the study area is the airport lands footprint and a 1 km buffer area.

12.3.3 In addition, consideration has also been given to any attributes of surface water or groundwater or water dependent ecological sites outside this study area but hydrologically connected to the airport (i.e. downstream along watercourses), as some impacts can propagate downstream. Professional judgement will be applied to identify the extent to which such features are included.

Methodology for Determining Baseline Conditions and Sensitive Receptors

12.3.4 The existing water environment has been determined from desktop review, site walkovers and site studies / investigations, as follows:

- Aquatic & Hydrological studies undertaken to establish a baseline for the Applicant's Infrastructure Application[1] and monitoring conducted in 2020 and 2021;
- Ordnance Survey Ireland (OSI) website for historical maps of 1:2,500 scale and 1:10,560 scale and aerial photographs;
- OSI discovery series of 1:50,000 scale;
- GSI website for public viewer and groundwater maps;
- EPA website Geo Portal;
- Local authority web portals;
- Topography maps;
- Flood information mapping; and
- Existing site investigation information.

12.3.5 Receptors have been identified and a qualitative assessment has been used to assign a sensitivity rating from negligible to high based on the EPA Draft Guidance and considers their likely adaptability, tolerance and recoverability.

Methodology for Determining Construction Effects

12.3.6 As the proposed Relevant Action propose no changes to the design or construction of North Runway, or any other part of Dublin Airport, there will be no physical changes in any part of the airport or its surroundings. As a result, the proposed Relevant Action will not result in any new effects on the water environment arising from construction, and further assessment is therefore not required.

Methodology for Determining Operational Effects

12.3.7 The potential operational impacts of the proposed Relevant Action on the water environmental were considered. Potential impacts identified include:

- Potential for pollution of surface and ground water arising from additional flights;
- Potential for increased usage of water by additional passengers; and
- Potential for increased generation of wastewater by additional passengers.

12.3.8 These potential impacts are examined in more detail and their effects assessed below.

Limitations and Assumptions

12.3.9 There are no limitations to the assessment of potential effects on the water environment presented in this chapter.

12.4 Current State of the Environment

Surface water

12.4.1 Dublin Airport is located within four WFD sub-basins:

- The Mayne River Sub-basin, which includes the Cuckoo Stream. This sub-basin covers the majority of the airport campus, including the terminal, the west and central aprons, and the majority of the South Runway. The Cuckoo Stream flows into the Mayne River, which then flows into the Baldoyle Estuary Special Area of Conservation (SAC);
- The Sluice sub-basin, which includes the Forrest Little Stream and Kealy's Stream. This sub-basin extends across the majority of the North Runway, the North Apron, and other airport areas. Forrest Little Stream and Kealy's Stream flow into the Sluice River, which then flows into the Baldoyle SAC;

[1] See *Chapter 22: Future Development Plans* for details of the Infrastructure Application.

- The Ward River sub-basin. The Ward River natural catchment extends across the western part of the North Runway, however, does not receive drainage from the North Runway. The Ward River flows into the Malahide Estuary SAC; and
- The Santry River sub-basin, which extends across the western part of the South Runway and airport car parking. The Santry River flows into Dublin Bay behind Bull Island.

12.4.2 The catchment characteristics, surface water quality and WFD status of each of these sub-basins is considered below.

The Mayne River sub-basin, including Cuckoo Stream

12.4.3 The majority of the Dublin Airport currently drains to the Cuckoo Stream of the Mayne River sub-basin (WFD Sub-basin Mayne_010) of the Mayne sub-catchment. The airport catchment consists of the terminal, other buildings, the west and central aprons, and the majority of the South Runway. A small part of the South Runway drains directly to the Mayne Stream.

12.4.4 The Cuckoo Stream effectively forms the northern branch of the River Mayne, joining the southern branch which flows into the Baldoyle Estuary SAC at Mayne Bridge 2km below the confluence. The River Mayne catchment is approximately 17km^2 in area, with a significant proportion of urbanised landscape with approximately 3.5km^2 within the airport boundary. The length of watercourse channel between the airport boundary and the outfall at into the Baldoyle Estuary is 7.4 km.

12.4.5 The Cuckoo Stream branch of the Mayne is not monitored for water quality by the EPA. However, a site downstream of the confluence of the Cuckoo Stream with the southern branch of the Mayne River is monitored by the EPA at Wellfield Bridge (station code RS09M030500, approximately 5.5 km east-south-east of the airport)). In 2019 the water quality was classified as *Poor* with a Q value[2] of 2-3, i.e. moderately polluted. The EPA data indicates that this site has historically varied between Q3 and Q2-3 over the years.

12.4.6 The Applicant undertakes regular monitoring of the Cuckoo Stream, including near its outfall from the airport, comprising of bi-annual biological monitoring and regular water chemistry analysis. Sampling is conducted by conducted by Conservation Services using biological sampling and water quality assessment in accordance with EPA Q value methodology. Available monitoring data for the Cuckoo Stream (up to May 2019[3]) report Q values of 1-2, which shows the stream to be seriously polluted and therefore having Bad Ecological Status under the Water Framework Directive. This has more or less been the situation since 2006 (varying between Q1-2 and Q1 during that period). The Mayne River monitoring had reported Q values of 3 in May 2019, indicating the river is moderately polluted and has a *Poor* Ecological Status under the WFD.

12.4.7 Table 12-1 below summarises monitoring data for sampling points within the Cuckoo Stream / Mayne sub-basin collected by Fitz Scientific between March 2020 and February 2021. Results of surface water monitoring at three locations along the Cuckoo Stream and Mayne River conducted by Fitz Scientific in 2020-2021 indicate that the it does not meet the standard for *Good* status.

Table 12-1: Monitoring Data for Cuckoo / Mayne, 2020-2021

Monitoring Point	S.I. No. 77/2019 Criteria for Good Status[4]	Cuckoo Mayne 1	Cuckoo Mayne 2	Cuckoo Mayne 3	Cuckoo Mayne 4
Location	NA	53.4117, -6.2391	53.4206, -6.2329	53.4091, -6.1635	53.4097, -61565
Detergents as Methylene blue active substances (MBAS) – average concentration	NC	101 µg/L	86 µg/L	175 µg/L	136 µg/L

[2] The EPA classifies river biological quality using Q values. Q values measure the ecological health of rivers based on the population of aquatic invertebrates present, it ranges from 5 (High) to 1 (Bad).
[3] Conservation Services, *Biological Monitoring of Surface Water Quality in the Vicinity of Dublin Airport*, report reference: 19112/DS19/F, dated 06 June 2019.
[4] NA – Not Applicable, NC – No Criteria for good status, µg/L – micrograms per litre, mg/L – milligrams per litre.

Monitoring Point	S.I. No. 77/2019 Criteria for Good Status[4]	Cuckoo Mayne 1	Cuckoo Mayne 2	Cuckoo Mayne 3	Cuckoo Mayne 4
Propylene glycol – average concentration	NC	Below detection	Below detection	4.5 mg/L	Below detection
Total Petroleum Hydrocarbons (TPH, carbon band C10-C40) – average concentration	NC	Below detection	Below detection	Below detection	47 µg/L
Ammonia as nitrogen (N) – average concentration	0.065 mg/L as N	0.11 mg/L as N	0.10 mg/L as N	0.78 mg/L as N	0.85 mg/L as N
Phosphate (P) (Ortho) – average concentration	0.035 mg/L	0.051 mg/L as P	0.056 mg/L as P	0.193 mg/L as P	0.042 mg/L as P
Biological Oxygen Demand – average concentration	1.5 mg/L	Below detection	3.1 mg/L	13.6 mg/L	5.9 mg/L
Chemical Oxygen Demand – average concentration	NC	23.3 mg/L	8.8 mg/L	30.1 mg/L	24.8 mg/L
pH – average reading	NC	7.82	8.01	7.70	8.09
Dissolved Oxygen – average concentration	NC	10.6 mg/L	9.6 mg/L	7.8 mg/L	7.4 mg/L

12.4.8 The WFD status of the Mayne and the Cuckoo is classified as *Poor* for the period 2013-2018 and *At Risk*. The Mayne river is at risk due to Poor ecological status, with nutrients and diffuse urban sources of pollution causing significant pressures[5].

12.4.9 According to Inland Fisheries Ireland (IFI) the Mayne River and tributaries including the Cuckoo Stream are currently non-salmonid[6] although this was historically a salmonid system which had lost its status primarily because of poor water quality due to urbanisation. Water quality remains moderately polluted though IFI are confident that salmonid status could be restored. IFI are currently working with Fingal County Council on a project to reintroduce salmonids naturally to the system.

Forest Little / Sluice sub-basin

12.4.10 The North Runway and aircraft stands currently drain to the Forest Little Stream, Kealy's Stream and the Wad Stream of the Sluice River sub-basin (WFD Sub-basin Sluice_010) of the Mayne sub-catchment. The Sluice River catchment is approximately 10 km^2 in area, which includes approximately 2.4 km^2 within the airport boundary, which consists of buildings, roads, several large carparks, aircraft stands, the Northern Runway, and associated taxiways. The Forest Little / Sluice River flows from west-north-west to east-south-east, discharging to the north of Baldoyle Estuary SAC at Portmarnock Bridge, approximately 7 km east-south-east from the North Runway, the final 2 km of channel being under tidal influence.

12.4.11 Neither the Sluice River nor its tributaries are monitored for water quality status by the EPA as part of their various river monitoring programmes, neither do they monitor water quality in the Baldoyle Estuary SAC itself.

12.4.12 The Applicant conducts biannual biological sampling and water quality assessment of three monitoring points along the Forest Little / Sluice downstream of the airport, sampling is conducted by Conservation Services using biological sampling and water quality assessment in accordance with EPA Q value

[5] WFD Cycle 2. Catchment Liffey and Dublin Bay. Sub-catchment Mayne_SC_010. Available online: https://www.catchments.ie/wp-content/files/subcatchmentassessments/09_17%20Mayne_SC_010%20Subcatchment%20Assessment%20WFD%20Cycle%202.pdf
[6] Freshwater capable of supporting salmon or trout.

methodology. Available monitoring data (up to May 2019[7]) report Q values of 3 for each of the three monitoring points in May 2019, indicating a pollution status of *Moderate*. Over time at the two monitoring points closest to the airport (F4A/B and F5) Q values had improved from 1-2 in 2006 and 2007 to 3 from September 2017 onwards. The most downstream of the three monitoring points (F6) has been monitored since September 2013, and Q values of 3 were predominantly reported up to May 2019. This indicates improving water quality over time.

12.4.13 Table 12-2 below summarises monitoring data for sampling points within the Forest Little / Sluice sub-basin collected by Fitz Scientific between March 2020 and February 2021. Results of surface water monitoring at three locations along the Forest Little / Sluice conducted by Fitz Scientific in 2020 indicate that the it does not meet the standard for *Good* status.

Table 12-2: Monitoring Data for Forest Little / Sluice, 2020-2021

Monitoring Point	S.I. No. 77/2019 Criteria for Good Status[8]	Forest Little 1	Forest Little 2	Forest Little 3
Location	NA	53.4386, -6.2280	53.4268, -6.1772	53.4228, -6.1565
Detergents as MBAS – average concentration	NC	94 µg/L	92 µg/L	109 µg/L
Propylene glycol – average concentration	NC	Below detection	Below detection	Below detection
TPH C10-C40 – average concentration	NC	Below detection	22.5 µg/L	Below detection
Ammonia as nitrogen (N) – average concentration	0.065 mg/L as N	0.07 mg/L as N	0.06 mg/L as N	0.06 mg/L as N
Phosphate (P) (Ortho) – average concentration	0.035 mg/L	0.06 mg/L as P	0.05 mg/L as P	0.05 mg/L as P
Biological Oxygen Demand – average concentration	1.5 mg/L	3.8 mg/L	2.1 mg/L	Below detection
Chemical Oxygen Demand – average concentration	NC	13 mg/L	10.7 mg/L	9.5 mg/L
pH – average reading	NC	7.54	7.53	7.85
Dissolved Oxygen – average concentration	NC	9.0 mg/L	9.6 mg/L	9.6 mg/L

12.4.14 The WFD status of the Forest Little / Sluice for the 2013 to 2018 period is Unclassified, while the risk status is to be reviewed. As noted above, for other streams within the Mayne sub-catchment, the Mayne and the Cuckoo, their status is classified as *Poor* for the period 2013-2018 and *At Risk*.

12.4.15 According to IFI the Sluice system is salmonid with brown trout historically in the lakes at Abbeyville, though there has been no recent survey on the lakes, and in the Sluice downstream of Abbeyville. Towards the downstream part of the stream, where the water quality is improved (Q3) and the substrate is very suitable, brown trout could be present as well as other fish species such as eel and stickleback. This is supported by a recent (2016) IFI fisheries survey which recorded eel, brown trout (young-of-year), stickleback and flounder on the Sluice River at Portmarnock Bridge 1[9].

[7] Conservation Services, *Biological Monitoring of Surface Water Quality in the Vicinity of Dublin Airport*, report reference: 19112/DS19/F, dated 06 June 2019.
[8] NA – Not Applicable, NC – No Criteria for good status, µg/L – micrograms per litre, mg/L – milligrams per litre.
[9] Kelly, F.L., Matson, R., Delanty, K., Connor, L., O'Brien, R., Gordon, P., Corcoran, W., McLoone, P., Coyne, L., Morrissey, E., Cierpal, D., Rocks., K., Buckley, S., Kelly, K., McWeeney, D. and Puttharee, D. (2017) Sampling Fish in Rivers 2016. National Research Survey Programme. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24, Ireland.

The Ward sub-basin

12.4.16 The western end of the North Runway is within the Ward sub-basin (WFD Sub-basin Ward_030[10]), which is a subdivision of the Broadmeadow sub-catchment. The Ward River sub-basin is approximately 32.9 km^2 in area; approximately 1 km^2 of the airport is shown to be within the Ward River catchment, however the stormwater drainage does not discharge from hardstanding areas into this catchment.

12.4.17 Two tributaries of the Ward are located to the north and west of the North Runway; these are named St. Margaret's Stream and Barberstown Stream and flow in westerly and northerly directions, respectively. The tributaries confluence approximately 1.1 km north-west of the North Runway, prior to flowing into the Ward River immediately upstream of Toberburr Road, approximately 1 km further downstream. The Ward River discharges to Malahide Estuary SAC 7 km downstream of the confluence, and approximately 4 km north-east of the North Runway.

12.4.18 The EPA monitor the Ward River and tributaries in multiple locations downstream of the airport. The nearest downstream EPA surface water quality monitoring point within the Ward sub-basin that was monitored in 2020 is the bridge north of Killeek (station code RS08W010300), located 1.8 km north of the North Runway. At this monitoring point the surface water quality is classified by the EPA as *Moderate* with a Q[11] value of 3-4 in 2020. River water quality upstream of this was also classified by the EPA as *Moderate* (Q value of 3-4) in 2020 at Coolatrath Bridge (station code RS08W010070, located 4.6 km upstream), indicating that there is no deterioration in the Q value of watercourses within the Ward sub-basin downstream of the airport.

12.4.19 Table 12-3 below summarises monitoring data for sampling points within the Ward sub-basin collected by the Applicant between March 2020 and February 2021.

Table 12-3: Monitoring Data for Ward, 2020-2021

Monitoring Point	S.I. No. 77/2019 Criteria for Good Status[12]	Ward 1	Ward 2	Ward 3	Ward 4
Location	NA	53.4356, -6.3013	53.4553, -6.2764	53.4640, -6.2188	53.4426, -6.2678
Detergents as MBAS – average concentration	NC	95.4 µg/L	74.3 µg/L	116 µg/L	74.4 µg/L
Propylene glycol – average concentration	NC	Below detection	Below detection	Below detection	Below detection
TPH C10-C40 – average concentration	NC	Below detection	Below detection	Below detection	Below detection
Ammonia as nitrogen (N) – average concentration	0.065 mg/L as N	0.25 mg/L as N	0.09 mg/L as N	1.03 mg/L as N	0.10 mg/L as N
Phosphate (P) (Ortho) – average concentration	0.035 mg/L	0.08 mg/L as P	0.08 mg/L as P	0.08 mg/L as P	0.07 mg/L
Biological Oxygen Demand – average concentration	1.5 mg/L	4.6 mg/L	Below detection	2.6 mg/L	3.4 mg/L
Chemical Oxygen Demand – average concentration	NC	19 mg/L	16.3 mg/L	12.6 mg/L	10.1 mg/L
pH – average reading	NC	7.87	7.86	7.93	7.69
Dissolved Oxygen – average concentration	NC	8.8 mg/L	9.7 mg/L	9.7 mg/L	8.3 mg/L

12.4.20 Under the WFD the WFD Status of the Ward sub-basin for the period 2013 to 2018 between the North Runway and the monitoring station at the bridge north of Killeek is classified as *Moderate*, while

[10] EPA Maps
[11] The EPA classifies river biological quality using Q values. Q values measure the ecological health of rivers based on the population of aquatic invertebrates present, it ranges from 5 (High) to 1 (Bad).
[12] NA – Not Applicable, NC – No Criteria for good status, µg/L – micrograms per litre, mg./L – milligrams per litre.

downstream of that monitoring point it is classified as *Poor* for the same period. The risk status of the Ward is given as *At Risk*.

12.4.21 The Ward is considered a salmonid river by IFI.

The Santry River sub-basin

12.4.22 A small part of Dublin Airport currently drains to the Santry River sub-basin (WFD Sub-basin Santry_010). The catchment of the Santry sub-basin is approximately 9.7 km^2 which includes approximately 1.5 km^2 of the airport, including the western part of the South Runway and airport car parking. The Santry River originates to the west of the airport and flows to the south of the South Runway, and into Dublin Bay behind Bull Island, approximately 11 km downstream of the airport.

12.4.23 The EPA monitor the Santry River at multiple locations downstream of the airport. The nearest downstream EPA surface water quality monitoring point within the Santry sub-basin that was monitored in 2020, is the at Clonshaugh Road Bridge (station code RS09S010300), located 6 km downstream of the airport. At this monitoring point the surface water quality is classified by the EPA as *Poor* with a Q[13] value of 2-3 in 2020.

12.4.24 Table 12-4 below summarises monitoring data for sampling points within the Santry sub-basin collected by the Applicant for 2020-2021.

Table 12-4: Monitoring Data for Santry, 2020-2021

Monitoring Point	S.I. No. 77/2019 Criteria for Good Status[14]	Santry 1	Santry 2	Santry 3
Location	NA	53.4098, -6.2706	53.3966, -6.2055	53.3802, -6.1767
Detergents as MBAS – average concentration	NC	99.7 µg/L	76 µg/L	76.3 µg/L
Propylene glycol – average concentration	NC	Below detection	Below detection	Below detection
TPH C10-C40 – average concentration	NC	Below detection	Below detection	Below detection
Ammonia as nitrogen (N) – average concentration	0.065 mg/L as N	0.04 mg/L as N	0.11 mg/L as N	0.05 mg/L as N
Phosphate (P) (Ortho) – average concentration	0.035 mg/L	0.034 mg/L as P	0.056 mg/L as P	0.056 mg/L as P
Biological Oxygen Demand – average concentration	1.5 mg/L	Below detection	Below detection	Below detection
Chemical Oxygen Demand – average concentration	NC	14.7 mg/L	15.0 mg/L	11.0 mg/L
pH – average reading	NC	7.78	7.84	7.93
Dissolved Oxygen – average concentration	NC	9.1 mg/L	9.2 mg/L	9.6 mg/L

12.4.25 The WFD status of the Santry is classified as *Poor* for the period 2013 - 2018 and *At Risk*. The Santry river is at risk due to Poor ecological status, and diffuse urban sources of pollution causing significant pressures[15].

[13] The EPA classifies river biological quality using Q values. Q values measure the ecological health of rivers based on the population of aquatic invertebrates present, it ranges from 5 (High) to 1 (Bad).
[14] NA – Not Applicable, NC – No Criteria for good status, µg/L – micrograms per litre, mg./L – milligrams per litre.
[15] WFD Cycle 2. Catchment Liffey and Dublin Bay. Sub-catchment Mayne_SC_010. Available online: https://www.catchments.ie/wp-content/files/subcatchmentassessments/09_17%20Mayne_SC_010%20Subcatchment%20Assessment%20WFD%20Cycle%202.pdf

12.4.26 According to IFI the Santry River is currently non-salmonid due to the presence of a number of impassable features to fish located towards the lower end of the system.

Groundwater

12.4.27 The geology and groundwater beneath the Dublin airport have been reviewed, and comprise the following geological units:

- The Malahide Formation, comprising argillaceous limestone and shale, located beneath the north-west of the airport;
- The Tober Colleen Formation, comprising calcareous shale and limestone conglomerate, located through the centre of the airport in a south-west to north-east direction;
- The Waulsortian Limestones, comprising massive unbedded lime-mudstone, located in a small outcrop towards the north-east of the airport; and
- The Lucan Formation, comprising dark limestone and shale, located in a small area to the south-east of the airport.

12.4.28 Some limited outcrop of bedrock is mapped within the airport, with limestone till forming the overburden across most of the area. Thickness of the till cover is understood from available site investigation information to be relatively thin, 2 m to 3.5 m, with up to 1 m of weathered bedrock also present at some locations.

12.4.29 In Ireland aquifers are divided into the three categories according to the function of yield:

- Regionally Important Aquifer: An aquifer which is sufficiently productive to be able to yield enough water to supply major regional water schemes.
- Locally important Aquifer: An aquifer which is moderately productive, i.e. capable of yielding enough water to boreholes or springs to supply villages, small towns or factories.
- Poor Aquifer; An aquifer which is normally capable of yielding only sufficient water from wells or springs to supply single houses, small farms or small group water schemes.

12.4.30 The bedrock beneath the airport and surrounding area is classified as a *Locally Important Aquifer*, beneath the majority of the site, and a *Poor Aquifer* towards the south-east of the airport, corresponding to parts of the Tober Colleen Formation. Owing to the thin overburden cover, the bedrock aquifer is classified as being *Highly* to *Extremely* vulnerable to pollution.

12.4.31 There is one borehole within the airport boundary, located at the airport business park (borehole ID 2923NEW034), which was drilled in 1991 and is used for industrial use; the borehole has a good yield (300 metres cubic per day (m^3/d)). Two warm springs and an abstraction well are mapped at St Margaret's between 600 m and 1 km west of the airport campus. Both springs are described as having a low yield, one (spring ID 2923NEW023) with a temperature range between 15 °C and 19 °C and the second (spring ID 2923NEW024) with a temperature range between 8 °C and 16 °C. The abstraction well (well ID 2923NEW017) reportedly dates from the 19th century with a good yield (164 m^3/d), it is not known if this well still exists and is in use. There is a borehole located approximately 0.8 km south of the South Runway at Merryfalls (Borehole ID 2923NEW035), which was drilled in 1984 and has a moderate yield (48.5 m^3/day), the use of this borehole is not known. There are six boreholes located between 600 m to 1 km south-east of the airport, around Ballystruan. Two were drilled in the 19th century, one is for domestic use (2923NEW016) and one for industrial use (2923NEW015); both have a good yield (109m^3/day and 130m^3/day respectively). The other four were drilled in 1988, and were all for industrial use (2923NEW037, 2923NEW036, 2923NEW062, 2923NEW061).

12.4.32 There are no public supply or group scheme Source Protection Areas mapped within a 2 km radius of the Dublin Airport.

12.4.33 Topography of the airport is relatively flat, at an approximate elevation of 70 m above Ordnance Datum, with the regional topographic gradient being gently to the north-east toward Malahide Estuary and the eastern coastline. It is expected that the general direction of groundwater flow is also to the north-east, though local variations in groundwater flow direction may occur where shallow groundwater is in hydraulic continuity with surface water streams.

12.4.34 The majority of the airport is within the Dublin groundwater body (IE_EA_G_008), which is classified as *Good* under the WFD for the period 2013 to 2018, with a status of *Not at Risk*. The north-west of the airport is within the Swords groundwater body (IE_EA_G_011), which is classified as *Good* under the WFD for the period 2013 to 2018, with a risk status of *Not at Risk*. It is understood that remediation of the former Fire Training Ground within the North Runway site was addressed during construction works. It is not affected in any way by the proposed Relevant Action.

12.4.35 The eastern end of the North Runway site is within the Industrial Facility (P0480-02) groundwater body (IE_EA_G_086), which is classified as *Poor* for the period 2013 to 2018, and *At Risk*. Industrial Emissions Licence P0480-02 was granted to Dublin Aerospace Limited, which operates out of Hangar 5 at Dublin Airport. It is understood from publicly available monitoring data that chlorinated solvents are detected in groundwater beneath the Dublin Aerospace Limited site.

Biodiversity Sites

12.4.36 The Malahide Estuary SPA and SAC is located approximately 4 km north-east of North Runway receives flows from the Ward River. The Malahide Estuary is approximately 8 km downstream of the airport boundary. The SPA and SAC encompasses the estuary, saltmarsh habitats and shallow subtidal areas at the mouth of the estuary. Following construction of a railway viaduct in the 19th century, the estuary became lagoonal in character and is only partly tidal. There are extensive intertidal flats which are exposed at low tide, with substantial stands of eelgrass (both *Zostera noltii* and *Zostera angustifolia*), and saltmarshes which provide important roost sites at high tide.

12.4.37 The Cuckoo Steam (via the Mayne River) and the Sluice River discharge to the Baldoyle Estuary SPA and SAC (Site Code 000199) which is located approximately 7 km east-south-east from the airport, and approximately 7.4 km downstream of the airport boundary. The Mayne River which flows into the centre of Baldoyle Estuary at Mayne Bridge while the Sluice River discharges to the head of the estuary at Portmarnock Bridge. The aquatic habitat for which the SAC is designated is Annex 1 Habitat 1140 (mudflats and sandflats not covered by seawater at low tide) and specifically in this inner estuarine area for the benthic community type 'Estuarine sandy mud with Pygospioelegans and Tubificoides benedii Community Complex' which also includes Hediste diversicolor as a prominent community member. A different community type is found in the outer estuary i.e. outside Cush Point.

Flood Risk

12.4.38 The majority of Dublin Airport is not mapped as being prone to flooding on the Office of Public Works (OPW) flood maps[16].

12.4.39 The OPW flood map shows a small area of the Forest Little / Sluice sub-basin, just south of the L3132 and north of the North Runway, is mapped as having a high probability of flooding at an annual exceedance probability (AEP) of 10% (i.e. a one in ten chance of flooding occurring or being exceeded in a given year). This flooding is associated with the Forest Little Stream. The mapped area prone to flooding increases at the medium (AEP of 1%) and low (AEP of 0.1%) probability thresholds. This area is grassed and does not contain any airport buildings or infrastructure.

12.4.40 The OPW flood map shows an area along Corballis Road South, and some surrounding properties to the south of the road, is mapped as having a high probability of flooding at an AEP of 10%. This flooding is associated with Cuckoo Stream. The mapped area prone to flooding increases at the medium (AEP of 1%) and low (AEP of 0.1%) probability thresholds. This area includes roads, car parks, and non-aviation infrastructure.

12.4.41 The OPW flood map also shows some other small areas of flooding to the south of the South Runway, associated with other tributaries, however these are all located outside of the main runway, taxiways and other sensitive areas, and are associated with areas of grass or car parks.

[16] Flood Maps - Floodinfo.ie

Stormwater Drainage Network

12.4.42 Dublin Airport has an existing stormwater drainage network, that flows to various open drains and streams to the local watercourses discussed above[17]. The stormwater network provides attenuation to most hard-standing and developed areas, with the exception of the Mayne and Santry sub-catchments.

12.4.43 Pollution retention facilities are provided for the runways, the aprons and the taxiways, to collect de-icing chemicals. Surface water runoff from other hardstanding areas, including roads and car-parking, do not have any formal treatment prior to downstream discharge. The paved area drainage network is sealed to protect groundwater from contamination. Operational discharges at the airport are controlled under an extant trade effluent licence.

12.4.44 The North Runway is currently under construction; however the stormwater drainage network has been designed to attenuate flows and avoid water quality impacts to the receiving watercourses.

Attenuation

12.4.45 Attenuation, where it is provided, is designed to contain the 1% AEP storm event, with a discharge rate reduced to greenfield in many catchments. There are existing 'global' underground attenuation facilities along the Cuckoo stream downstream of the Cuckoo culvert, which provides the main facility for attenuating flows from the Cuckoo Stream sub-catchment. There are also 'local' attenuation facilities for various aprons and the other stormwater catchments.

12.4.46 The areas of the Mayne River Catchment and Santry River catchment within the airport complex are currently unattenuated, despite draining part of the main runway which impacts on the rate and quality of the surface water discharge to the receiving watercourse. The applicant is currently investigating options to provide attenuation to these areas (daa, 2020).

Pollution Control

12.4.47 De-icing of planes and taxi/runways occurs at Dublin Airport several times a year during cold weather. As a result, associated runoff will be polluted and the Biological oxygen demand (BOD)[18] of the polluted water will spike and exceed the permissible BOD discharge limit. Therefore, the stormwater drainage network pollution system is designed to control pavement de-icer (potassium acetate) run-off.

12.4.48 De-icing of the runway, stands and taxiways generally occurs when temperatures are predicted to drop to 0°C or lower. Departing aircraft are generally de-iced when the air temperature reaches 3°C or lower. All aircraft are de-iced while stationary on their stands prior to departure / pushback.

12.4.49 The majority of the airfield, within the Cuckoo Stream sub-catchment, is treated via a flow diversion chamber and pollution control tank that has been constructed at the Cuckoo stream adjacent to the underground attenuation facility. As water is conveyed along the channel, BOD monitors take readings of flow within the watercourse. If and when the BOD levels exceed the allowable threshold, flow is diverted out of the channel and into the pollution tank. The polluted water is than pumped from the site via the Irish Water (IW) sewer to the wastewater treatment facility at Ringsend.

12.4.50 Once construction of North Runway is completed under the Permitted Scenario, run-off from paved areas will be continuously monitored via online Total Organic Carbon (TOC) analysers (which allow for low levels of assessment and irregular flows in the network) to measure TOC values which shall be calibrated to equivalent BOD and Chemical Oxygen Demand (COD) limits to measure compliance with permitted discharge levels. If monitoring shows that the surface water is contaminated, it will be automatically diverted to the polluted water holding tank (PWHT), from there pumped to the IW sewer. If the pollution is below the threshold it will be diverted into the clean water attenuation tank from where it will be discharged at green-field rates.

[17] Daa (2020). Dublin Airport Local Area Plan, Appendix 6: Strategic Flood Risk Assessment and Surface Water Management Plan.

[18] BOD indicates the amount of oxygen which bacteria and other micro organisms consume in a water sample to degrade the water quality. BOD is an indirect measure of the sum of all biodegradable organic substances in the water. High BOD is usually a result of organic pollution, and can result in reduced freshwater oxygen levels which will reduce the biodiversity of aquatic communities. Daa discharge limit uses BOD5, which indicates the amount of oxygen which bacteria and other micro organisms consume in a water sample during the period of 5 days at a temperature of 20ºC.

12.4.51 The thresholds determining whether the run-off is diverted to the contaminated or clean water holding tanks are set at 5 mg/l BOD for the period October to April inclusive and 3 mg/l BOD for the period May-September inclusive. These thresholds have been agreed with Fingal County Council and IFI.

12.4.52 The control system for the tank discharge will include failsafe mechanisms to ensure that there is no accidental release of contaminated paved area drainage water into receiving waterways.

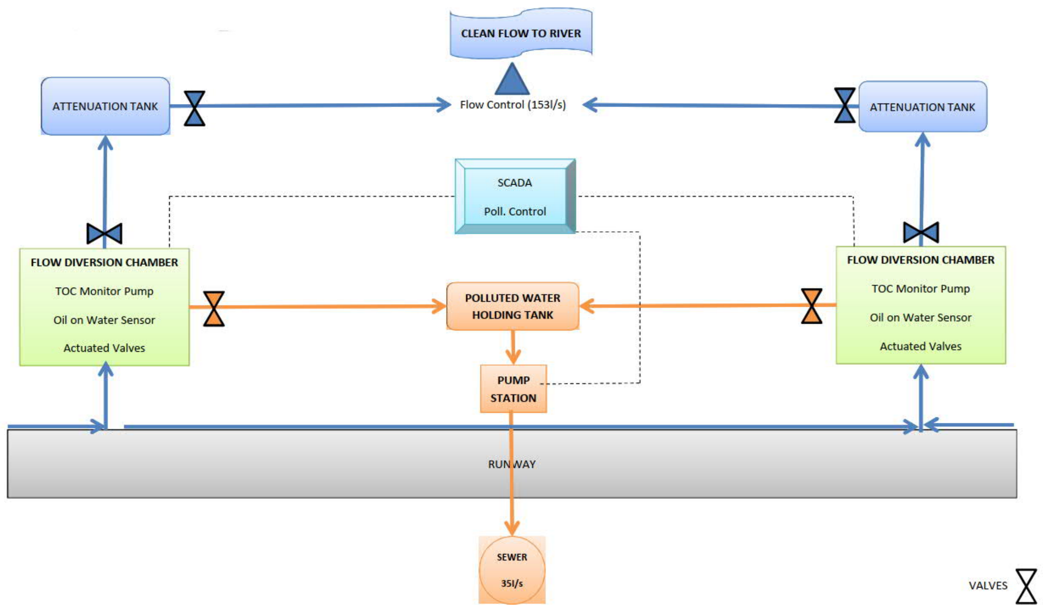


Plate 12.1: Illustrated Drainage Flow

12.4.53 As the Ward catchment is considered a salmonid water course, all drainage from paved areas of the North Runway is designed to be directed to the Forest Little / Sluice. Only runoff from grassed areas of the North Runway discharges to the Ward. Runoff from grassed areas discharges via stone filter drain trenches with catchpits. These filter drains are also fitted with isolation valves in the event of a major incident as an added safeguard to prevent potentially contaminated runoff from entering the Ward.

Water Supply and Foul Sewer

12.4.54 Potable water is supplied to Dublin Airport via existing potable water pipes from the Dublin Airport Reservoir.

12.4.55 The existing public foul sewer system and pumping house serving Dublin Airport is located on the R132 road and discharges into the North Fringe Sewer and ultimately to the Ringsend wastewater treatment facility.

Summary of Sensitivity of Receptors

12.4.56 A summary of the water receptors is provided in Table 12-5. This considers the importance of the receptors, the WFD status and the water quality of each receptor.

Table 12-5 Summary of receptors and sensitivity

Type	Receptor	Sensitivity
Surface water	Cuckoo Stream & Mayne River sub-basin	**Low** – watercourse has a Q value of 1-2 indicating Poor ecological status
	Forest Little / Sluice sub-basin	**Low** – watercourse has a Q value of 1-2 indicating Poor ecological status
	Ward Sub-basin	**High** – watercourse has a Q value of 3, and is a salmonid river
	Santry sub-basin	**Low** - watercourse has a Q value of 1-2 indicating Poor ecological status

Type	Receptor	Sensitivity
Biodiversity sites	Malahide Estuary SPA and SAC	**High** – water dependent designated site
	Baldoyle Estuary SAC	**High** – water dependent designated site
Groundwater	Groundwater aquifers	**Low –** aquifers are not regionally important, and abstractions are limited. Discharge from the surface is limited through sealed hardstand and the overlying boulder clay

12.5 Future Receiving Environment

12.5.1 It is assumed for the purposes of this chapter that the Future Receiving Environment would not be substantively different than at present.

12.5.2 There is no infrastructure proposed as part of this application and the proposed Relevant Action will not result in any changes to the existing drainage system. For this reason, the drainage infrastructure relating will remain unchanged as a result of the proposed Relevant Action.

12.5.3 In the absence of the proposed Relevant Action, the Permitted Scenario, with its predicted passenger and ATM forecasts, will come into effect once the North Runway is operational.

12.6 Environmental Design and Management

12.6.1 The operation of the de-icing and pollution control system is described above. This will be in place in both the Permitted Scenario and the Proposed Scenario in all three Assessment Years.

12.7 Assessment of Effects and Significance

12.7.1 As the proposed Relevant Action will not result in changes to the design or construction of the North Runway, there will be no construction impacts. As a result, the proposed Relevant Action will not result in any construction related effects on the water environment.

Pollution of Surface Water

12.7.2 The proposed Relevant Action will not alter the current or consented operational drainage systems and de-icing operations at the airport. There would be no amendments to surface water drainage operation relative to that already consented in the Permitted Scenario.

12.7.3 Table 12-6 summarises the potential ways in which the water environment might be affected by the proposed Relevant Action, and a summary of the effect is described. There are no differences identified between the Assessment Years of 2022, 2025 or 2035, except that there are fewer night-time ATMs (51 in the Permitted Scenario and 82 in the Proposed Scenario) in 2022.

Table 12-6: Comparison of Potential Impacts

Scenario	With North Runway Conditions No. 3(d) and 5 Restrictions (Permitted Scenario)	Without North Runway Conditions No. 3(d) and 5 Restrictions (Proposed Scenario)
Biological loading to sewer	As per existing trade effluent discharge licence (TEDL). Approx. 100-200 mg/L COD, and BOD of 80 to 150 mg/L to sewer.	No change. As per existing TEDL. Approx. 100-200 mg/L COD to sewer and BOD of 80 to 150 mg/L to sewer.
Hydraulic loading	Greenfield run-off rates for North Runway (and other new infrastructure).	No change. As per existing drainage network. No new infrastructure in this catchment as part of the proposed Relevant Action.
Area of Infrastructure	North runway - 362,400 m^2 runway and taxiway paved area.	No change to North Runway or any area within airport boundary.
Estimated extent of de-icer use	Pavement de-icer used for existing runways and taxiways as required based on weather	No change to pavement de-icing on existing runway and taxiways.

Scenario	With North Runway Conditions No. 3(d) and 5 Restrictions (Permitted Scenario)	Without North Runway Conditions No. 3(d) and 5 Restrictions (Proposed Scenario)
	conditions. Aircraft de-icing on stand dependent on air temperatures. De-icing required for departing aircraft only and can occur any time of day but mostly for first wave of departures in 0:00 hrs to 08:00 hrs period. Average of 65 movements permitted in 23:00 – 07:00 hour. Many of the flights that cannot be accommodated in the 06:00 – 07:00 hour are not lost completely but will depart at less preferred time after 07:00 due to the restrictions. They remain part of the first wave and continue to require de-icing in that period also. 3,000-5,000 L of pavement de-icer on runway per application.	Approximately 82 movements in the 23:00 – 07:00 period and some reduction in the numbers in the 07:00 – 08:00 period as they can now be accommodated at their preferred departure time. Therefore, the actual amount of additional aircraft de-icing is not significant and continues on the same stands as today and no additional infrastructure required. Therefore, no significant additional run-off. No change to 3,000-5,000 L of pavement de-icer on runway per application.
IW agreement with regard flows	As per pending Trade Effluent Discharge Licences (TEDL). For North Runway - 35 litres per second (L/s) as agreed with IW in letter of support dated 24th October 2016. To be finalised with trade effluent discharge licence and Planning Condition 21 discharge.	No change as a result of proposed Relevant Action to any pending or existing TEDL or limit values at the airport
IFI agreement with regard streams	5 mg/L BOD winter, 3mg/L BOD summer as per existing treatment and North Runway Permission.	No change as a result of the proposed Relevant Action to any limit values or monitoring at the airport No change to 5 mg/L BOD winter and 3 mg/L summer trigger level for polluter water in North Runway catchments

12.7.4 The primary threat to water quality as a result of the operating system at the airport is the application of de-icing chemicals following snow or frost events. The runways, aprons and taxiways are de-iced when temperatures are predicted to fall to 0 °C or below, and the planes when temperatures are predicted to fall to 3 °C or below. Given the relatively low number of these events at Dublin Airport, the frequency of pavement de-icing is relatively low. The extent of de-icing undertaken is independent of the time of day or the usage of the runway. The volume of de-icing fluid used and, therefore, the volume of potentially contaminated surface water arising, is directly related to the area of the runways / taxiways being de-iced and subsequent rainfall and is independent of the number of aircraft using the runway system. The design criteria for the pollution control system on the runway are not affected by the runway usage patterns (timing, frequency or aircraft types). Therefore, there will be no changes to either de-icing procedures / volumes or the runway drainage system as a result of the proposed Relevant Action.

12.7.5 There will also be no change in stormwater run-off volumes, attenuation discharge rates, attenuation volume requirements, or discharge locations as a result of the proposed Relevant Action. For these reasons, drainage relating to the runways / taxiways will remain unchanged. As a result of the above, there will be no significant effects arising due to the proposed Relevant Action.

12.7.6 An understanding of how the drainage systems and de-icing operations in use at the airport operate demonstrates that there is no potential for significant adverse effects associated with the proposed Relevant Action during operation as a result of surface water pollution because these operations are unaffected by the extended hours operation or larger number of night-time flights in the Proposed Scenario.

12.7.7 Therefore, the proposed Relevant Action would have no effect on surface water features in any of the Assessment Years since the drainage system will prevent any increase in pollution.

Pollution of Groundwater

12.7.8 The proposed Relevant Action does not pose a significant risk to the groundwater aquifers in terms of contaminated water entering the resource. As with surface water, the increase in the number of night-time flights (and passengers in Assessment Years 2022 and 2025) in the Proposed Scenario would have no effect on groundwater features, since the number or the time of day at which flights operate has little bearing on the volume of pollution in runoff from the runway system. De-icing operations would not be significantly different, as explained in Table 12-6. Furthermore, the drainage system consented as part of the North Runway Planning Permission is sealed to prevent impacts to groundwater and incorporates pollution control measures to prevent any increase in pollution to either surface water or infiltration to groundwater.

12.7.9 Therefore, the proposed Relevant Action would have no effect on groundwater features in any of the Assessment Years since the consented drainage system will prevent any increase in pollution.

Increased Usage of Water and Generation of Wastewater

12.7.10 The increase in the number of passengers in the Proposed Scenario, compared with the Permitted Scenario, would likely lead to a proportional increase in the volume of water usage and wastewater generation in the Assessment Years of 2022 and 2025. However, the total volumes in the Proposed Scenario would be comparable to those experienced in 2018 when the airport was operating at close to the consented 32mppa Cap, without causing significant effects on the supply of potable water or discharge and treatment of wastewater.

12.7.11 The difference between the Permitted and Proposed Scenarios is forecast to narrow to nothing by 2027 and thus there is no difference between the two scenarios in the 2035 Assessment Year. The impact on water usage and wastewater generation is therefore assessed as imperceptible and temporary.

Summary of Effects

12.7.12 The proposed Relevant Action will have no significant effects on the water environment in any of the Assessment Years: 2022, 2025 or 2035.

12.8 Mitigation and Monitoring

12.8.1 As the proposed Relevant Action will have not any significant effects on water the water environment, there is no requirement for mitigation to be implemented. No monitoring measures are proposed.

12.9 Residual Effects and Conclusions

12.9.1 There will be no significant effects on the water environment as a result of the proposed Relevant Action in any of the Assessment Years.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections, including minor removals from and additions to the earlier text, the chapter has been revised to:

- Address additional assessment years requested by the Council; and
- Set out more clearly the scenarios for assessment in the EIAR.

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

13. Aircraft Noise and Vibration

13.1 Introduction

13.1.1 This chapter of the EIAR reports the findings of an appraisal of effects on the noise environment from air noise and vibration. It sets out the relevant aspects of the Current State of the Environment and the Future Receiving Environment and goes on to consider the impact of the proposed Relevant Action, which will be an operational change, to remove the numerical cap on the number of flights permitted between the hours of 23:00 and 07:00 daily in the Permitted Scenario, replacing it with an annual night-time noise quota, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 6:00 to 07:00.

13.1.2 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2027 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario. Around 6.9 million additional passengers will have used the airport in in the period 2022-2026 in the Proposed Scenario.

13.1.3 The effect on the forecast numbers of passengers and movements in each of the Assessment Years is summarised in Table 1-1 of *Chapter 1: Introduction* which is repeated below as Table 13-1.

Table 13-1: Assessment Years, Scenarios, PAX and ATMs

Assessment Years and Scenarios	Predicted Annual Passengers (PAX) (millions per annum)	Permitted vs Proposed Difference in PAX (millions)	Air Traffic Movements (ATMs) ('000s per annum)	Typical 'Busy Day' Night-Time ATMs (23:00-07:00)
2022 Permitted	19.6	n/a	166	51
2022 Proposed	21.0	1.4	176	82
2025 Permitted	30.4	n/a	227	60
2025 Proposed	32.0	1.6	236	98
2035 Permitted	32.0	n/a	236	60
2035 Proposed	32.0	0.0	236	98

13.1.4 The overall effect on Air Traffic Movements is an increase of around 6% in 2022 and an increase of around 4% in 2025. In 2035 not effect is forecast due to activity being limited by the 32mppa Cap. Considering the typical 'Busy Day' activity at night, the increase in movements is around 60%. This is partly due to movements under the Permitted scenarios having to reduce from recent levels to comply with the requirement of Condition 5.

13.1.5 This assessment and EIAR chapter have been produced by Bickerdike Allen Partners LLP. The company and the key individuals involved are described in *Chapter 1: Introduction*.

13.1.6 Air noise and vibration specifically encompasses noise and vibration associated with flights into and out of Dublin Airport while airborne or using the runway system, including any start of roll or reverse thrust activities but excluding noise and vibration related to any other aircraft ground operations such as taxiing and when aircraft are on stands, which are covered in Chapter 14.

13.1.7 Chapter 14 also includes an assessment of the road traffic noise effects and a cumulative assessment of all noise sources.

13.1.8 This chapter presents information to represent the Current State of the Environment. This includes noise levels for 2018 at it is the most recent year with a throughput of close to but less than 32 million passengers per annum (mppa) at the airport. It is therefore considered to represent the situation with the airport operating without the North Runway or the effects of the Covid-19 pandemic. The chapter considers three Assessment Years of 2022, when the North Runway is expected to become operational, 2025, the first year when 32 mppa is expected to be reached after the North Runway is open, and 2035, which has been included in response to a request from Fingal County Council for an assessment over a longer term period.

13.1.9 For each of the three Assessment Years, this chapter has compared the Permitted Scenario with the Proposed Scenario in the corresponding year. These scenarios are described in *Chapter 1: Introduction*.

13.2 Legislation and Planning Policy Context

13.2.1 The Environmental Impact Assessment (EIA) process is described in *Chapter 1: Introduction*.

13.2.2 *Chapter 6: Planning and Development Context* of this EIAR sets out the legislative and planning policy context for the proposed Relevant Action. It includes reference to relevant national and local planning policies, including those that have been considered when determining the EIAR scope, method and mitigation. Those considered relevant to this chapter are summarised below with additional material also considered relevant. More detail on this additional material, and selected policies included in Chapter 6, are given in Appendix 13A.

Strategic Planning Context

13.2.3 The Applicant has a number of obligations to fulfil with regard to the management of Dublin Airport which are described in Chapter 6. The following regulations are relevant to noise:

- S.I. No. 549/2018– Environmental Noise Regulations 2018[1]; and
- Aircraft Noise (Dublin Airport) Regulation Act 2019 (the Aircraft Noise Act).[2]

13.2.4 The last of these implements European Union (EU) Regulation 598/2014[3] on the establishment of rules and procedures with regard to the introduction of noise related operating restrictions at EU Airports within the ICAO Balanced Approach[4]. Further details of this regulation, and the two listed above are contained in Appendix 13A.

National Planning Policy

13.2.5 National planning policy which is relevant to the proposed Relevant Action is described in Chapter 6.

Local Planning Policy

13.2.6 Local planning policy which is relevant to the proposed Relevant Action is described in Chapter 6. The following policy documents are relevant to noise and are discussed further in Section 13.6.

- Fingal Development Plan 2017-2023;[5]
- Dublin Airport Local Area Plan (2020);[6] and
- Noise Action Plan for Dublin Airport (2019-2023).[7]

[1] Government of Ireland (2018). S.I. No. 549/2018 - European Communities (Environmental Noise) Regulations 2018, [Online]. Available at: http://www.irishstatutebook.ie/eli/2018/si/549/made/en/ [Checked 12/08/2021]
[2] Government of Ireland (2019). Aircraft Noise (Dublin Airport) Regulation Act 2019, [Online]. Available at: http://www.irishstatutebook.ie/eli/2019/act/12/enacted/en/html [Checked 12/08/2021]
[3] European Commission (2014). Regulation (EU) No 598/2014 of the European Parliament and of the Council of 16 April 2014 on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports within a Balanced Approach and repealing Directive 2002/30/EC, [Online]. Available at: https://eur-lex.europa.eu/eli/reg/2014/598/oj [Checked 12/08/2021]
[4] ICAO (2010). Doc 9829 Guidance on the Balanced Approach to Aircraft Noise Management, ICAO
[5] Fingal County Council (2017). Fingal Development Plan 2017-2023, [Online]. Available at: https://www.fingal.ie/fingal-development-plan-2017-2023 [Checked 12/08/2021]
[6] Fingal County Council (2020). Dublin Airport Local Plan, [Online]. Available at: https://www.fingal.ie/sites/default/files/2020-01/dublin-airport-lap-2020.pdf [Checked 12/08/2021]
[7] Fingal County Council (2019). Noise Action Plan for Dublin Airport 2019-2023, [Online]. Available at: https://www.fingal.ie/sites/default/files/2019-04/NAP%20Final.pdf [Checked 12/08/2021]

International Policy, Standards and Guidance

13.2.7 The following international policies, standards and guidance documents are considered relevant to this assessment. More detail is given in Appendix 13A.

- ICAO Balanced Approach;[8]
- ICAO Convention on International Civil Aviation, Annex 16, Volume 1;[9]
- Environmental Noise Directive 2002/49/EC;[10]
- EU Commission Directive 2020/367;[11]
- WHO Guidelines for Community Noise (1999);[12]
- WHO Night Noise Guidelines for Europe (2009);[13] and
- WHO Environmental Noise Guidelines for the European Region (2018).[14]

Relevant UK Policy, Standards and Guidance

13.2.8 The National and International Policy, Standards and Guidance described above set out the overall approach, and much of the subsequent detail required to implement it. There are however some areas where additional information is considered beneficial, such as in relation to the significance of particular noise levels and criteria for particular types of buildings.

13.2.9 To provide this, information has been taken from the following UK policies, standards and guidance documents. More detail is given in Appendix 13A.

- Noise Policy Statement for England (2010);[15]
- UK Aviation Policy Framework (2013);[16]
- Survey of Noise Attitudes 2014 (2021);[17]
- UK Airspace Policy: A framework for balanced decisions on the design and use of airspace 2017 consultation;[18]
- BS 8233:2014 Sound insulation and noise reduction in buildings – code of practice;[19]

[8] ICAO (2010). Doc 9829 Guidance on the Balanced Approach to Aircraft Noise Management, ICAO
[9] ICAO (2014). Annex 16 to the Convention on International Civil Aviation, Environmental Protection, Volume 1 Aircraft Noise, 7th Edition, ICAO
[10] European Commission (2002). Directive 2002/49/EC Directive of the European Parliament and of the Council of 25th June 2002 relating to the assessment and management of environmental noise, [Online]. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0049&from=EN [Checked 12/08/2021]
[11] European Commission (2020). Commission Directive (EU) 2020/367 of 4 March 2020 amending Annex III to Directive 2002/49/EC of the European Parliament and of the Council as regards the establishment of assessment methods for harmful effects of environmental noise (Text with EEA relevance), [Online]. Available at: https://eur-lex.europa.eu/eli/dir/2020/367/oj [Checked 12/08/2021]
[12] Berglund, B. et al (1999). Guidelines for community noise, [Online]. Available at: http://apps.who.int/iris/bitstream/handle/10665/66217/a68672.pdf?sequence=1&isAllowed=y [Checked 12/08/2021]
[13] World Health Organisation Europe (2009). Night Noise Guidelines for Europe, [Online]. Available at: http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf [Checked 12/08/2021]
[14] World Health Organization Regional Office for Europe (2018). Environmental Noise Guidelines for the European Region, [Online]. Available at: http://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf [Checked 12/08/2021]
[15] Defra (2010). Noise Policy Statement for England, [Online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf [Checked 12/08/2021]
[16] UK Department for Transport (2013). Aviation Policy Framework, [Online]. Available at: https://www.gov.uk/government/publications/aviation-policy-framework [Checked 12/08/2021]
[17] UK Civil Aviation Authority (2017). Survey of noise attitudes 2014: Aircraft, CAP 1506, [Online]. Available at: https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=7744 [Checked 12/08/2021]
[18] Department for Transport (2017). Consultation Response on UK Airspace Policy: A framework for balanced decisions on the design and use of airspace, [Online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/653801/consultation-response-on-uk-airspace-policy-web-version.pdf [Checked 12/08/2021]
[19] British Standards Institution (2014). BS 8233:2014 Sound insulation and noise reduction for buildings – Code of practice, [Online]. Available at: https://shop.bsigroup.com/ProductDetail/?pid=000000000030241579 [Checked 12/08/2021]

- Department of Education - Acoustic design of schools: performance standards BB93 (2015);[20]
- Department of Health - Specialist Services, Health Technical Memorandum 08-01: Acoustics (2013);[21]
- CAP1616a Airspace Change: Environmental requirements technical annex;[22] and
- BS7445 Description and measurement of environmental noise.[23]

13.3 Assessment Methodology

13.3.1 This section of this EIAR chapter describes the approach to the assessment of the air noise effects, covering the following:

- The key sources of information that have been consulted throughout the preparation of this chapter, see paragraph 13.3.2;
- The methodology behind the assessment of air noise and vibration effects, including the criteria for the determination of sensitivity of receptor and magnitude of change due to the proposed Relevant Action;
- An explanation as to how the identification and assessment of potential air noise and vibration effects has been reached; and
- The significance criteria and terminology for the assessment of air noise and vibration residual effects.

13.3.2 Key sources of information that have been utilised for this assessment are as follows:

- The physical location of the runway system;
- Flight paths, in particular for departures. This information for existing routes has been taken from a combination of the Aeronautical Information Publication (AIP) for Ireland and an inspection of actual aircraft flight paths using the airport's Noise and Flight Track Monitoring System (NFTMS). Representative future routes for noise modelling purposes have been developed based on the 2016 public consultation for flight paths and ongoing consultation with the IAA; and
- The number of flights in each relevant assessment period, including their aircraft type, operation, and destination. The actual flights in 2018 have been supplied by the Applicant. For future years air traffic movement forecasts have been supplied by Mott Macdonald in their report *Dublin Airport Operating Restrictions Quantification of Impacts on Future Growth Updated analysis in response to the ANCA RFI June 2021 - version 1.3.1 (Final)*.

Air Noise Modelling Methodology

13.3.3 The assessment of air noise relies heavily on the modelling of noise levels. This has been carried out using the noise modelling software produced by the Federal Aviation Administration (FAA), the Aviation Environmental Design Tool (AEDT). This industry standard software evaluates aircraft noise in the vicinity of airports based on aircraft type, operation, route, and flight profile, as well as taking into account local terrain and meteorological information. This software is used to produce noise contours and to predict noise levels at specific locations. The model has been validated by taking into account the measurements recorded by Dublin Airport's Noise and Flight Track Monitoring System (NFTMS). Details of the modelling methodology are given in Appendix 13B.

13.3.4 The aircraft movements assessed as part of the air noise assessment include all aircraft taking off from or landing at Dublin Airport, with the exception of helicopter and military aircraft. Operations by helicopter and military aircraft make up a very small proportion of the total and are not able to be assessed to the

[20] UK Department of Education (2015). BB93: acoustic design of schools – performance standards, [Online]. Available at: https://www.gov.uk/government/publications/bb93-acoustic-design-of-schools-performance-standards [Checked 12/08/2021]
[21] UK Department of Health (2013). Specialist Services, Health Technical Memorandum 08-01: Acoustics, [Online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/144248/HTM_08-01.pdf [Checked 12/08/2021]
[22] Civil Aviation Authority (2020). CAP1616a: Airspace Change: Environmental requirements technical annex, [Online]. Available at: https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8128 [Checked 12/08/2021]
[23] British Standards Institution (2003). BS 7445:2003 Description and measurement of environmental noise [Online]. Available at: https://shop.bsigroup.com/ProductDetail?pid=000000000030098820 [Checked 12/08/2021]

same level of accuracy. For example, in 2018 there were 820 operations by helicopters and 2 operations by military aircraft, making up 0.4% of the total. The military aircraft operated during the day, and at night there were only 28 helicopter movements in the years. As a result, their inclusion would have a negligible effect on the findings of this assessment.

Primary Assessment Metrics

13.3.5 There are various noise metrics available for the assessment of the impacts of air noise. These are described in detail in Appendix 13A. The metrics used here include those that have been used previously to rate air noise around Dublin Airport, as used currently in the UK and also those used around Europe for strategic noise mapping purposes and in noise action plans. Whilst other metrics have been considered in this assessment, emphasis has been placed on the European noise metrics, i.e.:

- L_{den}, which takes into account the annual activity throughout the 24-hour period, with a 5 dB penalty applied to noise in the evening (19:00-23:00) period and a 10 dB penalty applied to noise in the night (23:00-07:00) period. The key effect linked with this metric is annoyance; and
- L_{night}, which takes into account the annual activity during the night (23:00-07:00) period. The key effect linked with this metric is sleep disturbance.

13.3.6 These two metrics are required to be used in order to comply with the requirements of EU Regulation 598/2014, and are the metrics used for strategic noise mapping as required under the Environmental Noise Regulations (S.I. No. 549/2018) in Ireland.

13.3.7 The Relevant Action specifically relates to controls at activity at night, however the effect on movements is not confined to the night period, as for example an aircraft that becomes able to arrive at night may then depart during the following day. The L_{den} metric also takes into account activity at night so both it and the L_{night} metric respond to changes in activity at night and so are considered directly relevant.

13.3.8 The number of people 'highly sleep disturbed' and 'highly annoyed' has also been predicted in accordance with the method set out in the World Health Organisation's Environmental Noise Guidelines 2018 as endorsed by the European Commission through Directive 2020/367. These metrics aim to give an overall picture of the noise exposure by assessing a percentage chance of people being highly annoyed or highly sleep disturbed at different noise levels. For example, the association in the WHO Guidelines has around 10% of people assessed as being highly annoyed at a noise level of 45 dB L_{den}, increasing to around 55% of people at a noise level of 70 dB L_{den}.

13.3.9 This chapter does not assign significance to these results as there is not published guidance regarding significance thresholds for a collective community-level assessment. On an individual level however, high annoyance and high sleep disturbance is considered harmful to health, as outlined in EU Directive 2020/367.

Supplementary Noise Metrics

13.3.10 The primary air noise assessment metrics generally rely on extensive surveying of attitudes to aircraft noise resulting in a dose-response relationship linking levels of community annoyance to the metric. In addition, as used previously in the assessment of air noise around Dublin Airport, noise contours have been prepared in terms of the established UK noise metrics for air noise, the $L_{Aeq,16h}$ metric for the daytime (07:00-23:00) period and the $L_{Aeq,8h}$ metric for the night-time (23:00-07:00) period. These periods relate to an average summer day. Summer in this instance is defined as the 92-day period between 16 June and 15 September inclusive.

13.3.11 Some other supplementary air noise metrics, while having limited research into correlation with community annoyance, can be useful in reflecting how aircraft noise is experienced in the locality around an airport and these are also presented here.

13.3.12 The following supplementary noise metrics have been presented to contextualise the noise around Dublin Airport associated with the proposed Relevant Action:

- The summer $L_{Aeq,16h}$ and $L_{Aeq,8h}$ metrics. These describe the average noise level during a summer day (07:00-23:00) and summer night (23:00-07:00) respectively. They were used for the application that led to the North Runway Planning Permission and the former is used for the eligibility of the current Residential Sound Insulation Schemes;

- The annual L_{day} and $L_{evening}$ metrics which are optional under EU Regulation 598/2014. These describe the average noise level during an annual day (07:00-19:00) and evening (19:00-23:00) respectively. They provide information on the variation in noise across the day and evening;
- N65 and N60 indices. N65 for example indicates the number of times a threshold level of 65 dB L_{Amax} is exceeded within the time period of interest and has been determined for the summer daytime period. The N60 has been determined for the summer night-time period. These metrics are included as they are considered to aid public understanding by providing distributions of noise events;
- Single mode contours for the L_{night} and N60 indices. These are used to illustrate the noise on a night when aircraft operate all in the same direction. This differs from the standard contours which reflect the average use of the runways over the long-term, typically a year;
- L_{Amax}, which can be used to rate the impacts of noise from individual aircraft operations at night; and
- Hourly noise levels during the night at representative residential receptors shown in Plate 13.4 and listed in Table 13-10, to give an indication of how these will change due to the proposed Relevant Action.

Methodology for Determining Study Area and Sensitive Receptors

13.3.13 The study area is based on the largest extent of likely impacts due to air noise, i.e. encompassing an envelope formed by the lowest value noise contours assessed for each metric detailed above. The extents of the study area are contained within a rectangle that extends 25 km to the west, 30 km to the east, 20 km to the north and 25 km to the south of the centre of the existing main runway at Dublin Airport.

13.3.14 The following have been considered as potential receptors of high sensitivity for this assessment:

- Dwellings;
- Schools;
- Residential healthcare facilities; and
- Places of worship.

13.3.15 Receptors with a lower sensitivity to noise, such as offices and hotels, have not been considered as part of this assessment.

13.3.16 The assessment of dwellings includes an allowance for those which are consented but not yet constructed, including land zoned for residential development. These have been presented separately to the totals for existing dwellings.

Methodology for Determining Construction Effects

13.3.17 As the proposed Relevant Action propose no changes to the design or construction of North Runway, or any other part of Dublin Airport, there will be no physical changes in any part of the airport or tis surroundings. As a result, the proposed Relevant Action will not result in any new effects on the noise environment arising from construction, and further assessment is therefore not required.

Methodology for Determining Operational Effects

13.3.18 The proposed Relevant Action will seek to amend condition no. 3(d) and replace condition no. 5 of the North Runway Planning Permission. An assessment of the International Civil Aviation Organisation (ICAO) Balanced Approach is therefore required under the Aircraft Noise Act. The principle of the "balanced approach" to aircraft noise management was adopted by the ICAO Assembly in 2011. The Balanced Approach recognises the importance of achieving a careful balance between the interests of developing airport growth as well as managing noise levels; operating restrictions are only considered when all other elements of the Balanced Approach have been assessed.

13.3.19 The Aircraft Noise Act implements European Union (EU) Regulation 598/2014 on the establishment of rules and procedures with regard to the introduction of noise related operating restrictions at EU Airports within the Balanced Approach.

13.3.20 A Regulation 598 assessment for Dublin Airport considered a number of different options for the use of the runway system at night. The resulting preferred option, presented in this EIAR as the Proposed Scenario, is described in *Chapter 1: Introduction*.

13.3.21 The effects of the proposed Relevant Action are determined by comparing the Proposed Scenario with the Permitted Scenario for the relevant Assessment Year. The Permitted Scenario represents the situation if the proposed Relevant Action is not consented and is also described in *Chapter 1: Introduction*.

13.3.22 The Permitted and Proposed Scenarios are examined in the Assessment Years of 2022, 2025 and 2035.

13.3.23 The general assessment methodology involves the following:

- Derivation of assessment criteria;
- Computation of existing and future noise levels under the various scenarios;
- Assessment of magnitude of impacts (absolute) on sensitive receptors, for each scenario;
- Determination of the change in noise levels, and associated impacts (relative) as a result of the proposed Relevant Action;
- Consideration of the likely significant effects of the proposed Relevant Action, based on both the absolute and relative noise levels;
- Description of the potential effects (beneficial and adverse) associated with the proposed Relevant Action; and
- Description of any mitigation measures, where appropriate, in relation to the proposed Relevant Action and a description of any residual effects.

Significance Criteria – Air Noise

13.3.24 The air noise effects are considered in terms of both the absolute noise level and the change in noise level due to the proposed Relevant Action in order to determine the significance of the effects due to the proposed Relevant Action. Both need to be considered to determine whether a significant effect arises from the proposed Relevant Action in an EIA context; for example if a receptor experiences a high absolute noise level but no change due to the proposed Relevant Action then this is not a significant effect. Equally if a receptor experiences a large change in noise level but the resulting level is still very low then this receptor is not considered to be significantly affected.

Residential Receptors

13.3.25 Absolute noise impacts for residential receptors have been developed against an effect scale and are given in Table 13-2. The derivation of these is discussed in Appendix 13A.

Table 13-2: Air Noise Impact Criteria (absolute) – residential

Scale Description	Annual dB Lden	Annual dB Lnight
Negligible	<45	<40
Very Low	45 – 49.9	40 – 44.9
Low	50 – 54.9	45 – 49.9
Medium	55 – 64.9	50 – 54.9
High	65 – 69.9	55 – 59.9
Very High	≥70	≥60

13.3.26 The effect scale used to assess the change in noise level is given in Table 13-3. A semantic scale of this type, following the format of examples given in the Institute of Environmental Management and Assessment (IEMA[24]) guidelines, has been applied in previous air noise assessments and accepted in Public Inquiries for airport developments in the UK and Ireland, for example the application for the North Runway at Dublin Airport. The thresholds are derived from the difference contour bands recommended in CAP1616a[25].

Table 13-3: Air Noise Impact Criteria (relative)

Scale Description	Change in noise level, dB(A)
Negligible	0 – 0.9
Very Low	1 – 1-9
Low	2 – 2.9
Medium	3 – 5.9
High	6 – 8.9
Very High	≥9

13.3.27 The effect of a change in noise level tends to increase with the absolute level of noise experienced at a receptor. If, for example, the night-time noise level at a dwelling were to change from 45 dB to 50 dB L_{night}, the overall effect for the occupants would be less than if the night-time noise level were to increase by the same amount from 55 dB to 60 dB L_{night}.

13.3.28 There is no clearly accepted method of how to rate the magnitude of the effect of a change in the absolute air noise level and the associated change in noise level. Some guidance however has been provided in the UK's Planning Practice Guidance (PPG[26]) which states:

13.3.29 "*In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise may result in a significant adverse effect occurring even though little or no change in behaviour would be likely to occur.*"

13.3.30 The magnitude of an effect from changing between one scenario and another (i.e. Permitted Scenario to Proposed Scenario) has been established by considering both the absolute noise level in the higher of the two scenarios and the relative change in noise level that occurs at a given receptor.

13.3.31 Table 13-4 shows how the absolute and relative impacts are interpreted into magnitude of effect. This takes into account the criteria presented above, other guidance and professional judgement. The effect rating scale is taken from the EPA Draft EIAR Guidelines[27].

Table 13-4: Summary of magnitude of effect – air noise

Absolute Noise Level Rating	*Change in Noise Level Rating*					
	Negligible	*Very Low*	*Low*	*Medium*	*High*	*Very High*
Negligible	Imperceptible	Imperceptible	Imperceptible	Not Significant	Slight	Moderate
Very Low	Imperceptible	Imperceptible	Not Significant	Slight	Moderate	Significant
Low	Imperceptible	Not Significant	Slight	Moderate	Significant	Significant
Medium	Not Significant	Slight	Moderate	Significant	Significant	Very Significant
High	Slight	Moderate	Significant	Significant	Very Significant	Profound
Very High	Moderate	Significant	Significant	Very Significant	Profound	Profound

[24] Institute of Environmental Management and Assessment (2014). Guidelines for Environmental Noise Impact Assessment. London: IEMA.
[25] Civil Aviation Authority (2020). CAP 1616a Airspace Change: Environmental requirements technical annex https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8128 [Checked 12/08/2021]
[26] Ministry of Housing, Communities & Local Government, Planning practice guidance Noise (2019) https://www.gov.uk/guidance/noise--2 [Checked 12/08/2021]
[27] Environmental Protection Agency (2017). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, [Online]. Available at: https://www.epa.ie/publications/monitoring--assessment/assessment/draft-guidelines-on-the-information-to-be-contained-in-environmental-impact-asse.php [Checked 12/08/2021]

13.3.32 A potential significant effect (adverse or beneficial) would be considered to arise if in Table 13-4 the magnitude of the effect was rated as significant or higher.

Non-Residential Receptors

13.3.33 For receptors other than dwellings, absolute levels rated as medium have been derived from the relevant guidance documents, as described in Appendix 13A. These are given in Table 13-5. The impact on each non-residential receptor has been rated as significant if the absolute noise level is above this threshold and the change in noise level is at least 3 dB(A), i.e. it is rated medium or higher.

Table 13-5: Air Noise Impact Criteria (absolute) – non-residential

Receptor Type	*Threshold for Medium Absolute Effect*
Schools (08:00-16:00)	55 dB $L_{Aeq,30m}$ (approx. 55 dB L_{den})
Residential Healthcare Facilities – Day (07:00-23:00)	55 dB $L_{Aeq,1h}$ (approx. 55 dB L_{den})
Residential Healthcare Facilities – Night (23:00-07:00)	50 dB $L_{Aeq,1h}$ (approx. 45 dB L_{night})
Places of Worship	55 dB L_{den}

Significance Criteria – Vibration

13.3.34 Low frequency noise from airborne aircraft has the potential to cause perceptible vibration levels within dwellings. For this reason, the most appropriate noise metric to assess the likelihood of these effects is the maximum C-weighted noise level, denoted L_{Cmax}. C-weighting gives more weight to low frequency noise rather than the more commonly used A-weighting, which approximates the average human hearing response to different frequencies of noise.

13.3.35 This vibration effect is most obviously characterised by effects such as windows rattling. As discussed in the Historic England report[28], aircraft passbys that produce a maximum noise level above 97 dB L_{Cmax} are likely to produce an audible rattle of windows. While it is appreciated that low frequency noise from aircraft can induce perceptible vibration levels in lightweight structures and loose-fitting components, the vibration levels are below those at which even minor cosmetic damage would be likely to occur.

13.3.36 Vibration effects due to airborne aircraft can vary depending on the specific details of the building, for example, the room dimensions which can cause resonance effects at certain frequencies. Resonances increase the sound level in parts of the room and decrease it in others which can influence any consequential vibration.

13.3.37 The other potential effect from airborne aircraft vibration is vortex damage to buildings.

13.3.38 Aircraft in flight creates vortices, circulating currents of air that are shed from the aircraft wings. For the most part, these vortices are dissipated by the effects of the wind and atmospheric turbulence before they reach the ground and, whilst they may more often be heard after an aircraft has passed, they seldom have any physical impact at ground level. Occasionally, however, vortices may persist long enough to make contact with buildings underneath the flight path. In extreme cases, the variation in pressure within these vortices can cause some damage to roofs if tiles or slates are not sufficiently firmly secured. In practice, such events may be encountered due to the passage of larger wide-bodied jets which create the largest vortices and during landing when aircraft are relatively close to the ground.

13.3.39 The issue of wake vortex damage was considered in some detail in the 2004 EIS[29] that supported the application for the permitted North Runway. The previous EIS was based on an assumption of 348,358 movements per annum, significantly higher than the number now envisaged in 2025 for the proposed Relevant Action which is 236,000 movements per annum. In granting permission for North Runway under those assumptions, the wake vortex impacts of that number of operations was evidently

[28] Historic England (2014). Aviation Noise Metric – Research on the Potential Noise Impacts on the Historic Environment by Proposals for Airport Expansion in England, [Online]. Available at: https://research.historicengland.org.uk/Report.aspx?i=15740 [Checked 12/08/2021]

[29] Dublin Airport Northern Parallel Runway Environmental Impact Statement, Part 2 - Text. Mouchel Parkman, December 2004

considered acceptable by the planning authorities. Additionally, the proposed Relevant Action does not affect which aircraft are able to use Dublin Airport or the routes flown. On that basis, the wake vortex impacts associated with the proposed Relevant Action can be expected similarly to be considered acceptable. There have been no reported cases of wake vortex damage at Dublin.

13.3.40 The noise level of 97 dB L_{Cmax} occurring on average at least once per 24-hour day over the year has been taken as a threshold for potential significance of vibration effects due to airborne aircraft events. Whether a significant effect occurs between the Permitted Scenario and the Proposed Scenario depends on the number of dwellings affected and the frequency of the events.

Consultation

13.3.41 Chapter 5 details the consultation on this application.

Limitations and Assumptions

13.3.42 Planned background noise surveys have been hampered by the Covid-19 pandemic which means that even if measurements were taken at this time, the ambient conditions may not currently be representative. However, a detailed survey was carried out in 2016, and this is supplemented by the continuous measurements taken by Dublin Airport's fixed Noise Monitoring Terminals (NMTs). In any event, the assessment criteria for air noise are dependent on the absolute levels from the aircraft and not the background noise.

13.3.43 There is always some uncertainty associated with forecasting future aircraft traffic, and this has been increased by the recent Covid-19 pandemic, particularly in the short term. The worst-case year in terms of air noise effects is likely to be the year that a passenger throughput of 32 mppa is first reached, as the ongoing fleet renewal means that over time aircraft are getting quieter. It is currently expected that this will occur in 2025 under the Proposed Scenario. If it occurs in a later year then the absolute air noise impacts would be expected to be slightly lower.

13.3.44 Some aircraft in the forecasts are either not currently in service or have limited noise data available. Assumptions over the future performance of these types have been made using the data available. This is not expected to significantly affect the assessment as aircraft in this category, such as the Airbus A330neo and Boeing 777X, are a minority of the total aircraft movements.

13.3.45 In addition to 'high annoyance' and 'high sleep disturbance' EU Directive 2020/367 lists ischaemic heart disease (IHD) as a harmful effect that should be considered. However, it also states that in the case of aircraft noise:

> *"the population exposed above adequate L_{den} levels is estimated as subject to an increased risk of IHD, while the exact number N of cases of IHD cannot be calculated."*

13.3.46 It has therefore not been possible to assess the effects of the proposed Relevant Action on the number of cases of IHD.

13.4 Current State of the Environment

13.4.1 This section describes the current state of the environment in the vicinity of Dublin Airport. In view of the location of the airport, the surrounding community is affected primarily by noise from the local road network and airport operations.

13.4.2 The assessment of the Current State of the Environment includes noise levels for 2018 at it is the most recent year with a throughput of close to but less than 32 million passengers per annum (mppa) at the airport. It is therefore considered to represent the situation with the airport operating without the North Runway. Due to the ongoing Covid-19 pandemic the noise conditions at the present time are likely to differ but this effect is expected to be temporary, although the precise timescale is uncertain.

13.4.3 Noise surveys have been carried in 2016 out at key receptor positions around Dublin Airport to establish the prevailing ambient and background noise conditions during both the daytime and night-time. Use has also been made of the extensive database of noise monitoring data for 2016 and 2018 obtained from Dublin Airport's continuous noise monitoring system, which records in real time noise from both aircraft and non-aircraft related noise sources continuously throughout 24 hours of each day. This database of measurements has been processed to extract both the total noise levels and just those which correlate with aircraft noise events.

13.4.4 Airborne aircraft noise has been modelled for 2018 based on the actual aircraft activity. The primary assessment metrics are presented in this section, and the supplementary metrics are presented in Appendix 13C.

13.4.5 In order to inform the vibration assessment, airborne aircraft noise has been modelled in terms of the L_{Cmax} metric based on the actual aircraft activity in 2018.

Noise Surveys

13.4.6 The noise surveys comprised a combination of attended and unattended noise monitoring. Attended noise monitoring was undertaken at various locations during periods in August, September and October 2016. Appendix 13D contains details of the noise monitoring procedures, survey dates, observations and results and, identifies the nature of the key contributors to the noise environment for each position.

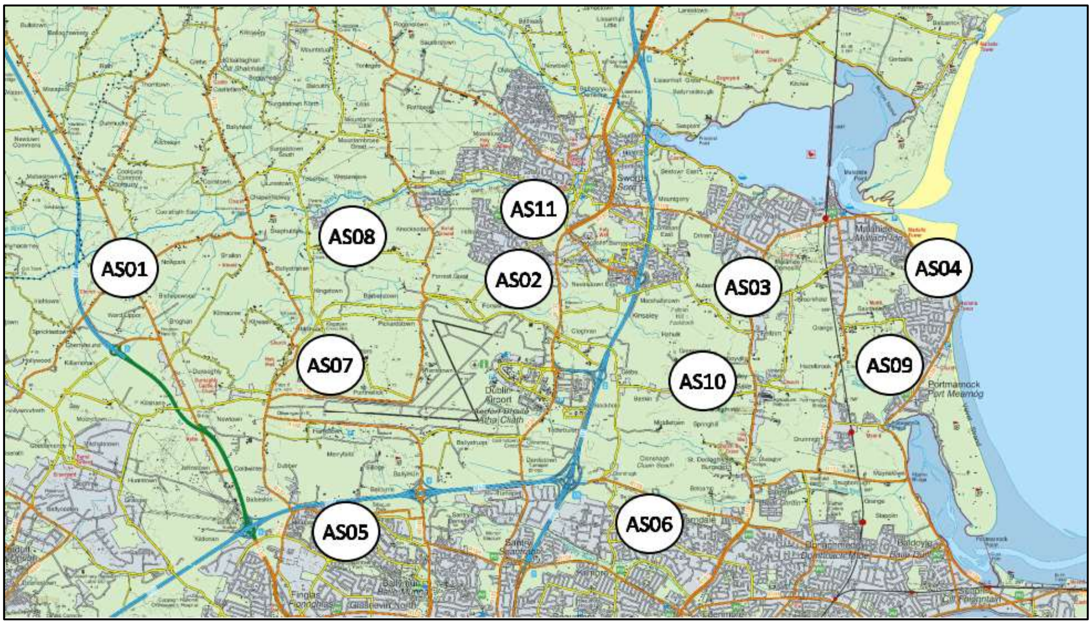
13.4.7 Unattended monitoring was carried out during similar periods to the attended monitoring.

13.4.8 In addition, the long-term monitoring data measured by Dublin Airport's Noise Monitoring Terminals (NMTs) has been utilised for the calendar year of 2018. A comparison of the NMT data for 2016 and 2018 has also been carried out in order to check if the conditions in 2016 were significantly different to those in 2018.

Measurement Locations

13.4.9 The locations of the attended and unattended monitoring are shown in Plate 13.1[30].

Plate 13.1: Noise Measurement Locations



[30] Plates 13-1 to 13-5 CYAL50217544 © Ordnance Survey Ireland/Government of Ireland.

Attended Survey Measurements

13.4.10 All attended noise monitoring measurements were undertaken in general accordance with the British Standard BS 7445[31]. This comprised positions with free field conditions and a series of 5-minute measurement samples taken at a specified position for typically at least 30 minutes. Repeat measurements were made at each position on a given day or night. The microphone of the noise monitor was positioned approximately 1.5 m above ground level with the monitor mounted on a tripod and away from any reflective surfaces. Observations were made of the noise climate prevailing at the time. These attended measurements include the noise contribution of aircraft activity as well as non-aircraft related activities. This procedure is commonly used to obtain attended environmental noise information, supplemented where possible with unattended noise measurement data.

Unattended Survey Measurements

13.4.11 During the unattended surveys noise measurements were obtained over a period of around three weeks at each position. At three of the locations, AS07, AS08 and AS09, noise measurements were obtained under free field conditions. At two of the positions, locations AS10 and AS11, measurements were made approximately 1 m from a reflective surface and therefore a reflection effect was included in the measurements. Unattended measurements comprised a series of continuous 15-minute measurement samples over the full survey period. The noise monitors were located in environmental cases with the microphones connected via extension cables. The microphones were fitted with windshields and attached to tripods positioned approximately 1.5 m above local ground level with the exception of Portmarnock Community School where the tripod was on a first floor flat roof.

Measurement Parameters and Results

13.4.12 The results of the noise monitoring at survey locations are summarised in Table 13-6 and Table 13-7, which show the attended and unattended results respectively. The survey results are presented in terms of the following parameters:

- $L_{Aeq,T}$ which is commonly used to denote the ambient noise level, signifies the single steady average noise exposure level which is equivalent in energy terms to that produced by the various fluctuating noise levels that occur in the given measurement period.
- $L_{A90,T}$ which represents the prevailing background noise level in the absence of any noise from aircraft in flight or other individual noise sources, such as passing cars. This index denotes the level of noise which is exceeded for 90% of the time.

Table 13-6: Noise Survey Results – Attended – Dublin Airport

Reference	Location	Daytime (07:00-23:00)		Night-time (23:00-07:00)		Location Description and Observations	Survey dates
		$L_{Aeq,T}$ dB	$L_{A90,T}$ dB	$L_{Aeq,T}$ dB	$L_{A90,T}$ dB		
AS01	The Ward Cross	61	52	59	44	Measurement position located approximately 60 metres from R135	9th and 11th August 2016
AS02	Ridgewood	61	47	57	39	Residential area with infrequent local road traffic	9th and 11th August 2016
AS03	South Malahide	50	40	47	32	Residential area, measurement position located approximately 90 metres from Swords Road	16th 17th and 18th August 2016
AS04	Malahide	69	54	55	40	Coastal area, adjacent to the sea and R106	17th and 18th August 2016
AS05	Belcamp Park	57	53	52	46	Residential area with infrequent local road traffic	9th 10th and 11th August 2016
AS06	Hampton Wood	59	56	48	44	Residential area with infrequent local road traffic	10th and 11th August 2016

[31] British Standards Institution BS 7445 - Description and measurement of environmental noise

Table 13-7: Noise Survey Results – Unattended – Dublin Airport

Reference	Location	Daytime (07:00-23:00)		Night-time (23:00-07:00)		Location Description and Observations	Survey dates
		$L_{Aeq,T}$ dB	$L_{A90,T}$ dB	$L_{Aeq,T}$ dB	$L_{A90,T}$ dB		
AS07	St Margaret's Dunsoghly	64	45	59	39	Small village in rural area. Aircraft activity the dominant noise source	11th to 29th August 2016
		64	47	57	42		15th to 26th September 2016
AS08	Kilbrook	50	40	44	33	Quiet residential area. No obvious dominant noise source	11th to 29th August 2016
AS09	Portmarnock Community School	51	40	44	33	Measurement position located within the school grounds. No obvious dominant noise source	19th August to 5th September 2016
AS10	The Baskins	58	43	52	37	Residential area Aircraft activity occasionally the dominant noise source	11th to 29th August 2016
AS11	River Valley	56	45	45	39	Measurement position located within the school grounds	10th to 30th October 2016

13.4.13 As illustrated in the tables above, noise levels vary considerably depending on the proximity to noise sources such as roads and aircraft flight paths in the surrounding environment. Consideration is therefore given below to the areas in the vicinity of the airport in turn.

Noise Environment Description

13.4.14 This section describes the general noise environment in the vicinity of the attended and unattended monitoring locations based on observations made on site and the results presented in Table 13-6 and

13.4.15 Table 13-7. Reference is made below to ambient noise levels, depicted by the $L_{Aeq,T}$ index, and background noise levels, depicted by the L_{A90} index.

North (Locations AS02, AS08 & AS11)

13.4.16 River Valley is a residential area located just under 2 km north of the airport. The R132 and M1 are located approximately 1 km and 2.5 km from measurement positions D and M. Daytime ambient and background noise levels ranged between 56 dB – 61 dB $L_{Aeq,T}$ and 45 dB – 47 dB L_{A90} respectively. Night-time ambient noise levels ranged between 45 – 57 dB and background noise levels were around 39 dB at both locations. Local road traffic dominated noise sources, however, at location AS02 between 06:30 and 07:00 frequent plane activity was the dominant noise source.

13.4.17 Approximately 2.5 km to the west of River Valley is Kilbrook, a quieter residential area located away from busy main roads. At location AS08 the daytime ambient and background noise levels were 50 dB and 40 dB respectively. The night-time levels were 44 dB $L_{Aeq,T}$ and 33 dB L_{A90}. Aircraft noise at this location was considered negligible.

North east (Locations AS03 & AS04)

13.4.18 Malahide is located near the coast, north east of the airport. The R106 was a dominant noise source in the area during the daytime. Position F was located next to the R106 approximately 7 km away from Dublin Airport with ambient and background noise levels of around 69 dB $L_{Aeq,T}$ and 54 dB L_{A90}. At night-time ambient and background noise levels at this position were around 55 dB and 40 dB respectively. Position E was located approximately 4 km away from Dublin Airport in a quieter residential area located away from busy main roads. The daytime ambient and background noise levels were 50 dB and 40 dB respectively. The night-time levels were 47 dB $L_{Aeq,T}$ and 32 dB L_{A90}. Aircraft noise at these locations was considered negligible.

East (Locations AS09 & AS10)

13.4.19 The area east of the Dublin Airport, at a distance of approximately 2.5 km contains rural areas with smaller residential neighbourhoods located away from busy roads. The area is generally quieter than other locations around the airport with the daytime ambient and background noise levels, measured at Position H, of around 58 dB $L_{Aeq,T}$ and 43 dB L_{A90}. The night-time ambient and background noise levels were around 52 dB $L_{Aeq,T}$ and 37 dB L_{A90}. Aircraft noise was occasionally dominant. For Portmarnock School, approximately 6.5 km away from Dublin Airport, which was closed for the summer holidays during the survey, a similar result was evident with daytime ambient and background noise levels of around 51 dB $L_{Aeq,T}$ and 40 dB $L_{Aeq,T}$. At night, the ambient and background levels were around 44 dB $L_{Aeq,T}$ and 33 dB $L_{Aeq,T}$. Aircraft noise at this location was not considered dominant.

South east (Location AS06)

13.4.20 Clonshaugh's business and technology park and Belcamp Park are located approximately 3 km to the south east of the airport. The M1, M50 and R139 are dominant noise sources in the area. The daytime ambient and background noise levels measured were 57 dB and 53 dB respectively. The night-time ambient and background noise levels measured were 52 dB and 46 dB respectively. Aircraft noise was occasionally dominant.

South (Location AS05)

13.4.21 The M50 and the Hampton Wood residential area are located south of the airport. The measurement position was located approximately 500 metres from the M50 and 2 km from Dublin Airport. The daytime ambient and background noise levels were 59 dB and 56 dB respectively. The night-time ambient and background noise levels measured were 48 dB and 44 dB respectively.

West (Location AS07)

13.4.22 The area west of the airport contains further rural areas with smaller residential neighbourhoods. Aircraft noise dominated St Margaret's with daytime ambient noise levels of 64 dB and background noise levels ranging from 45 dB – 47 dB. The night-time ambient noise levels ranged between 57 dB – 59 dB and background noise levels ranged between 39 dB – 42 dB. The surrounding road network consisting of N2 and R135 were also audible. Aircraft noise was measured under both easterly and westerly modes of operation at the airport.

North west (Location AS01)

13.4.23 North west of the airport approximately 4 km away contains further rural areas. The R135 and R121 roads are dominant noise sources. Ambient and background noise levels of 61 dB and 52 dB respectively were measured. The night-time ambient and background noise levels measured were 59 dB and 44 dB respectively. Aircraft noise was not considered dominant.

Permanent Noise Monitoring Terminal Results

13.4.24 This section describes the locations of the permanent noise monitors in place and operating in the vicinity of Dublin Airport. Results are presented for each noise monitor over the period commencing January 2016 to the end of December 2016, describing the noise environment with and without aircraft activity. The corresponding information for the period commencing January 2018 to the end of December 2018 is also presented to highlight any trends.

13.4.25 The location of each noise monitoring terminal (NMT) is shown in Plate 13.2. There are currently eight permanent NMTs in the vicinity of Dublin Airport. These are located as follows:

- Bay Lane (NMT1), monitoring Runway 28 Departures & Runway 10 Arrivals;
- St. Doolaghs (NMT2), monitoring Runway 10 Departures & Runway 28 Arrivals;
- Bishopswood (NMT3), monitoring the local area;
- Feltrim (NMT4), monitoring the local area;
- Balcultry (NMT5), monitoring Runway 34 Departures & Runway 16 Arrivals;
- Artane (NMT6), monitoring Runway 16 Departures & Runway 34 Arrivals;

- Coast Road (NMT20), monitoring Runway 10 Departures & Runway 28 Arrivals; and
- North-east of the airport off the Naul Road (NMT21), monitoring noise produced by aircraft on the ground at a location close to the airport.

13.4.26 NMT22 is a mobile NMT, currently located within the airport site, located close to the West Apron in the vicinity of the mid-western boundary of the airport. NMTs 3 and 4 have been installed for permitted operations. The Applicant publishes half yearly reports on the outputs of these NMTs, providing a summary of the aircraft noise measurements from the system. The most recent of these reports are available from the Dublin Airport website[32].

Plate 13.2: Permanent Noise Monitoring Terminals at Dublin Airport

13.4.27 Table 13-8 presents the average measured noise level over the six-month period from January to July 2016 inclusive at each monitor, split into daytime (07:00-23:00) and night time (23:00-07:00) periods. Also presented is the noise level produced by aircraft, i.e. the correlated aircraft noise events. Where the "total" noise level at a given monitor is close in value to the "aircraft" noise level, this indicates that the total noise is dominated by aircraft noise. Where there is a 3 dB or more difference, this indicates that some other noise source(s) dominates the noise environment at the NMT. It can be seen that only at NMTs 1 and 2 does aircraft noise dominate the total noise environment. This is to be expected given the locations of these two monitors within 4 km directly to the east and west respectively of the airport's existing main runway.

13.4.28 These averages are not directly comparable to noise contours produced by computer modelling as noise contours are typically based on an average summer or annual day, and also include all aircraft movements rather than just those which produce a correlated noise event. Noise contours also include no noise other than that produced by aircraft.

[32] https://www.dublinairport.com/corporate/community-and-sustainability/noise/airport-noise-noise-reports

Table 13-8: Average Measured Noise Levels (2016)

NMT	Daytime Noise Level, dB $L_{Aeq,16hr}$				Night Time Noise Level, dB $L_{Aeq,8hr}$			
	Jan-Jun 2016		Jul-Dec 2016		Jan-Jun 2016		Jul-Dec 2016	
	Total	Aircraft	Total	Aircraft	Total	Aircraft	Total	Aircraft
1	63.8	62.5	63.7	62.4	58.4	57.1	58.1	57.0
2	62.4	60.7	61.8	60.3	56.8	55.4	56.8	55.6
3	62.9	49.6	-	-	54.9	47.0	-	-
4	56.6	41.5	56.8	41.2	52.1	38.3	49.7	39.4
5	54.9	49.2	55.3	48.6	57.3	48.1	51.3	49.7
6	61.6	46.7	58.1	44.2	56.5	45.5	51.6	43.4
20	63.7	57.2	62.4	54.9	57.6	52.2	56.3	50.2

Table 13-9: Average Measured Noise Levels (2018)

NMT	Daytime Noise Level, dB $L_{Aeq,16hr}$				Night Time Noise Level, dB $L_{Aeq,8hr}$			
	Jan-Jun 2018		Jul-Dec 2018		Jan-Jun 2018		Jul-Dec 2018	
	Total	Aircraft	Total	Aircraft	Total	Aircraft	Total	Aircraft
1	63.9	62.8	64.0	62.9	58.9	57.2	58.1	56.6
2	61.1	60.5	61.9	61.1	56.5	54.9	57.5	56.5
4	57.2	46.9	55.3	43.8	54.2	36.7	51.0	33.7
5	58.3	49.5	54.8	48.5	55.1	50.2	54.3	50.4
6	57.7	45.8	60.9	48.9	58.0	45.1	59.2	47.0
20	64.3	58.7	63.4	59.6	58.6	47.7	58.9	54.8

13.4.29 Taking the NMTs where the highest noise levels were measured, these are generally consistent between the two years, especially so for NMT1 where the differences are not more than 0.5 dB, At some of the other locations the variations are greater, for example at NMT6 where the aircraft activity is due to use of the Crosswind Runway, the amount of which is weather dependent. Despite this, the overall picture presented by the results is similar in regard to where the highest noise levels occur, generally at NMT 1 and 20, and where aircraft noise contributes the most, at NMT 1 and 2.

Noise Modelling L_{den} Metric

13.4.30 Aircraft activity in 2018 was primarily on the South Runway with the majority of arrivals from the east along a straight track to the runway. The majority of the departures headed initially to the west on a straight track before commencing turns to the North and South depending on their destination. Some activity took place on the cross runway, mainly arrivals from the North or departures to the North so the number of flights over Dublin were relatively low. The distribution of the aircraft noise reflects this, particularly for locations closer to the airport. Further from the airport the proximity of locations to the departure routes also influences the noise levels.

13.4.31 Taking the representative locations, some such as St Doolaghs and Kilshane Cross were exposed to aircraft noise levels associated with a high impact, with others such as Portmarnock South and St Margret's exposed to aircraft noise levels associated with a medium impact, and others such as Ridgewood and Dunboyne exposed to aircraft noise levels associated with a low impact.

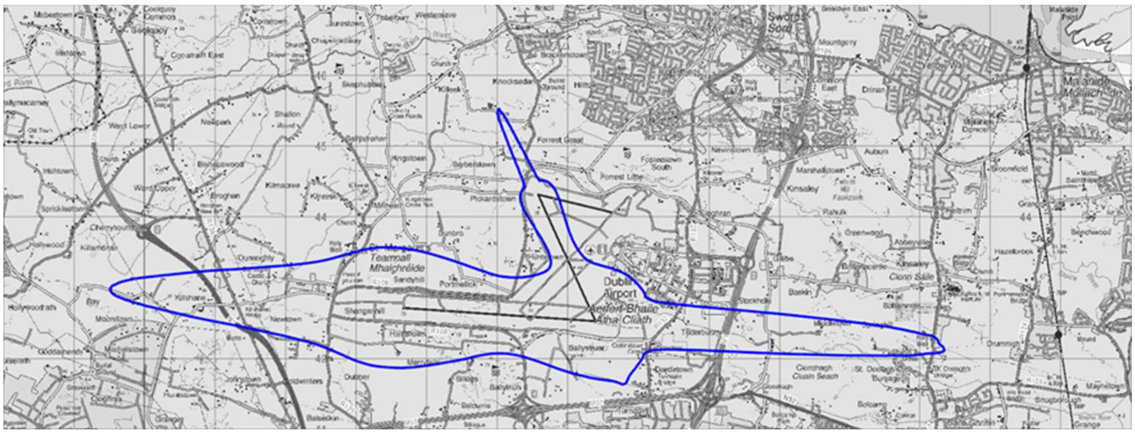
Modelled Results

13.4.32 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 13.3. The contours are based on the actual aircraft movements in 2018.

13.4.33 The results for the L_{den} metric are detailed below. These results are also presented in Appendix 13C along with the results for the supplementary noise metrics.

13.4.34 Appendix 13C presents the full set of noise contours for each scenario. Plate 13.3 shows the noise contours representing a high impact, 65 dB L_{den}, for 2018.

Plate 13.3: 65 dB L_{den} Noise Contours, 2018



13.4.35 The 2018 65 dB L_{den} contour (blue) extends to the west from the South Runway to Mooretown and to the east to St Doolaghs. From the Crosswind Runway, the contour extends to Knocksedan to the north and does not reach the M50 to the south.

13.4.36 To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Plate 13.4. The results of these predictions for 2018 in terms of the L_{den} metric are given in Table 13-10.

Plate 13.4: Representative Location Points

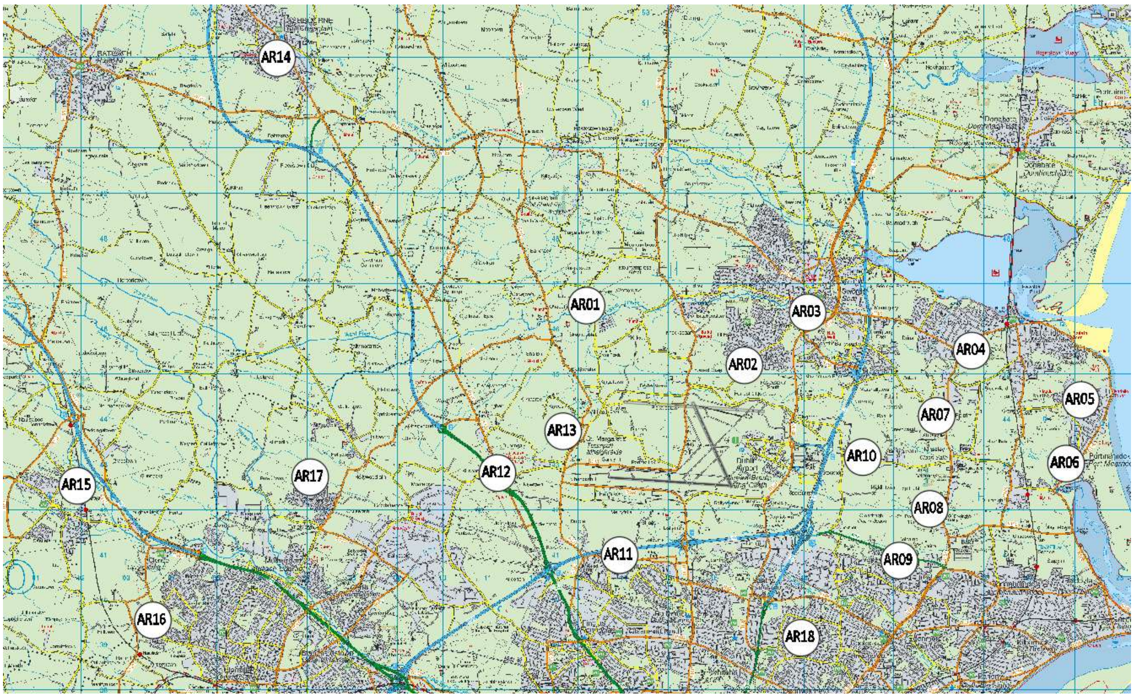


Table 13-10: Noise levels at Representative Locations (L_{den}) – 2018

Representative Location	Reference No.	Noise Level, dB (L_{den})
		2018
Tyrellstown, Toberburr	AR01	50
Ridgewood	AR02	53
Swords	AR03	47

Representative Location	Reference No.	Noise Level, dB (L_{den})
Malahide Castle	AR04	45
Portmarnock N	AR05	48
Portmarnock S	AR06	56
Malahide S	AR07	50
St Doolaghs	AR08	65
Darndale Park	AR09	53
The Baskins	AR10	58
Mayeston Hall	AR11	57
Kilshane Cross	AR12	68
St Margret's	AR13	62
Ashbourne	AR14	48
Dunboyne	AR15	53
Ongar	AR16	51
Mount Garrett	AR17	61
Beaumont	AR18	54

Note – noise levels rounded to nearest whole number.

13.4.37 For the 2018 contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population including consented developments and land zoned for residential development. The consented developments comprise not yet built dwellings, which have already been granted planning permission, and these have been combined with the estimated number of dwellings that areas that have been zoned for residential use are assumed to contain.

13.4.38 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

13.4.39 The dwelling and population results for 2018 are given by contour in Table 13-11 along with the areas of the contours.

Table 13-11: Areas, number of dwellings and population in 2018 Annual L_{den} contours

Scenario	2018				
Contour L_{den} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	703.2	245,808	716,725	257,387	753,077
50	209.3	61,728	184,777	71,334	215,168
55	85.9	11,889	35,482	18,102	54,568
60	33.5	1,641	4,717	4,955	15,255
65	11.6	94	257	94	257
70	4.1	10	31	10	31

13.4.40 The number of people assessed to be highly annoyed in 2018 is given in Table 13-12.

Table 13-12: Number of people highly annoyed – 2018

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2018	110,238	120,205

13.4.41 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. The numbers of each of these above the thresholds given in Table 13-5 for 2018 are given in Table 13-13.

Table 13-13: Schools, residential healthcare facilities and places of worship in L_{den} contours – 2018

Scenario	No. Receptors Above Threshold for Medium Absolute Effect		
	Schools	Residential Healthcare Facilities	Places of Worship
2018	10	2	6

Noise Modelling L_{night} Metric

13.4.42 Aircraft activity at night in 2018 was primarily on the South Runway with the majority of arrivals from the east along a straight track to the runway. The majority of the departures headed initially to the west on a straight track before commencing turns to the north and south depending on their destination. Some activity took place on the cross runway, mainly arrivals from the north or departures to the north so the number of flights over Dublin were relatively low. The distribution of the aircraft noise reflects this, particularly for locations closer to the airport. Further from the airport the proximity of locations to the departure routes also influences the noise levels.

13.4.43 Taking the representative locations, some such as St Doolaghs and Kilshane Cross were exposed to aircraft noise levels associated with a high impact, with others such as Mount Garrett and St Margret's exposed to aircraft noise levels associated with a medium impact, and others such as Ridgewood and Dunboyne exposed to aircraft noise levels associated with a low impact.

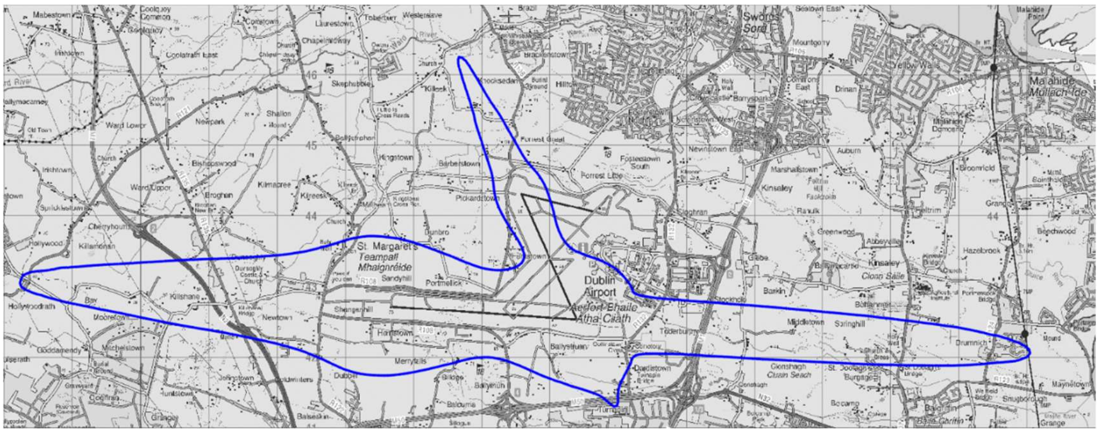
Modelled Results

13.4.44 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 13.3. The contours are based on the actual aircraft movements in 2018.

13.4.45 The results for the L_{night} metric are detailed below. These results are also presented in Appendix 13C along with the results for the supplementary noise metrics.

13.4.46 Plate 13.5 shows the noise contours representing a high impact, 55 dB L_{night}, for 2018.

Plate 13.5: 55 dB L_{night} Noise Contours, 2018



13.4.47 The 2018 55 dB L_{night} contour (blue) extends to the west from the South Runway to Hollystown and to the east to Drumnigh. From the Crosswind Runway, the contour extends to Killeek to the north and just crosses the M50 to the south.

13.4.48 To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Plate 13.4. The results of these predictions for 2018 in terms of the L_{night} metric are given in Table 13-14.

Table 13-14: Noise levels at Representative Locations (L_{night}) – 2018

Representative Location	Reference No.	Noise Level, dB (L_{night})
		2018
Tyrellstown, Toberburr	AR01	43
Ridgewood	AR02	45
Swords	AR03	39
Malahide Castle	AR04	36
Portmarnock N	AR05	39
Portmarnock S	AR06	48
Malahide S	AR07	42
St Doolaghs	AR08	57
Darndale Park	AR09	44
The Baskins	AR10	49
Mayeston Hall	AR11	48
Kilshane Cross	AR12	59
St Margret's	AR13	54
Ashbourne	AR14	38
Dunboyne	AR15	45
Ongar	AR16	43
Mount Garrett	AR17	52
Beaumont	AR18	47

Note – noise levels rounded to nearest whole number.

13.4.49 For each of the 2018 contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population, excluding consented developments, and allowing for consented developments and land zoned for residential development.

13.4.50 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

13.4.51 The dwelling and population results for 2018 are given by contour in Table 13-15 along with the areas of the contours.

Table 13-15: Areas, number of dwellings and population in 2018 Annual L_{night} contours

Scenario		2018			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	304.4	102,538	307,457	112,422	338,671
45	118.2	18,815	55,492	25,998	77,477
50	48.4	4,131	12,316	7,808	23,926
55	16.8	276	753	328	950
60	5.8	19	56	19	56
65	2.3	3	10	3	10

13.4.52 The number of people assessed to be highly sleep disturbed in 2018 is given in Table 13-16.

Table 13-16: Number of people highly sleep disturbed – 2018

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2018	42,260	48,062

13.4.53 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night. The number of these above the threshold given in Table 13-5 for 2018 is given in Table 13-17.

Table 13-17: Residential healthcare facilities in L_{night} contours – 2018

Scenario	No. Residential Healthcare Facilities Above Threshold for Medium Absolute Effect
2018	4

Noise Modelling to Inform Vibration Effects

13.4.54 The number of dwellings exceeding the threshold for potential vibration effects due to airborne aircraft, based on experiencing noise levels of at least 97 dB L_{Cmax} at least once per 24 hour day, has been predicted for 2018. The results are given in Table 13-18.

Table 13-18: Number of dwellings exceeding threshold for potential vibration effects due to airborne aircraft – 2018

Scenario	No. dwellings exceeding threshold for potential vibration effects due to airborne aircraft
2018	4

13.5 Future Receiving Environment

13.5.1 This section describes the future receiving environment in the Assessment Years of 2022, 2025 and 2035. This is the environment in the absence of the proposed Relevant Action and is represented by the Permitted Scenario in each Assessment Year.

13.5.2 Airborne aircraft noise predictions have been made for the Permitted Scenario in the Assessment Years of 2022, 2025 and 2035. The primary assessment metrics are presented in this section, and the supplementary metrics are presented in Appendix 13C.

13.5.3 In order to inform the vibration assessment, airborne aircraft noise predictions using the L_{Cmax} metric have also been made for the Permitted Scenario in the Assessment Years of 2022, 2025 and 2035.

Noise Modelling L_{den} Metric

13.5.4 Aircraft activity in the Permitted Scenarios during the day is primarily split between the South Runway and the North Runway. Arrivals from the east and departures to the east primarily use the South Runway with arrivals from the west and departures to the west primarily using the North Runway. There is very limited used of the cross runway, and at night activity there is no use of the North Runway. The distribution of the aircraft noise reflects this, particularly for locations closer to the airport. Further from the airport the proximity of locations to the departure routes also influences the noise levels.

13.5.5 Taking the representative locations, in 2025 none are forecast to be exposed to aircraft noise levels associated with a high impact, with others such as St Doolaghs, Kilshane Cross, Portmarnock S and St Margret's exposed to aircraft noise levels associated with a medium impact, and others such as Malahide S and Dunboyne exposed to aircraft noise levels associated with a low impact.

13.5.6 The noise levels in 2022 are generally lower than those in 2025 by 1 dB, changes of this magnitude are associated with a very low impact. The reduced noise levels in 2022 are the result of the lower level of activity.

13.5.7 The noise levels in 2035 are generally lower than those in 2025 by 1 to 2 dB, changes of these magnitudes are associated with a very low to low impact. The reduced noise levels in 2035 are the result of the activity being the same but the aircraft fleet modernising.

13.5.8 Compared to 2018 the noise levels in 2025 do not show a consistent difference. This is primarily due to the opening of North Runway which introduces a new location for some of the flights. For some locations such as Portmarnock N and St Margret's the noise levels are the same, with others such as Ridgewood and Tyrellstown, Toberburr having increased noise levels in 2025. The magnitude of these increases is associated with a low to medium impact. For other locations such as Mount Garrett, Beaumont and Mayeston Hall the noise levels are lower in 2025. The magnitude of these decreases is associated with a medium impact.

Modelled Results

13.5.9 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 13.3. The contours are based on forecast aircraft movements for the Permitted Scenario in the Assessment Years of 2022, 2025 and 2035.

13.5.10 The results for the L_{den} metric are detailed below. These are also presented in Appendix 13C along with the results for the supplementary noise metrics.

13.5.11 Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13.1 (*EIAR Volume 3: Figures*) shows the noise contours representing a high impact, 65 dB L_{den}, for the 2022, 2025 and 2035 Permitted Scenarios. The equivalent contour for 2018 is also included for comparison.

13.5.12 The 2018 65 dB L_{den} contour (blue) extends to the west from the South Runway to Mooretown and to the east to St Doolaghs. From the Crosswind Runway, the contour extends to Knocksedan to the north and does not reach the M50 to the south.

13.5.13 The 2022 Permitted Scenario 65 dB L_{den} contour (cyan) does not reach as far west as 2018 in line with the South Runway, not reaching Killshane Bridge, and is also smaller to the east, not reaching St Doolaghs. This is due to the reduction in aircraft movements compared to 2018. In line with the North Runway, the contour extends to Kilmacree to the west and barely leaves the airport site to the east. The exposure from the Crosswind Runway does not leave the airport site.

13.5.14 The 2025 Permitted Scenario 65 dB L_{den} contour (yellow) is a very similar shape to that in 2022, albeit slightly larger. The aircraft movements are slightly less than 2018, however they are spread between two runways so the number on the South Runway is lower. Fleet renewal also has some effect to reduce the contour size.

13.5.15 The 2035 Permitted Scenario 65 dB L_{den} contour (red) is a very similar shape to that in 2022, albeit slightly smaller to the west and slightly larger to the east. The aircraft movements are slightly more than 2018, however they are spread between two runways so the number on the South Runway is lower. Fleet renewal also has some effect which causes the reduction compared to 2025.

13.5.16 To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Plate 13-4. The results of these predictions for the 2022, 2025 and 2035 Permitted Scenarios in terms of the L_{den} metric are given in Table 13-19. The 2018 results are also included for comparison.

Table 13-19: Noise levels at Representative Locations (L_{den}) – 2018 and Permitted Scenarios

Representative Location	Reference No.	Noise Level, dB (L_{den})			
		2018	2022 Permitted	2025 Permitted	2035 Permitted
Tyrellstown, Toberburr	AR01	50	52	52	50
Ridgewood	AR02	53	56	56	54
Swords	AR03	47	47	48	46
Malahide Castle	AR04	45	43	44	43
Portmarnock N	AR05	48	47	48	46
Portmarnock S	AR06	56	54	55	54
Malahide S	AR07	50	49	50	49
St Doolaghs	AR08	65	63	64	63
Darndale Park	AR09	53	52	53	51
The Baskins	AR10	58	57	57	56
Mayeston Hall	AR11	57	53	54	52
Kilshane Cross	AR12	68	63	64	63
St Margret's	AR13	62	61	62	60
Ashbourne	AR14	48	45	46	44
Dunboyne	AR15	53	50	51	50
Ongar	AR16	51	48	49	46
Mount Garrett	AR17	61	56	57	56
Beaumont	AR18	54	48	49	47

Note – noise levels rounded to nearest whole number.

13.5.17 Noise levels at receptors close to flight paths from the existing South Runway or Crosswind Runway, for example St Doolaghs (AS08), Killshane Cross (AS12) or Beaumont (AS18), are forecast to reduce between 2018 and the 2022 Permitted Scenario, whereas the opposite is true for receptors closer to flight paths from the North Runway, for example Ridgewood (AS02). Going from the 2022 Permitted Scenario to the 2025 Permitted Scenario, there are small increases of 0-1 dB at all locations. Noise levels in the 2035 Permitted Scenario are generally lower than those for the 2022 Permitted Scenario by 0-2 dB.

13.5.18 For each of the sets of contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population including consented developments and land zoned for residential development.

13.5.19 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

13.5.20 The dwelling and population results for the 2022 Permitted Scenario are given by contour in Table 13-20 along with the areas of the contours.

Table 13-20: Areas, number of dwellings and population in 2022 Permitted Annual L_{den} contours

Scenario		2022 Permitted			
Contour L_{den} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	432.2	112,351	336,611	123,319	371,141
50	162.3	26,107	77,349	33,525	100,048
55	67.6	4,492	12,850	9,647	28,810
60	26.4	492	1,513	1,849	5,793
65	9.2	31	94	31	94
70	3.3	4	13	4	13

13.5.21 The dwelling and population results for the 2025 Permitted Scenario are given by contour in Table 13-21 along with the areas of the contours.

Table 13-21: Areas, number of dwellings and population in 2025 Permitted Annual L_{den} contours

Scenario		2025 Permitted			
Contour L_{den} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	535.2	141,352	421,417	152,670	456,978
50	186.5	32,524	96,889	40,175	120,414
55	80.7	6,571	19,213	12,542	37,621
60	31.4	699	2,006	2,299	7,004
65	11.2	40	119	40	119
70	3.9	6	19	6	19

13.5.22 The dwelling and population results for the 2035 Permitted Scenario are given by contour in Table 13-22 along with the areas of the contours.

Table 13-22: Areas, number of dwellings and population in 2035 Permitted Annual L_{den} contours

Scenario		2035 Permitted			
Contour L_{den} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	350.5	72,661	217,006	83,005	249,488
50	148.5	19,077	55,979	26,215	77,701
55	63.6	3,344	9,630	8,399	25,290
60	24.3	480	1,486	1,950	6,116
65	8.0	23	71	23	71
70	2.9	2	6	2	6

13.5.23 The number of people assessed to be highly annoyed in the Permitted Scenarios for the Assessment Years of 2022, 2025 and 2035 is given in Table 13-23. The 2018 results are also included for comparison.

Table 13-23: Number of people highly annoyed – 2018 and Permitted Scenarios

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2018	110,238	120,205
2022 Permitted	50,603	58,880
2025 Permitted	64,241	73,209
2035 Permitted	33,437	41,234

13.5.24 The number of people exposed to aircraft noise in terms of the L_{den} metric is forecast to reduce from 2018 to the 2022 Permitted Scenario, for all contour levels. Consequently, the number of people assessed as highly annoyed by aircraft noise also decreases, specifically by 54% from 110,238 to 50,603 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) decreases from 251 to 94.

13.5.25 Going forward to the 2025 Permitted Scenario, the number of people assessed as highly annoyed increases compared to the 2022 Permitted Scenario to 64,241 (excluding consented developments), although it remains well below the 2018 level. 119 people are forecast to be exposed to at least a high noise level.

13.5.26 Looking further into the future at the 2035 Permitted Scenario, the number of people assessed as highly annoyed decreases to 33,437 (excluding consented developments), lower than in the 2022 Permitted Scenario. 71 people are forecast to be exposed to at least a high noise level.

13.5.27 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. The numbers of each of these above the thresholds given in Table 13-5 for the Permitted Scenarios are given in Table 13-24. The 2018 results are also presented for comparison.

Table 13-24: Schools, residential healthcare facilities and places of worship in L_{den} contours – 2018 and Permitted Scenarios

Scenario	No. Receptors Above Threshold for Medium Absolute Effect		
	Schools	Residential Healthcare Facilities	Places of Worship
2018	10	2	6
2022 Permitted	5	1	4
2025 Permitted	7	2	5
2035 Permitted	5	1	4

13.5.28 The number of non-residential receptors exposed to the thresholds given in Table 13-5 is forecast to reduce from 2018 to the 2022 Permitted Scenario. In the 2025 Permitted Scenario it increases from 2022, although still remaining the same or lower than 2018, before reducing again in the 2035 Permitted Scenario to equal the number for 2022.

Noise Modelling L_{night} Metric

13.5.29 Aircraft activity at night in the Permitted Scenarios comprises very limited used of the cross runway and no use of the North Runway. The distribution of the aircraft noise reflects this, particularly for locations closer to the airport. Further from the airport the proximity of locations to the departure routes also influences the noise levels.

13.5.30 Taking the representative locations, in 2025 some such as St Doolaghs and Kilshane Cross are forecast to be exposed to aircraft noise levels associated with a high impact, with others such as Mount Garrett and St Margret's exposed to aircraft noise levels associated with a medium impact, and others such as Portmarnock S and Mayeston Hall exposed to aircraft noise levels associated with a low impact.

13.5.31 The noise levels in 2022 are generally the same or 1 dB lower than those in 2025, so the changes are at most of a magnitude associated with a very low impact. The reduced noise levels in 2022 are the result of the lower level of activity.

13.5.32 The noise levels in 2035 are generally lower than those in 2025 by 1 to 2 dB, changes of these magnitudes are associated with a very low to low impact. The reduced noise levels in 2035 are the result of the activity being the same but the aircraft fleet modernising.

13.5.33 Compared to 2018 the noise levels in 2025 do not show a consistent difference. This is primarily due to the reduction in use of the cross runway. For the locations of Portmarnock N and Darndale Park the noise levels are the same, with most others such as St Margret's and Kilshane Cross having reductions of 1 to 2 dB(A). The magnitude of these decreases is associated with a very low to low impact. For other locations such as Swords, Ridgewood and Tyrellstown, Toberburr the reduction from 2018 is greater and associated with a medium impact. The largest reduction from 2018 to 2025 is for Beaumont at 7 dB(A) which is high impact, in this case a beneficial one.

Modelled Results

13.5.34 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 13.3. The contours are based on forecast aircraft movements for the Permitted Scenario in the Assessment Years of 2022, 2025 and 2035.

13.5.35 The results for the L_{night} metric are detailed below. These are also presented in Appendix 13C along with the results for the supplementary noise metrics.

13.5.36 Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13.2 (*EIAR Volume 3: Figures*) shows the noise contours representing a high impact, 65 dB L_{den}, for the 2022, 2025 and 2035 Permitted Scenarios. The equivalent contour for 2018 is also included for comparison.

13.5.37 The 2018 55 dB L_{night} contour (blue) extends to the west from the South Runway to Hollystown and to the east to Drumnigh. From the Crosswind Runway, the contour extends to Killeek to the north and just crosses the M50 to the south.

13.5.38 The 2022 Permitted 55 dB L_{night} contour (cyan) does not extend as far as the 2018 contour in line with the South Runway, almost reaching Bay to the west and almost reaching St Doolaghs to the east. This is due to the reduction in aircraft movements compared to 2018. The exposure from the Crosswind Runway does not leave the airport site. There is no contour in line with the North Runway as it is not used at night under the Permitted Scenarios.

13.5.39 The 2025 Permitted 55 dB L_{night} contour (yellow) is a very similar shape to that in 2022, albeit somewhat larger. The aircraft movements are greater than in 2022, but still less than 2018. Fleet renewal also has some effect to reduce the contour size.

13.5.40 The 2035 Permitted 55 dB L_{night} contour (red) is a very similar shape to that in 2022, albeit slightly smaller to the west and slightly larger to the east. The aircraft movements are greater than in 2022, but still less than 2018. Fleet renewal also has some effect which causes the reduction compared to 2025.

13.5.41 To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Plate 13.4. The results of these predictions for the 2022, 2025 and 2035 Permitted Scenarios in terms of the L_{night} metric are given in Table 13-25. The 2018 results are also included for comparison.

Table 13-25: Noise levels at Representative Locations (L_{night}) – 2018 and Permitted Scenarios

Representative Location	Reference No.	Noise Level, dB (L_{night})			
		2018	2022 Permitted	2025 Permitted	2035 Permitted
Tyrellstown, Toberburr	AR01	43	38	38	36
Ridgewood	AR02	45	41	41	39
Swords	AR03	39	36	36	34
Malahide Castle	AR04	36	35	35	33

Representative Location	Reference No.	Noise Level, dB (L_{night})			
		2018	2022 Permitted	2025 Permitted	2035 Permitted
Portmarnock N	AR05	39	38	39	37
Portmarnock S	AR06	48	46	46	45
Malahide S	AR07	42	41	41	40
St Doolaghs	AR08	57	54	55	54
Darndale Park	AR09	44	43	44	42
The Baskins	AR10	49	48	48	47
Mayeston Hall	AR11	48	46	47	45
Kilshane Cross	AR12	59	58	58	58
St Margret's	AR13	54	52	52	50
Ashbourne	AR14	38	35	36	34
Dunboyne	AR15	45	43	44	43
Ongar	AR16	43	41	42	39
Mount Garrett	AR17	52	50	51	50
Beaumont	AR18	47	39	40	38

Note – noise levels rounded to nearest whole number.

13.5.42 Noise levels are forecast to reduce between 2018 and the 2022 Permitted Scenario, in particular for receptors close to flight paths from the Crosswind Runway such as Beaumont (AS18). For areas closer to flight paths from the existing South Runway such as St Doolaghs (AS08) the forecast reduction is more modest. Going from the 2022 Permitted Scenario to the 2025 Permitted Scenario there are small increases of 0-1 dB at all locations. Noise levels in the 2035 Permitted Scenario are generally lower than those for the 2022 Permitted Scenario by 0-2 dB.

13.5.43 For each of the sets of contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population including consented developments and land zoned for residential development.

13.5.44 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

13.5.45 The dwelling and population results for the 2022 Permitted Scenario are given by contour in Table 13-26 along with the areas of the contours.

Table 13-26: Areas, number of dwellings and population in 2022 Permitted Annual L_{night} contours

Scenario	2022 Permitted				
Contour L_{den} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	170.7	45,205	138,421	54,403	167,368
45	75.1	9,421	27,964	15,519	46,738
50	29.0	1,192	3,482	4,506	14,020
55	10.1	82	222	82	222
60	3.5	9	28	9	28
65	1.4	0	0	0	0

13.5.46 The dwelling and population results for the 2025 Permitted Scenario are given by contour in Table 13-27 along with the areas of the contours.

Table 13-27: Areas, number of dwellings and population in 2025 Permitted Annual L_{night} contours

Scenario		2025 Permitted			
Contour L_{den} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population	Dwellings	Population
40	196.8	53,627	163,476	69,310	196,231
45	85.9	11,422	33,932	16,351	49,096
50	34.6	2,077	6,080	5,728	17,714
55	12.0	101	280	110	309
60	4.2	10	31	10	25
65	1.6	2	6	2	5

13.5.47 The dwelling and population results for the 2035 Permitted Scenario are given by contour in Table 13-28 along with the areas of the contours.

Table 13-28: Areas, number of dwellings and population in 2035 Permitted Annual L_{night} contours

Scenario		2035 Permitted			
Contour L_{den} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population	Dwellings	Population
40	149.9	27,161	81,373	34,592	104,112
45	68.5	6,981	21,201	13,025	39,802
50	26.6	1,177	3,280	4,491	13,818
55	9.0	75	203	75	203
60	3.0	7	23	7	23
65	1.2	0	0	0	0

13.5.48 The number of people assessed to be highly sleep disturbed in the Permitted Scenarios for the Assessment Years of 2022, 2025 and 2035 is given in Table 13-29. The 2018 results are also included for comparison.

Table 13-29: Number of people sleep disturbed – 2018 and Permitted Scenarios

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2018	42,260	48,062
2022 Permitted	18,789	23,729
2025 Permitted	22,500	27,806
2035 Permitted	11,374	15,551

13.5.49 The number of people exposed to aircraft noise in terms of the L_{night} metric is forecast to reduce from 2018 to the 2022 Permitted Scenario, for all contour levels. Consequently the number of people assessed as highly sleep disturbed by aircraft noise also decreases, specifically by 56% from 42,260 to 18,789 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) decreases from 753 to 222.

13.5.50 Going forward to the 2025 Permitted Scenario, the number of people assessed as highly sleep disturbed increases slightly compared to the 2022 Permitted Scenario to 64,241 (excluding consented developments), although it remains well below the 2018 level. 280 people are forecast to be exposed to at least a high noise level.

13.5.51 Looking further into the future at the 2035 Permitted Scenario, the number of people assessed as highly sleep disturbed decreases to 11,374 (excluding consented developments), lower than in the 2022 Permitted Scenario. 203 people are forecast to be exposed to at least a high noise level.

13.5.52 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night. The number of these above the threshold given in Table 13-5 for the Permitted Scenarios is given in Table 13-30. The 2018 result is also presented for comparison.

Table 13-30: Residential healthcare facilities in L_{night} contours – 2018 and Permitted Scenarios

Scenario	No. Residential Healthcare Facilities Above Threshold for Medium Absolute Effect
2018	4
2022 Permitted	2
2025 Permitted	2
2035 Permitted	1

13.5.53 The number of residential healthcare facilities exposed to the threshold given in Table 13-5 is forecast to reduce from 4 in 2018 to 2 in the 2022 and 2025 Permitted Scenarios and to reduce further to 1 in the 2035 Permitted Scenario.

Noise Modelling to Inform Vibration Effects

13.5.54 The number of dwellings exceeding the threshold for potential vibration effects due to airborne aircraft, based on experiencing noise levels of at least 97 dB L_{Cmax} at least once per 24 hour day, has been predicted for the Permitted Scenario in the Assessment Years of 2022, 2025 and 2035. The results are given in Table 13-31. The 2018 result is also presented for comparison.

Table 13-31: Number of dwellings exceeding threshold for potential vibration effects due to airborne aircraft – 2018 and Permitted Scenarios

Scenario	No. dwellings exceeding threshold for potential vibration effects due to airborne aircraft
2018	4
2022 Permitted	0
2025 Permitted	2
2035 Permitted	0

13.5.55 In 2018, there were 4 dwellings which experienced noise levels in excess of 97 dB L_{Cmax} at least once per day. These are located to the south of Old Airport Road, near to the eastern end of the South Runway. No dwellings exceed this threshold in the 2022 Permitted or 2035 Permitted Scenarios, and 2 dwellings exceed this threshold in the 2025 Permitted Scenario.

13.6 Environmental Design and Management

13.6.1 There are a number of measures already in place at Dublin Airport that reduce or mitigate the noise effects of aircraft operations. These are described in this section.

Reduction of Noise at Source

13.6.2 Over the past 20 years, the models and types of aircraft using Dublin Airport have evolved, and improvements in technology have meant that the typical aircraft using the airport are quieter than they used to be. This is illustrated in Figure 7 of the approved Dublin Airport Noise Action Plan 2019-2023[33].

[33] Fngal County Council Noise Action Plan for Dublin Airport 2019 – 2023 December 2018 https://www.fingal.ie/sites/default/files/2019-04/NAP%20Final.pdf [Checked 12/08/21]

13.6.3 The ICAO Noise 'Chapter'[34] defines specific noise performance criteria to which aircraft must be certificated. Since 2002, Chapter 2 aircraft have been banned from use in Europe and the vast majority of aircraft operating in the skies above the EU are now Chapter 4 compliant, with an increasing number of quieter Chapter 14 aircraft entering the fleet as airlines take delivery of newer aircraft.

13.6.4 This trend is expected to continue in the future as airlines renew their fleets, and begin to use new aircraft such as the Airbus A320neo and Boeing 737 MAX 8, which both meet the ICAO Chapter 14 requirements and are quieter than the equivalent types they will be replacing.

13.6.5 Specific fleet renewal plans for the two largest airlines at Dublin Airport, Aer Lingus and Ryanair, were considered when preparing the future forecast scenarios and details are presented in the Mott McDonald report Dublin Airport Operating Restrictions Quantification of Impacts on Future Growth Updated analysis in response to the ANCA RFI June 2021 - version 1.3.1 (Final).

13.6.6 The Applicant plans to incentivise quieter aircraft particularly at night in accordance with Action 1 of the Dublin Airport Noise Action Plan 2019-2023. An initial noise charging consultation was circulated to airlines at the end of November 2020. This consultation outlined a range of questions relating to the implementation of noise charging and the potential methodology. Airline responses were received in mid-February. A follow-on consultation outlining the more prescript next steps of noise charging application to airlines is due in Summer 2021. This will detail the proposal for the implementation of noise charging between 23:30-06:00, as well as the potential introduction of a modification discount to incentivise quieter aircraft. It is intended that noise charging will be fully implemented during the Winter 2021/22 season.

Land use Planning and Management

Noise Zones

13.6.7 Noise Zones have been in use for a number of years in the Fingal Development Plan. Most recently they were updated in the 2020 Dublin Airport Local Area Plan (LAP). The LAP dedicates an entire section (section 9.1) to noise. In that section it notes the following:

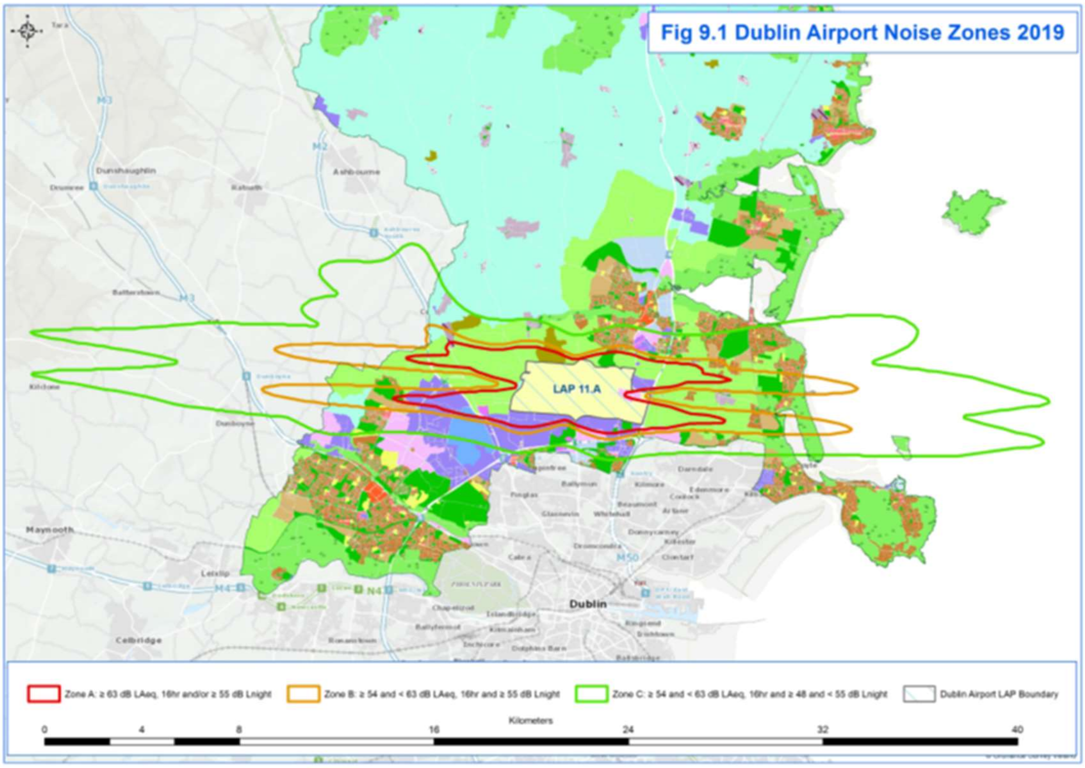
13.6.8 *"The Dublin Airport LAP is a land use plan for the purposes of effective land-use planning and safeguarding the use of the Airport. Noise zones relating to Dublin Airport have been in place for many years to aid land use planning. Since the publication of previous noise zones in 2005, and over the last decade, further evidence has emerged that has updated understanding of how aircraft noise can affect health and quality of life. With the north runway set to become operational in 2022, updated information is available relating to aircraft noise performance and flight paths. For these reasons, it was considered appropriate to update the noise zones for Dublin Airport to allow for more effective land use planning for development within airport noise zones.*

13.6.9 *The updated noise zones are set out in Fig. 9.1. Dublin Airport Noise Zones and policies relating to development in Noise Zones are set out in Variation No. 1 to the Fingal Development Plan 2017 - 2023."*

13.6.10 This figure is reproduced as Plate 13.6 below.

[34] https://www.icao.int/environmental-protection/pages/reduction-of-noise-at-source.aspx Checked 12/08/2021]

Plate 13.6: Extract of Figure 9.1 from Dublin Airport Local Area Plan



13.6.11 The actions to restrict inappropriate development in the noise zones are described in the Fingal Development Plan 2017-2023 Variation No. 1, which states:

13.6.12 *"Three noise zones are shown in the Development Plan maps, Zones B and C within which the Council will continue to restrict inappropriate development, and Zone A within which new provisions for residential development and other noise sensitive uses will be actively resisted. An additional assessment zone, Zone D is also proposed to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment."*

13.6.13 Table 7.2 of the Fingal Development Plan 2017-2023 Variation No. 1 is reproduced below for reference as Table 13-32. The table considers two noise metrics, L_{night} which is one of the primary metrics used in this chapter, and $L_{Aeq,16hr}$ which is one of the supplementary noise metrics. Due to the distribution of flights across the day, evening and night periods at larger airports, the noise exposure expressed using the $L_{Aeq,16hr}$ metric is typically 2 dB lower than if it is expressed using the L_{den} metric, the other primary metric used in this chapter.

Table 13-32: Extract from Fingal Development Plan 2017-2023 (Table 7.2)

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
D	≥ 50 and < 54 dB $L_{Aeq,16hr}$ and ≥ 40 and < 48 dB L_{night}	To identify noise sensitive developments which could potentially be affected by aircraft noise and to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment. All noise sensitive development within this zone is likely to be acceptable from a noise perspective. An associated application would not normally be refused on noise grounds, however where the development is residential-led and comprises non-residential noise sensitive uses, or comprises 50 residential units or more, it may be necessary for the applicant to demonstrate that a good acoustic design has been followed. Applicants are advised to seek expert advice.

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
C	≥ 54 and < 63 dB $L_{Aeq,16hr}$ and ≥ 48 and < 55 dB L_{night}	To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure, where appropriate, noise insulation is incorporated within the development Noise sensitive development in this zone is less suitable from a noise perspective than in Zone D. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed. The noise assessment must demonstrate that relevant internal noise guidelines will be met. This may require noise insulation measures. An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels. Applicants are strongly advised to seek expert advice.
B	≥ 54 and < 63 dB $L_{Aeq,16hr}$ and ≥ 55 dB L_{night}	To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure noise insulation is incorporated within the development. Noise sensitive development in this zone is less suitable from a noise perspective than in Zone C. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed. Appropriate well-designed noise insulation measures must be incorporated into the development in order to meet relevant internal noise guidelines. An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels. Applicants must seek expert advice.
A	≥ 63 dB $L_{Aeq,16hr}$ and/or ≥ 55 dB L_{night}	To resist new provision for residential development and other noise sensitive uses. All noise sensitive developments within this zone may potentially be exposed to high levels of aircraft noise, which may be harmful to health or otherwise unacceptable. The provision of new noise sensitive developments will be resisted.

Notes:

'Good Acoustic Design' means following the principles of assessment and design as described in ProPG: Planning & Noise – New Residential Development, May 2017;

Internal and External Amenity and the design of noise insulation measures should follow the guidance provided in British Standard BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

Residential Sound Insulation Schemes

13.6.14 Dublin Airport operates an insulation scheme for dwellings exposed to 63 dB $L_{Aeq,16h}$ or greater. There are two separate schemes; a one-off voluntary scheme based on 2016 exposure, and a scheme required by the North Runway Planning Permission based on the forecast traffic in 2022. The 63 dB $L_{Aeq,16h}$ contour eligibility as part of the North Runway scheme will be reviewed every two years following the opening of the North Runway as required by the planning conditions. Over 200 local residences are currently eligible for insulation under the two schemes.

13.6.15 64% of eligible households are currently participating in the voluntary Residential Noise Insulation Scheme, with a further 17% opting to defer works until the biennial reviews (for various reasons such as having recently undertaken insulation works themselves, the timing of works being unsuitable, wishing to undertake other structural works before new insulation, the purchase/sale of the property being incomplete, the legal title of house being in dispute). 17% of households did not participate because of ongoing legal action at the time they were contacted, and their later request to extend the opt-in deadline could not be accommodated; 2% of households have been purchased by daa and did not require works. If it is assumed that the 17% who sought the opt-in extension will seek to have works done as part of the biennial reviews, this indicates that participation in the overall scheme will be 98%.

13.6.16 Dublin Airport takes responsibility for the full implementation of the insulation programmes, from initial survey through to quality assessment after installation works. As part of the voluntary Residential Noise

Insulation Scheme (RNIS), which was assessed and approved in 2016 by Fingal County Council under Condition 7 of the North Runway Planning Permission, daa commissioned an assessment in 2020 to understand the internal acoustic reduction offered by the prescribed scheme's works of:

- Replacement of existing windows with acoustic windows;
- Installation of acoustic vents to allow adequate background ventilation;
- Acoustic insulation laid in roof/attic space; and
- Chimney dampers, where necessary.

13.6.17 Prescribed representative sample properties were acoustically surveyed before insulation works commenced, and those which were completed in time were assessed to establish the sound insulation improvement achieved.

13.6.18 Two recognised methods set out in BS EN ISO 16283-3:2016 Acoustics – Field measurements of sound insulation in buildings and of building elements. Part 3 – Façade sound insulation were followed to measure façade sound insulation performance.

13.6.19 The results showed that all dwellings surveyed in the RNIS benefited from an improvement in airborne sound insulation. Across the 20 examples the average improvements was 7.7 dB as a result of mitigation works conducted under the scheme. In six of the samples, a more significant improvement of ≥10 dB was achieved.

13.6.20 When considering the residual effects of the Relevant Action an improvement in internal noise levels of 5 dB has been assumed for the treated properties. This improvement was achieved in all but two of the 20 examples, and is lower than the average improvement achieved.

Schools Sound Insulation Scheme

13.6.21 A voluntary insulation scheme is on offer for all schools and registered pre-schools which fall within the predicted 60 dB $L_{Aeq,16h}$ contour. The scheme is designed to ensure that noise levels within classrooms and school buildings do not exceed 45 dB L_{Aeq} over 8 hours (a typical school day) after insulation measures are undertaken.

13.6.22 The following schools and pre-schools were specified in the North Runway planning permission and were contacted in relation to the insulation scheme:

- Mary Queen of Ireland National School, Rivermeade;
- Little Moo Moo's Pre-School, Skephubble;
- St. Margaret's National School, St. Margaret's;
- Nzone Creche & Pre-School, Kinsealy;
- St Nicholas of Myra National School, Kinsealy; and
- Portmarnock Community School, Portmarnock.

13.6.23 Following acoustic testing it was determined that 2 of these schools (Portmarnock Community School & Mary Queen of Ireland National School) did not exceed the 45 dB threshold and thus no works were required at these schools.

13.6.24 Of the four remaining eligible schools, three (Little Moo Moo's Pre-School, St. Margaret's National School and St Nicholas of Myra National School) opted to have the recommended insulation measures installed and these works were undertaken in 2020 and 2021. Nzone Creche & Pre-School did not wish to have any of the proposed noise insulation installed but they will be considered again as part of the biannual reviews after the North Runway is operational.

Dwelling Purchase Scheme

13.6.25 Following extensive engagement with eligible dwelling owners, their representatives, and the Planning Authority and its advisors, several significant enhancements were made to the draft Voluntary Dwelling Purchase Scheme, and it received approval in 2016. Eligibility for the Scheme is based on the predicted 69 dB $L_{Aeq,16h}$ contour.

13.6.26 Although just five dwellings are located in this contour, the Applicant has voluntarily extended participation in the Scheme to a further 33 dwellings, thus honouring earlier commitments and having regard to the contours used in the original planning application.

13.6.27 The Scheme is completely voluntary and places no obligation on any resident to participate. Offers to purchase will include a 30% premium on the current market value of the residence. Property valuations will be based on operations at Dublin Airport and prior to the North Runway being in place.

13.6.28 Eligible homeowners can have their property independently valued at the Applicant's cost, and the Applicant will also provide allowances in relation to conveyancing fees, stamp duty, tax advice and moving costs.

13.6.29 The Scheme will remain available for three years after the North Runway becomes operational, and homeowners are also eligible to participate in the Voluntary Residential Noise Insulation Scheme.

13.6.30 This Voluntary Dwelling Purchase Scheme compares very favourably to those at other airports such as Heathrow and Gatwick in the UK. At Heathrow, as detailed in Table 5.3 of the airports current Noise Action Plan[35], their Home relocation assistance scheme is capped at £12,500 per home. At Gatwick, as detailed in section 15 of the airport's Noise Action Plan[36], the proposed schemes for a potential new runway either buy properties at an unblighted price, without any premium, or offer a contribution to sale costs of up to 5% of their property's sale price to property owners.

Operational Procedures

13.6.31 Along with airport stakeholders, Dublin Airport have implemented a range of operational procedures to minimise noise. These 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;
- Environmental Noise Corridors: aircraft must stay within designated noise corridors on arrival and departure to minimise noise impact;
- Noise Abatement Procedures: these are specific rules on how aircraft should perform take-off climbs to ensure that noise is minimised;
- Continuous Descent Approach: this 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;
- Reverse thrust is not permitted at night, unless required for safety reasons;
- There are limitations on the use of the Crosswind Runway; and
- Once the North Runway is operational, Dublin Airport will be operated using "Option 7b" during the daytime (07:00-23:00), as described in *Chapter 2: Characteristics of the Project*. Option 7b is a preferred runway concept, which was agreed as part of the 2007 North Runway Planning Permission to lessen the impact of aircraft noise on local communities.

  Mode of operation 7B provides that:

  - The parallel runways - 10R-28L (existing main runway) and 10L-28R (North Runway) - shall be used in preference to the cross runway, 16-34.
  - In westerly operations, when winds are westerly, approximately 70% of the time, Runway 28L shall be preferred for arriving aircraft; either Runway 28L or 28R shall be used for departing aircraft as determined by air traffic control.

[35] NOISE ACTION PLAN 2019-2023 https://www.heathrow.com/content/dam/heathrow/web/common/documents/company/local-community/noise/making-heathrow-quiter/noise-action-plan/Noise_Action_Plan_2019-2023.pdf [Checked 12/08/2021]
[36] GATWICK AIRPORT LIMITED Environmental Noise Directive Noise Action Plan 2019–2024 https://www.gatwickairport.com/globalassets/business--community/new-sub-category-landing-pages/aircraft-noise--airspace/fpt-reports/gal-end-noise-action-plan-2019-2024-lr.pdf [Checked 21/08/2021]

– In easterly operations, when winds are easterly, approximately 30% of the time, either Runway 10L or 10R as determined by air traffic control shall be preferred for arriving aircraft. Runway 10R shall be preferred for departing aircraft.

Measures Forming Part of the Proposed Relevant Action

13.6.32 In addition to the mitigation measures already in place at Dublin Airport, as part of this application the Applicant is proposing the following mitigation measures and controls which are taken account of in the assessment which follows:

- An Annual Noise Quota (ANQ) system to replace the limit of 65 flights per night, as described in *Chapter 2: Characteristics of the Project;* and
- A preferential runway use system as described in *Chapter 2: Characteristics of the Project.*

13.7 Assessment of Effects and Significance

13.7.1 This section assesses the effects of the proposed Relevant Action in each Assessment Year by presenting the effects arising under the Proposed Scenario comparing them with the Permitted Scenario.

Effects During Operation with Proposed Relevant Action

2022 L_{den} Metric

13.7.2 Noise contours for the 2022 Proposed Scenario have been produced for the primary assessment metric of L_{den} using the methodology described in Section 13.3.

13.7.3 Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13.3 (*EIAR Volume 3: Figures*) shows the noise contours representing a high impact, 65 dB L_{den}, for the 2022 Proposed Scenario. The 2022 Permitted Scenario is also presented for comparison.

13.7.4 The 2022 Proposed Scenario 65 dB L_{den} contour (green) does not reach as far west as the 2022 Permitted Scenario contour (cyan) in line with the South Runway, not reaching Killshane Bridge, and is larger than the 2022 Permitted Scenario contour to the east, extending to St Doolaghs. In line with the North Runway, the 2022 Proposed Scenario contour extends further than the 2022 Permitted Scenario to Bishopswood to the west but both barely leave the airport site to the east. The exposure from the Crosswind Runway does not leave the airport site in either scenario. These changes occur because there are around 6% more flights overall in the Proposed Scenario with a greater increase at night, although there are fewer departures to the west which use the South Runway, causing that part of the contour to reduce in size.

13.7.5 To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Plate 13.4. The results of these predictions for the 2022 Proposed Scenario in terms of the L_{den} metric are given in Table 13-33, where they are compared with the 2022 Permitted Scenario.

Table 13-33: 2022 Noise levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})	
		2022 Proposed	Difference to 2022 Permitted
Tyrellstown, Toberburr	AR01	54	+2
Ridgewood	AR02	58	+2
Swords	AR03	49	+1
Malahide Castle	AR04	44	+1
Portmarnock N	AR05	48	+1
Portmarnock S	AR06	55	+1
Malahide S	AR07	50	+1

Representative Location	Reference No.	Noise Level, dB (L_{den})	
St Doolaghs	AR08	64	+1
Darndale Park	AR09	53	+1
The Baskins	AR10	57	+1
Mayeston Hall	AR11	52	-1
Kilshane Cross	AR12	62	-1
St Margret's	AR13	62	+1
Ashbourne	AR14	46	+1
Dunboyne	AR15	51	0
Ongar	AR16	48	0
Mount Garrett	AR17	54	-2
Beaumont	AR18	48	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

13.7.6 Comparing the 2022 Proposed Scenario to the 2022 Permitted Scenario, most receptors see an increase in noise level of around 1 dB(A), although receptors close to flight paths to the west of the existing South Runway, such as Kilshane Cross (AR12) and Mount Garrett (AR17), see reductions. The magnitude of the changes are therefore generally associated with a very low impact.

13.7.7 For the 2022 Proposed Scenario L_{den} contours, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13-34 along with the areas of the contours.

13.7.8 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

Table 13-34: Areas, number of dwellings and population in 2022 Proposed L_{den} contours

Scenario		2022 Proposed			
Contour L_{den}	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population	Dwellings	Population
45	499.6	118,213	351,063	129,424	386,327
50	185.3	28,176	83,696	35,788	107,074
55	76.9	6,061	17,270	11,603	34,126
60	30.2	696	2,024	2,296	7,022
65	11.1	47	142	47	142
70	4.0	7	23	7	23

13.7.9 The number of people assessed to be highly annoyed in the 2022 Proposed Scenario is given in Table 13-35, where it is compared with the 2022 Permitted Scenario.

Table 13-35: Number of people highly annoyed – 2022

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2022 Proposed	52,713	61,161
2022 Permitted	50,603	58,880

13.7.10 Comparing the 2022 Proposed Scenario with the 2022 Permitted Scenario, the number of people exposed to aircraft noise is forecast to increase, for all contour levels. The number of people assessed as highly annoyed by aircraft noise increases by 4% from 50,603 to 52,713 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) increases from 94 to 142.

13.7.11 When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 13.3, and specifically Table 13-4, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2022 Proposed Scenario is compared with the 2022 Permitted Scenario in Table 13-36. The table includes all people in existing residential receptors who are exposed to at least 45 dB L_{den} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are not assessed as being subject to significant effects and so have not been included.

Table 13-36: Air Noise (L_{den}) People by Magnitude of effect – 2022 Proposed vs 2022 Permitted

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	134,010	180,080
Not Significant	15,570	16,769
Slight	2,235	6,449
Moderate	7,996	5,538
Significant	87	80
Very Significant	0	0
Profound	0	0

13.7.12 Going from the 2022 Permitted Scenario to the 2022 Proposed Scenario, 87 people are assessed as having a significant beneficial effect, and 80 people are assessed as having a significant adverse effect. No people are assessed as having the highest effect levels, i.e. very significant and profound.

13.7.13 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. The numbers of each of these above the thresholds given in Table 13-5 for the 2022 Proposed Scenario are given in Table 13-37, where they are compared with the 2022 Permitted Scenario.

Table 13-37: Schools, residential healthcare facilities and places of worship in 2022 Proposed L_{den} contours

Scenario	No. Receptors Above Threshold for Medium Absolute Effect		
	Schools	Residential Healthcare Facilities	Places of Worship
2022 Proposed	7	1	4
2022 Permitted	5	1	4

13.7.14 The number of non-residential receptors exposed to the thresholds given in Table 13-5 is forecast to increase between the 2022 Permitted and 2022 Proposed Scenarios. The increases for the individual receptors are all less than 3 dB(A) and so are not rated as significant.

2022 L_{night} Metric

13.7.15 Noise contours for the 2022 Proposed Scenario have been produced for the primary assessment metric of L_{night} using the methodology described in Section 13.3.

13.7.16 Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13.4 (*EIAR Volume 3: Figures*) shows the noise contours representing a high impact, 55 dB L_{night}, for the 2022 Proposed Scenario. The 2022 Permitted Scenario is also presented for comparison.

13.7.17 The 2022 Proposed Scenario 55 dB L_{night} contour (green) does not extend as far as the 2022 Permitted Scenario contour in line with the South Runway to the west, reaching Killshane, but extends further to the east, reaching Drumnigh. In line with the North Runway, the 2022 Proposed Scenario contour extends just beyond Bishopswood to the west and barely leaves the airport site to the east. The exposure from the Crosswind Runway does not leave the airport site. These changes occur because the North

Runway is used and there are more flights at night in the Proposed Scenario, by around 60% on a typical 'Busy Day', although there are fewer departures to the west which use the South Runway, causing that part of the contour to reduce in size.

13.7.18 To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Plate 13.4. The results of these predictions for the 2022 Proposed Scenario in terms of the L_{night} metric are given in Table 13-38, where they are compared with the 2022 Permitted Scenario.

Table 13-38: 2022 Noise levels at Representative Locations (L_{night})

Representative Location	Reference No.	Noise Level, dB (L_{night})	
		2022 Proposed	Difference to 2022 Permitted
Tyrellstown, Toberburr	AR01	45	+7
Ridgewood	AR02	49	+9
Swords	AR03	40	+4
Malahide Castle	AR04	36	+1
Portmarnock N	AR05	39	+2
Portmarnock S	AR06	48	+2
Malahide S	AR07	42	+1
St Doolaghs	AR08	56	+2
Darndale Park	AR09	45	+1
The Baskins	AR10	49	+2
Mayeston Hall	AR11	45	-2
Kilshane Cross	AR12	56	-1
St Margret's	AR13	54	+2
Ashbourne	AR14	37	+2
Dunboyne	AR15	44	+1
Ongar	AR16	40	-1
Mount Garrett	AR17	48	-2
Beaumont	AR18	40	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

13.7.19 Comparing the 2022 Proposed Scenario to the 2022 Permitted Scenario, receptors close to flight paths to the west of the existing South Runway, for example Kilshane Cross (AR12) or Mount Garrett (AR17), see reductions. However, receptors closer to flight paths from the North Runway, for example Swords (AR03) or Malahide (AR07), or to the east of the airport, for example St. Doolaghs (AR06), see increases. The magnitude of the changes are generally associated with a low or very low impact but for Swords, Tyrellstown, Toberburr and Ridgewood the increases are associated with medium, high and very high impacts respectively. The significance of these is dependent on the resulting noise levels and is considered below.

13.7.20 For the 2022 Proposed Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13.39 along with the areas of the contours.

13.7.21 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

Table 13-39: Areas, number of dwellings and population in 2022 Proposed L_{night} contours

Scenario		2022 Proposed			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	248.5	45,937	136,626	54,117	161,693
45	116.3	11,526	33,603	18,153	53,816
50	45.2	1,936	5,200	5,061	14,804
55	16.9	120	356	120	356
60	5.8	14	45	14	45
65	2.2	0	0	0	0

13.7.22 The number of people assessed to be highly sleep disturbed in the 2022 Proposed Scenario is given in Table 13-40, where it is compared with the 2022 Permitted Scenario.

Table 13-40: Number of people highly sleep disturbed – 2022

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2022 Proposed	19,188	23,885
2022 Permitted	18,789	23,729

13.7.23 Comparing the 2022 Proposed Scenario with the 2022 Permitted Scenario, the number of people exposed to aircraft noise is forecast to increase, for all contour levels with the exception of the 40 dB L_{night} contour. Consequently, the number of people assessed as highly sleep disturbed by aircraft noise also increases, specifically by 2% from 18,789 to 19,188 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) increases from 222 to 356.

13.7.24 When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 13.3, and specifically Table 13-4, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2022 Proposed Scenario is compared with the 2022 Permitted Scenario in Table 13-41.The table includes all people in existing residential receptors who are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are assessed as not being subject to significant effects and so have not been included.

Table 13-41: Air Noise (L_{night}) People by Magnitude of effect – 2022 Proposed vs 2022 Permitted

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	44,531	55,263
Not Significant	18,116	10,976
Slight	10,109	11,038
Moderate	8,318	7,972
Significant	207	8,886
Very Significant	5	246
Profound	0	75

13.7.25 Going from the 2022 Permitted Scenario to the 2022 Proposed Scenario, 212 people are assessed as having at least a significant beneficial effect, and 9,225 people are assessed as having at least a significant adverse effect.

13.7.26 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night. The number of these above the threshold given in Table 13-5 for the 2022 Proposed Scenario is given in Table 13-42, where it is compared with the 2022 Permitted Scenario.

Table 13-42: Residential healthcare facilities in 2022 Proposed L_{night} contours

Scenario	No. Residential Healthcare Facilities Above Threshold for Medium Absolute Effect
2022 Proposed	2
2022 Permitted	2

13.7.27 The number of residential healthcare facilities exposed to the threshold given in Table 13-5 in the 2022 Proposed Scenario is the same as in the 2022 Permitted Scenario. Any increases for the individual receptors are all less than 3 dB(A) and so are not rated as significant.

2025 L_{den} Metric

13.7.28 Noise contours for the 2025 Proposed Scenario have been produced for the primary assessment metric of L_{den} using the methodology described in Section 13.3. They assume that during the peak early morning period of 06:00-08:00, one runway is used for arrivals but both runways are used for departures. This means during this period departures overfly more areas, but that no area is overflown as often as if only one runway was used.

13.7.29 Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13.5 (*EIAR Volume 3: Figures*) shows the noise contours representing a high impact, 65 dB L_{den}, for the 2025 Proposed Scenario. The 2025 Permitted Scenario is also presented for comparison.

13.7.30 The 2025 Proposed Scenario 65 dB L_{den} contour (orange) is very similar to the 2025 Permitted Scenario contour to the west of the South Runway, reaching Killshane Bridge, and is slightly larger than the 2025 Permitted Scenario contour to the east, reaching St Doolaghs. In line with the North Runway, the 2025 Proposed Scenario contour extends further than the 2025 Permitted Scenario to Bishopshwood to the west and barely leaves the airport site to the east. The exposure from the Crosswind Runway does not leave the airport site. These changes occur because there are around 4% more flights overall in the Proposed Scenario with a greater increase at night, although there is little change in the number of departures to the west which use the South Runway, which is why that part of the contour is a similar size.

13.7.31 To provide further information on changes in the noise environment for specific communities predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Plate 13.4. The results of these predictions for the 2025 Proposed Scenario in terms of the Lden metric are given in Table 13.43, where they are compared with the 2025 Permitted Scenario.

Table 13-43: 2025 Noise levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})	
		2025 Proposed	Difference to 2025 Permitted
Tyrellstown, Toberburr	AR01	54	+1
Ridgewood	AR02	59	+2
Swords	AR03	49	+2
Malahide Castle	AR04	49	+5
Portmarnock N	AR05	50	+3
Portmarnock S	AR06	56	+1
Malahide S	AR07	54	+3
St Doolaghs	AR08	65	+1
Darndale Park	AR09	53	0
The Baskins	AR10	58	+1

Mayeston Hall	AR11	54	0
Kilshane Cross	AR12	64	0
St Margret's	AR13	63	+1
Ashbourne	AR14	47	+1
Dunboyne	AR15	52	0
Ongar	AR16	50	+1
Mount Garrett	AR17	57	0
Beaumont	AR18	49	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

13.7.32 Comparing the 2025 Proposed Scenario to the 2025 Permitted Scenario, most receptors see an increase in noise level of around 1 dB(A) associated with a very low impact. However, receptors near Malahide, such as Malahide Castle (AR04) and Malahide S (AR07), see larger increases of up to 5 dB(A) associated with medium impacts. The significance of these is dependent on the resulting noise levels and is considered below.

13.7.33 For the 2025 Proposed Scenario Lden contours, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13.44 along with the areas of the contours.

13.7.34 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

Table 13-44: Areas, number of dwellings and population in 2025 Proposed L_{den} contours

Scenario		2025 Proposed			
Contour L_{den}	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	714.3	172,343	511,732	183,762	547,555
50	218.1	43,545	130,559	51,899	156,231
55	93.8	8,837	25,976	14,944	44,777
60	36.6	1,136	3,011	2,865	8,374
65	13.4	67	196	67	196
70	4.7	10	32	10	32

13.7.35 The number of people assessed to be highly annoyed in the 2025 Proposed Scenario is given in Table 13-45, where it is compared with the 2025 Permitted Scenario.

Table 13-45: Number of people highly annoyed – 2025

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2025 Proposed	79,405	88,950
2025 Permitted	64,241	73,209

13.7.36 Comparing the 2025 Proposed Scenario with the 2025 Permitted Scenario, the number of people exposed to aircraft noise is forecast to increase for all contour levels. The number of people assessed as highly annoyed by aircraft noise increases by 24% from 64,241 to 79,405 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) increases from 119 to 196.

13.7.37 When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 13.3, and specifically Table 13-4, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2025 Proposed Scenario is compared with the 2025 Permitted Scenario in Table 13-46. The table includes all people in existing residential receptors who are exposed to at least 45 dB L_{den} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are assessed as not being subject to significant effects and so have not been included.

Table 13-46: Air Noise (L_{den}) People by Magnitude of effect – 2025 Proposed vs 2025 Permitted

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	922	438,000
Not Significant	198	38,352
Slight	12	21,653
Moderate	0	12,598
Significant	0	67
Very Significant	0	0
Profound	0	0

13.7.38 Going from the 2025 Permitted Scenario to the 2025 Proposed Scenario, no people are assessed as having a significant beneficial effect, and 67 people are assessed as having a significant adverse effect. No people are assessed as having the highest effect levels, i.e. very significant and profound.

13.7.39 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. The numbers of each of these above the thresholds given in Table 13-5 for the 2025 Proposed Scenario are given in Table 13-47, where they are compared with the 2025 Permitted Scenario.

Table 13-47: Schools, residential healthcare facilities and places of worship in 2025 Proposed L_{den} contours

Scenario	No. Receptors Above Threshold for Medium Absolute Effect		
	Schools	Residential Healthcare Facilities	Places of Worship
2025 Proposed	8	2	5
2025 Permitted	7	2	5

13.7.40 The number of non-residential receptors exposed to the thresholds given in Table 13-5 is forecast to increase between the 2025 Permitted Scenario and 2025 Proposed Scenario. The increases for the individual receptors are all less than 3 dB(A) and so are not rated as significant.

2025 L_{night} Metric

13.7.41 Noise contours for the 2025 Proposed Scenario have been produced for the primary assessment metric of L_{night} using the methodology described in Section 13.3. They assume that during the peak early morning period of 06:00-08:00, one runway is used for arrivals but both runways are used for departures.

13.7.42 Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13.6 (*EIAR Volume 3: Figures*) shows the noise contours representing a high impact, 55 dB L_{night}, for the 2025 Proposed Scenario. The 2025 Permitted Scenario is also presented for comparison.

13.7.43 The 2025 Proposed Scenario 55 dB L_{night} contour (orange) extends slightly further to the west than the 2025 Permitted Scenario contour in line with the South Runway, not quite reaching Hollystown, but extends further to the east, reaching beyond Drumnigh. In line with the North Runway, the 2025 Proposed Scenario contour extends to Bishopswood to the west and barely leaves the airport site to the east. The exposure from the Crosswind Runway does not leave the airport site. These changes occur because there are more flights overall in the Proposed Scenario, by around 60% on a typical 'Busy Day', although there is little change in the number of departures to the west which use the South Runway, which is why that part of the contour is a similar size.

13.7.44 To provide further information on changes in the noise environment for specific communities predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Plate 13.4. The results of these predictions for the 2025 Proposed Scenario in terms of the L_{night} metric are given in Table 13-48, where they are compared with the 2025 Permitted Scenario.

Table 13-48: 2025 Noise levels at Representative Locations (L_{night})

Representative Location	Reference No.	Noise Level, dB (L_{night})	
		2025 Proposed	Difference to 2025 Permitted
Tyrellstown, Toberburr	AR01	44	+5
Ridgewood	AR02	50	+8
Swords	AR03	41	+5
Malahide Castle	AR04	42	+7
Portmarnock N	AR05	43	+5
Portmarnock S	AR06	48	+2
Malahide S	AR07	47	+6
St Doolaghs	AR08	57	+2
Darndale Park	AR09	45	+1
The Baskins	AR10	50	+2
Mayeston Hall	AR11	47	0
Kilshane Cross	AR12	59	0
St Margret's	AR13	54	+2
Ashbourne	AR14	38	+2
Dunboyne	AR15	45	+1
Ongar	AR16	43	+1
Mount Garrett	AR17	51	0
Beaumont	AR18	41	+2

Note – values rounded to nearest whole number. Differences based on unrounded values.

13.7.45 Comparing the 2025 Proposed Scenario to the 2025 Permitted Scenario, the majority of the receptors see increases of up to 2 dB(A) associated with a low impact. However, receptors closer to flight paths from the North Runway, for example Swords (AR03) or Malahide (AR07), see larger increases of up to 8 dB(A), some of which are associated with high impacts. The significance of these is dependent on the resulting noise levels and is considered below.

13.7.46 For the 2025 Proposed Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13.49 along with the areas of the contours.

13.7.47 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

Table 13-49: Areas, number of dwellings and population in 2025 Proposed L_{night} contours

Scenario		2025 Proposed			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	311.5	88,761	268,498	99,308	301,707
45	128.7	18,582	54,532	26,181	77,697
50	55.0	2,962	8,705	6,992	21,343

55	20.8	335	1,059	639	2,053
60	6.9	18	56	18	56
65	2.7	2	6	2	6

13.7.48 The number of people assessed to be highly sleep disturbed in the 2025 Proposed Scenario is given in Table 13.50, where it is compared with the 2025 Permitted Scenario.

Table 13-50: Number of people highly sleep disturbed – 2025

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2025 Proposed	37,080	43,179
2025 Permitted	22,500	27,806

13.7.49 Comparing the 2025 Proposed Scenario with the 2025 Permitted Scenario, the number of people exposed to aircraft noise is forecast to increase, for all contour levels. Consequently, the number of people assessed as highly sleep disturbed by aircraft noise increases by 65% from 22,500 to 37,080 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) increases from 280 to 1,059.

13.7.50 When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 13.3, and specifically Table 13-4, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2025 Proposed Scenario is compared with the 2025 Permitted Scenario in Table 13-51. The table includes all people in existing residential receptors who are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are assessed as not being subject to significant effects and so have not been included.

Table 13-51: Air Noise (L_{night}) People by Magnitude of effect – 2025 Proposed vs 2025 Permitted

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	42	198,375
Not Significant	68	17,197
Slight	69	26,688
Moderate	5	14,578
Significant	0	11,350
Very Significant	0	104
Profound	0	40

13.7.51 Going from the 2025 Permitted Scenario to the 2025 Proposed Scenario, no people are assessed as having a significant beneficial effect, and 11,494 people are assessed as having at least a significant adverse effect.

13.7.52 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night. The number of these above the threshold given in Table 13-5 for the 2025 Proposed Scenario is given in Table 13-52, where it is compared with the 2025 Permitted Scenario.

Table 13-52: Residential healthcare facilities in 2025 Proposed L_{night} contours

Scenario	No. Residential Healthcare Facilities Above Threshold for Medium Absolute Effect
2025 Proposed	2

2025 Permitted	2

13.7.53 The number of residential healthcare facilities exposed to the threshold given in Table 13-5 in the 2025 Proposed Scenario is the same as in the 2025 Permitted Scenario. Any increases for the individual receptors are all less than 3 dB(A) and so are not rated as significant.

2035 L_{den} Metric

13.7.54 Noise contours for the 2035 Proposed Scenario have been produced for the primary assessment metric of L_{den} using the methodology described in Section 13.3.They also assume that during the peak early morning period of 06:00-08:00, one runway is used for arrivals but both runways are used for departures.

13.7.55 Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13.7 (*EIAR Volume 3: Figures*) shows the noise contours representing a high impact, 65 dB L_{den}, for the 2035 Proposed Scenario. The 2035 Permitted Scenario is also presented for comparison.

13.7.56 The 2035 Proposed Scenario 65 dB L_{den} contour (black) is very similar to the 2035 Permitted Scenario contour in line with the South Runway to the west, not quite reaching Killshane Bridge, and is slightly larger than the 2035 Permitted Scenario contour to the east, reaching St Doolaghs. In line with the North Runway, the contour extends further than the 2035 Permitted Scenario nearly to Bishopswood to the west and barely leaves the airport site to the east. The exposure from the Crosswind Runway does not leave the airport site. These changes occur because although there are no more flights overall and more are by quieter modernised aircraft types in the Proposed Scenario, there are more flights at night.

13.7.57 To provide further information on changes in the noise environment for specific communities predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Plate13.4. The results of these predictions for the 2035 Proposed Scenario in terms of the L_{den} metric are given in Table 13-53, where they are compared with the 2035 Permitted Scenario.

Table 13-53: 2035 Noise levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})	
		2035 Proposed	Difference to 2035 Permitted
Tyrellstown, Toberburr	AR01	51	+1
Ridgewood	AR02	56	+2
Swords	AR03	47	+1
Malahide Castle	AR04	47	+3
Portmarnock N	AR05	49	+2
Portmarnock S	AR06	55	+1
Malahide S	AR07	52	+3
St Doolaghs	AR08	64	+1
Darndale Park	AR09	51	0
The Baskins	AR10	57	+1
Mayeston Hall	AR11	52	0
Kilshane Cross	AR12	63	0
St Margret's	AR13	60	+1
Ashbourne	AR14	45	+1
Dunboyne	AR15	50	0
Ongar	AR16	47	0
Mount Garrett	AR17	56	0
Beaumont	AR18	48	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

13.7.58 Comparing the 2035 Proposed Scenario to the 2035 Permitted Scenario, the majority of the receptors see increases of 0-1 dB(A) associated with a very low impact. However, receptors closer to flight paths from the North Runway, for example Swords (AR03) or Malahide (AR07), see larger increases of up to 3 dB(A) associated with a medium impact. The significance of these is dependent on the resulting noise levels and is considered below.

13.7.59 For the 2035 Proposed Scenario L_{den} contours, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13.54, along with the areas of the contours.

13.7.60 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

Table 13-54: Areas, number of dwellings and population in 2035 Proposed L_{den} contours

Scenario		2035 Proposed			
Contour L_{den}	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	410.3	85,894	255,392	96,614	289,066
50	168.1	22,148	65,241	29,787	88,553
55	73.2	4,173	12,108	9,466	28,481
60	28.1	777	2,201	2,377	7,199
65	9.4	36	110	36	110
70	3.4	2	6	2	6

13.7.61 The number of people assessed to be highly annoyed in the 2035 Proposed Scenario is given in Table 13-55, where it is compared with the 2035 Permitted Scenario.

Table 13-55: Number of people highly annoyed – 2035

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2035 Proposed	39,693	47,963
2035 Permitted	33,437	41,234

13.7.62 Comparing the 2035 Proposed Scenario with the 2035 Permitted Scenario, the number of people exposed to aircraft noise is forecast to increase for all contour levels. The number of people assessed as highly annoyed by aircraft noise increases by 19% from 33,437 to 39,693 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) increases from 71 to 110.

13.7.63 When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 13.3, and specifically Table 13-4, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2035 Proposed Scenario is compared with the 2035 Permitted Scenario in Table 13.56. The table includes all people in existing residential receptors who are exposed to at least 45 dB Lden in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are assessed as not being subject to significant effects and so have not been included.

Table 13-56: Air Noise (L_{den}) People by Magnitude of effect – 2035 Proposed vs 2035 Permitted

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	30,436	180,651
Not Significant	1,329	29,135

Slight	22	12,565
Moderate	6	1,512
Significant	0	20
Very Significant	0	0
Profound	0	0

13.7.64 Going from the 2035 Permitted Scenario to the 2035 Proposed Scenario, no people are assessed as having a significant beneficial effect, and 20 people are assessed as having a significant adverse effect. No people are assessed as having the highest effect levels, i.e. very significant and profound.

13.7.65 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. The numbers of each of these above the thresholds given in Table 13-5 for the 2035 Proposed Scenario are given in Table 13-57, where they are compared with the 2035 Permitted Scenario.

Table 13-57: Schools, residential healthcare facilities and places of worship in 2035 Proposed L_{den} contours

Scenario	No. Receptors Above Threshold for Medium Absolute Effect		
	Schools	Residential Healthcare Facilities	Places of Worship
2035 Proposed	6	1	5
2035 Permitted	5	1	4

13.7.66 The number of non-residential receptors exposed to the thresholds given in Table 13-5 is forecast to increase between the 2035 Permitted Scenario and 2035 Proposed Scenario. The increases for the individual receptors are all less than 3 dB(A) and so are not rated as significant.

2035 L_{night} Metric

13.7.67 Noise contours for the 2035 Proposed Scenario have been produced for the primary assessment metric of L_{night} using the methodology described in Section 13.3. They also assume, that during the peak early morning period of 06:00-08:00, one runway is used for arrivals but both runways are used for departures.

13.7.68 Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13.8 (*EIAR Volume 3: Figures*) shows the noise contours representing a high impact, 55 dB L_{night}, for the 2035 Proposed Scenario. The 2035 Permitted Scenario is presented for comparison.

13.7.69 The 2035 Proposed Scenario 55 dB L_{night} contour (black) extends slightly further than the 2035 Permitted Scenario contour in line with the South Runway to the west, reaching Bay, and extends further to the east, reaching Drumnigh. In line with the North Runway, the 2035 Proposed Scenario contour does not reach Bishopswood to the west and barely leaves the airport site to the east. The exposure from the Crosswind Runway does not leave the airport site. These changes occur because there are more flights at night in the Proposed Scenario, by around 60% on a typical 'Busy Day', although there is little change in the number of departures to the west which use the South Runway, which is why that part of the contour is a similar size.

13.7.70 To provide further information on changes in the noise environment for specific communities predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Plate 13-4. The results of these predictions for the 2035 Proposed Scenario in terms of the L_{night} metric are given in Table 13-58, where they are compared with the 2035 Permitted Scenario.

Table 13-58: 2035 Noise levels at Representative Locations (L_{night})

Representative Location	Reference No.	Noise Level, dB (L_{night})	
		2035 Proposed	Difference to 2035 Permitted
Tyrellstown, Toberburr	AR01	41	+5
Ridgewood	AR02	47	+8

Swords	AR03	39	+4
Malahide Castle	AR04	40	+7
Portmarnock N	AR05	42	+5
Portmarnock S	AR06	47	+2
Malahide S	AR07	45	+6
St Doolaghs	AR08	56	+2
Darndale Park	AR09	43	+1
The Baskins	AR10	49	+2
Mayeston Hall	AR11	45	0
Kilshane Cross	AR12	58	0
St Margret's	AR13	52	+2
Ashbourne	AR14	36	+2
Dunboyne	AR15	43	+1
Ongar	AR16	40	+1
Mount Garrett	AR17	50	0
Beaumont	AR18	40	+2

Note – values rounded to nearest whole number. Differences based on unrounded values.

13.7.71 Comparing the 2035 Proposed Scenario to the 2035 Permitted Scenario, the majority of the receptors see increases of up to 2 dB(A) associated with a low impact. However, receptors closer to flight paths from the North Runway, for example Swords (AR03) or Malahide (AR07), see larger increases of up to 8 dB(A), some of which are associated with high impacts. The significance of these is dependent on the resulting noise levels and is considered below.

13.7.72 For the 2035 Proposed Scenario Lnight contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13-59 along with the areas of the contours.

13.7.73 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

Table 13-59: Areas, number of dwellings and population in 2035 Proposed Lnight contours

Scenario		2035 Proposed			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	227.4	45,118	135,695	53,472	161,367
45	105.1	9,438	28,537	15,953	48,467
50	43.0	1,967	5,357	5,510	16,560
55	14.7	148	454	148	454
60	5.1	12	38	12	38
65	2.0	0	0	0	0

13.7.74 The number of people assessed to be highly sleep disturbed in the 2035 Proposed Scenario is given in Table 13-60, where it is compared with the 2035 Permitted Scenario.

Table 13-60: Number of people highly sleep disturbed – 2035

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2035 Proposed	18,711	23,567
2035 Permitted	11,374	15,551

13.7.75 Comparing the 2035 Proposed Scenario with the 2035 Permitted Scenario, the number of people exposed to aircraft noise is forecast to increase, for all contour levels. Consequently, the number of people assessed as highly sleep disturbed by aircraft noise increases by 65% from 11,374 to 18,711 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) increases from 203 to 454.

13.7.76 When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 13.3, and specifically Table 13-4, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2035 Proposed Scenario is compared with the 2035 Permitted Scenario in Table 13-61. The table includes all people in existing residential receptors who are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are assessed as not being subject to significant effects and so have not been included.

Table 13-61: Air Noise (L_{night}) People by Magnitude of effect – 2035 Proposed vs 2035 Permitted

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	15,778	70,030
Not Significant	65	11,043
Slight	69	15,265
Moderate	23	18,750
Significant	0	4,573
Very Significant	0	99
Profound	0	34

13.7.77 Going from the 2035 Permitted Scenario to the 2035 Proposed Scenario, no people are assessed as having a significant beneficial effect, and 4,706 people are assessed as having at least a significant adverse effect.

13.7.78 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night. The number of these above the threshold given in Table 13-5 for the 2035 Proposed Scenario is given in Table 13-62, where it is compared with the 2035 Permitted Scenario.

Table 13-62: Residential healthcare facilities in 2035 Proposed L_{night} contours

Scenario	No. Residential Healthcare Facilities Above Threshold for Medium Absolute Effect
2035 Proposed	1
2035 Permitted	1

13.7.79 The number of residential healthcare facilities exposed to the threshold given in Table 13-5 in the 2035 Proposed Scenario is the same as in the 2035 Permitted Scenario. Any increases for the individual receptors are all less than 3 dB(A) and so are not rated as significant.

Noise Modelling to Inform Vibration Effects

13.7.80 The number of dwellings exceeding the threshold for potential vibration effects due to airborne aircraft, based on experiencing noise levels of at least 97 dB L_{Cmax} at least once per 24 hour day, has been predicted for the Proposed Scenarios in the Assessment Years of 2022, 2025 and 2035. The results are given in Table 13-63 where they are compared with the results for the Permitted Scenarios.

Table 13-63: Number of dwellings exceeding threshold for potential vibration effects due to airborne aircraft

Scenario	No. dwellings exceeding threshold for potential vibration effects due to airborne aircraft
2022 Permitted	0
2025 Permitted	2
2035 Permitted	0
2022 Proposed	0
2025 Proposed	0
2035 Proposed	0

13.7.81 No dwellings exceed this threshold in any of the Proposed Scenarios. Therefore, there are no significant vibration effects predicted.

13.8 Mitigation and Monitoring

Mitigation and Controls Proposed

13.8.1 In addition to the mitigation measures already in place at Dublin Airport, as part of this application the Applicant is proposing the following mitigation measures and controls which will help to ensure that the noise effects assessed in the EIAR are not exceeded:

- A night noise insulation scheme.
- A detailed framework for monitoring the noise performance of Dublin Airport.

Night Noise Insulation Scheme

13.8.2 The proposed scheme will provide a grant of €20,000 to fund sound insulation improvement works, for dwellings meeting either of the following criteria:

- Exposed to night-time noise levels of at least 55 dB L_{night} once the North Runway is operational, or
- Exposed to a “very significant” rating arising from forecast noise levels of at least 50 dB L_{night} in the first full year when the Relevant Action comes into operation, with a change of at least +9 dB when compared with the current permitted operation in the same equivalent year. For the purpose of this assessment a comparison of the 2022 Permitted and Proposed Scenarios has been used to estimate which dwellings would be eligible.

13.8.3 Eligibility within the 55 dB L_{night} contour will be reviewed every 2 years.

13.8.4 The proposed night insulation scheme is additional to the existing daytime noise insulation scheme currently provided in accordance with Condition 7 of North Runway planning permission.

13.8.5 The basis for 55 dB L_{night} as a criterion is that it is the level at which a high impact arises. This follows from the 2009 WHO Night Noise Guidelines[13] which describe it as the threshold at which *“Adverse health effects occur frequently”* and *“a sizeable proportion of the population is highly annoyed and sleep-disturbed”*. The noise level is also comparable with the level of 55 dB $L_{Aeq,8h}$ commonly used at airports in the UK for eligibility for sound insulation schemes.

13.8.6 The basis for the 50 dB L_{night} with a change of at least 9 dB criterion is that these are the people who are not exposed to a level of 55 dB L_{night} but who will, without mitigation, experience a very significant effect in the year that the North Runway opens, using the rating scale presented in Table 13-4.

Noise Monitoring Framework

13.8.7 It is proposed to implement a framework for monitoring the noise performance with respect to any Noise Abatement Objective (NAO) set by the Aircraft Noise Competent Authority (ANCA) in due course. Performance will be reported annually to ANCA, in compliance with the relevant sections of the Aircraft Noise (Dublin Airport) Regulation Act 2019.

13.8.8 Performance will be reported for the previous calendar year and for other forecast years depending on the measure (and outlined below), will include, but not be limited to, the following items:

- Effects of aircraft noise:
  - The number of people highly annoyed and highly sleep disturbed by aircraft noise to be calculated using the method set out in EU Directive 2020/367 and reported for the previous calendar year and forecast for 2025.
- Exposure to aircraft noise:
  - Aircraft noise contours and associated area, population and dwelling (and other noise sensitive properties) totals to be produced in 5 dB bands, from 45 dB to 75 dB Lden and 40dB to 70 dB Lnight. For the previous calendar year and forecast for 2025.
- Aircraft Source Noise Measures:
  - As part of the reporting for performance of the proposed Night Quota System, the number of movements and QC will be reported for the previous year and the next year. Annual totals of Air Transport Movements (ATMs) and Quota Count (QC) will be reported, with a breakdown for each of the QC bands (QC0, 0.125, 0.25, 0.5, 1, 2, 4, 8, 16). Data will be provided for the Night Quota Period (NQP, 23:30-06:00) and the Night Period (23:00-07:00).
- Operational Measures:
  - For the previous year calendar year, the number of arriving and departing aircraft and their associated QC totals using each runway during the periods 23:00-00:00, 00:00-06:00 and 06:00-06:59. This will be averaged to indicate “per night” equivalent values. This will also be provided for a monthly breakdown.
- Noise Insulation Scheme Reporting:
  - The number of dwellings eligible and the total grants administered under the proposed night noise insulation scheme to be reported each year.
- Community Noise Reporting:
  - In addition to the requirements for noise reporting specified in Condition 10 of the parent permission. Noise reports will be developed working with ANCA and the local communities to present an overall picture of the airport’s operation and its effects which could include the information above.
  - In consultation with ANCA and local communities, the Applicant will develop a community noise monitoring programme to report specific noise related outcomes from the airport operation.
  - the Applicant will make available noise and flight track information to the local community.
  - The number and nature of noise complaints will be reported monthly and annually.

13.8.9 The Aircraft Noise Act sets out a process of aircraft noise regulation whereby the Aircraft Noise Competent Authority (ANCA) shall ensure that the Balanced Approach is adopted where a noise problem at the airport has been identified and requires the identification of a Noise Abatement Objective (NAO) as appropriate.

13.8.10 Prior to the submission of the Relevant Action application Dublin Airport did not have an established defined noise problem and related NAO, both are to be set in due course by ANCA. In order to allow ANCA to carry out their assessment, the Applicant has developed a candidate NAO (cNAO) to provide a basis for assessment of the proposed aircraft noise reduction measures.

13.8.11 The historic data for the following metrics are proposed to be reported, for comparison with a baseline year of 2018 that was chosen by the Applicant as part of the candidate NAO.

- The overall number of people exposed to noise >= 55dB L_{den}
- The overall number of people considered highly annoyed.
- The overall number of people exposed to noise >=40dB L_{night}
- The overall number of people considered highly sleep disturbed
- The Area of the contour outlining those exposed to significant levels of noise at night (>55dB L_{night}).

13.8.12 Throughout the reporting described above, where there is a comparison of population or effects with the equivalent for a baseline (e.g. 2018), the population dataset used for deriving the baseline figures will be used consistently for all calculation years.

13.9 Residual Effects and Summary

13.9.1 The commonly accepted metrics for assessing air noise all relate to external noise levels. Therefore the assessment of effects presented in Section 13.7 do not allow for any benefit of the residential sound insulation schemes, as this reduces the internal noise level. However, the internal noise level is more representative of the effects, in particular for night noise which is the main focus of this application as most people would be expected to be indoors.

13.9.2 Therefore, in order to assess the residual effects, the benefit of the residential sound insulation schemes has been allowed for by considering a residual effective noise level for properties with sound insulation, being 5 dB(A) lower than the modelled noise level.

13.9.3 Dwellings eligible for the existing schemes in a given scenario have been considered here as having a reduction of 5 dB for both their L_{den} and the L_{night} exposure, on the basis that the existing schemes offer to insulate the whole property.

13.9.4 Dwellings not eligible for the existing schemes, but eligible for the new scheme proposed as part of this application, have been considered here as having a reduction of 5 dB for their L_{night} exposure, and a reduction of 5 dB for the night component of their L_{den} exposure, on the basis that the new scheme is intended to cover insulation of bedrooms.

13.9.5 The assumed 5 dB(A) reduction is based on testing carried out in a sample of the properties treated under the existing scheme.

13.9.6 This residual effective noise level has then been used to determine residual effects, following the same methodology as the assessment of effects in Section 13.7.

13.9.7 Allowing for the benefit of the residential sound insulation schemes in general reduces the number of people assessed with residual significant adverse effects and in some cases increases the number of people assessed with residual significant beneficial effects. This analysis does result in an anomaly for some people who have already benefitted from the existing insulation scheme, where allowing for the insulation scheme reduces an assessed significant beneficial effect in Section 13.7 to a residual not significant beneficial effect in the table below. This is because at lower noise levels a larger change is required to be considered significant, although in practice the people still experience the same reduction in noise but from a lower initial level. This anomaly only occurs in the Assessment Year of 2022 and is estimated to affect fewer than 100 people which is a very small proportion of those being assessed.

Residual Effects

13.9.8 The residual effects, after the benefit of the residential sound insulation schemes has been allowed for, are summarised in Table 13-64. The table includes all people in existing residential receptors who are exposed to at least 45 dB L_{den} or 40 dB L_{night} in at least one of the scenarios.

Table 13-64: Summary of Residual Air Noise Effects, Proposed vs Permitted

Year	L_{den} Residual Effects			L_{night} Residual Effects		
	Significant Beneficial	Significant Adverse	Not Significant	Significant Beneficial	Significant Adverse	Not Significant
2022	79	10	368,727	151	8,985	166,605

2025	8	54	511,742	86	10,560	257,813
2035	0	20	255,657	12	4,284	131,432

13.9.9 Considering the Assessment Year of 2022, the residual effects of the Proposed Scenario when compared to the Permitted Scenario are a net significant beneficial effect for 69 people in terms of the L_{den} metric and a net significant adverse effect for 8,834 people in terms of the L_{night} metric.

13.9.10 Considering the Assessment Year of 2025, the residual effects of the Proposed Scenario when compared to the Permitted Scenario are a net significant adverse effect for 46 people in terms of the L_{den} metric and a net significant adverse effect for 10,474 people in terms of the L_{night} metric.

13.9.11 Considering the Assessment Year of 2035, the residual effects of the Proposed Scenario when compared to the Permitted Scenario are a net significant adverse effect for 20 people in terms of the L_{den} metric and a net significant adverse effect for 4,272 people in terms of the L_{night} metric.

13.9.12 Using a similar method to calculate the residual effects, the number of people exposed to residual noise levels assessed as high or very high can be calculated. These are presented in Table 13-65.

Table 13-65: Summary of People Exposed to High Residual Noise Levels

Scenario	No. People Exposed to High or Very High Residual L_{den} Noise Level	No. People Exposed to High or Very High Residual L_{night} Noise Level
2022 Permitted	13	28
2022 Proposed	23	45
2025 Permitted	19	64
2025 Proposed	32	56
2035 Permitted	6	23
2035 Proposed	6	38

13.9.13 Considering the L_{den} results, the number of people exposed to a high residual noise level is under 100 for the Permitted Scenario and the Proposed Scenario in all Assessment Years. The number of people so exposed in the Proposed Scenarios is the same or higher than the Permitted Scenarios for the same Assessment Year.

13.9.14 Considering the L_{night} results, the number of people exposed to a high residual noise level is under 100 for the Permitted Scenario and the Proposed Scenario in all Assessment Years. The number of people so exposed in the Proposed Scenarios is higher than the Permitted Scenarios for the same Assessment Year in 2022 and 2035, but in 2025 is lower than in the Permitted Scenario. This is due to the proposed new sound insulation scheme.

Summary

13.9.15 The assessment in this chapter presents the likely significant effects from air noise and vibration from aircraft as a result of the proposed Relevant Action.

13.9.16 Taking first the vibration assessment, no significant effects were found as a result of the proposed Relevant Action.

13.9.17 Considering the air noise, this chapter has considered Assessment Years of 2022, 2025 and 2035 and has compared the Proposed Scenarios with the Permitted Scenarios for each Assessment Year.

13.9.18 Two primary assessment metrics have been considered, one relating to the overall situation (L_{den}) and the other just to the situation at night (L_{night}). For each of these metrics the number of people exposed to various noise levels have been determined for each assessment scenario. From these the number of people predicted to be highly annoyed and highly sleep disturbed have been computed.

13.9.19 An assessment of significant effects has also been carried out based on the comparison between the Permitted Scenario and the Proposed Scenario for each Assessment Year. This takes into account the change in noise level for individual receptors and their resulting noise exposure.

13.9.20 Looking at the predicted number of people highly annoyed, in the 2022 Proposed Scenario this is 4% higher than the 2022 Permitted Scenario. In the 2025 Proposed Scenario it is predicted to be 24% higher than the 2025 Permitted Scenario. In the 2035 Proposed Scenario it is predicted to be 19% higher than the 2035 Permitted Scenario. For context the 2025 Proposed Scenario, which has the greatest number of people predicted to be highly annoyed of all the future scenarios, still represents a reduction of 28% compared to the number of people assessed as highly annoyed in 2018.

13.9.21 Looking at the predicted number of people highly sleep disturbed, in the 2022 Proposed Scenario this is 2% higher than the 2022 Permitted Scenario. In the 2025 Proposed Scenario it is predicted to be 65% higher than the 2025 Permitted Scenario. In the 2035 Proposed Scenario it is predicted to be 65% higher than the 2035 Permitted Scenario. For context the 2025 Proposed Scenario, which has the greatest number of people predicted to be highly sleep disturbed of all the future scenarios, still represents a reduction of 12% compared to the number of people assessed as highly sleep disturbed in 2018.

13.9.22 Looking at the number of people with significant residual effects after the proposed mitigation measures, firstly considering the overall situation (L_{den} metric), there is a forecast net significant beneficial effect when comparing the 2022 Proposed Scenario with the 2022 Permitted Scenario, and a forecast net significant adverse effect when doing a similar comparison for 2025 or 2035. In all three years the number of people experiencing significant residual effects (beneficial or adverse) based on the L_{den} metric is under 100.

13.9.23 Considering the night situation (L_{night} metric), in the Proposed Scenarios there is a forecast net significant adverse effect when compared with the corresponding Permitted Scenarios for all Assessment Years. In 2022 this net significant adverse effect is for around 9,000 people, in 2025 around 10,000 people, and in 2035 around 4,000 people. Although they are forecast to experience higher noise levels in the Proposed Scenario compared to the Permitted Scenario, for the majority of these people the resulting noise levels are low or very low. These totals are based on people living in existing dwellings, i.e. they do not include consented developments that have not yet been built.

13.9.24 Finally looking at non-residential receptors, no significant effects were found as a result of the proposed Relevant Action.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections, including minor removals from and additions to the earlier text, the chapter has been revised to:

- Address additional assessment years requested by the Council
- Respond to the latest passenger growth forecasts at Dublin Airport

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

14. Ground Noise and Vibration

14.1 Introduction

14.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) reports the findings of an assessment of the likely significant effects from ground noise and vibration as a result of the proposed Relevant Action, which is described in *Chapter 2: Characteristics of the Project*. Ground noise in this context encompasses aircraft ground noise, i.e. noise associated with aircraft activity on the ground, as well as road traffic noise.

14.1.2 This assessment and EIAR chapter have been produced by Bickerdike Allen Partners LLP (BAP), with road traffic noise predictions provided by AECOM.

14.1.3 The focus of this chapter is aircraft ground noise. This excludes any start of roll or reverse thrust activities, which are considered to be part of the air noise and covered in *Chapter 13: Aircraft Noise and Vibration*. The key aircraft ground operations are aircraft taxiing and aircraft using Auxiliary Power Units (APUs) when on stands.

14.1.4 Aircraft ground operations do not typically produce any significant vibration effects at sensitive receptors outside of the airport site, and the assessment of vibration due to aircraft ground operations does not need further assessment.

14.1.5 This chapter considers the Current State of the Environment and the Future Receiving Environment in the Permitted, Proposed and Apron 5H Scenarios for the Assessment Years of 2022, 2025 and 2035. The Permitted and Proposed Scenarios are described in *Chapter 1: Introduction*. The Apron 5H Scenario relates to a separate planning application (Ref: F20A/0550), which seeks to develop Apron 5H in the north-east of the airport site and would result in 12 aircraft stands being located there. This has been assessed in conjunction with the Proposed Scenario. Given the Apron 5H application is also considered in *Chapter 21: Interactions and Cumulative Effects* which consider the wider cumulative impact this is considered a particularly rigorous approach but one that is appropriate given the nature of the Relevant Action.

14.1.6 An assessment of road traffic noise effects and a cumulative assessment of all noise impacts from the proposed Relevant Action are also included in this chapter and additionally considered in *Chapter 21: Interactions and Cumulative Effects*. The changes to road traffic flows are discussed in more detail in *Chapter 9: Traffic and Transport*.

14.2 Legislation and Planning Policy Context

14.2.1 The Environmental Impact Assessment (EIA) process is described in *Chapter 1: Introduction*.

14.2.2 *Chapter 6: Planning and Development Context* sets out the legislative and planning policy context for the proposed Relevant Action. It includes reference to relevant national and local planning policies, including those that have been considered when determining the EIAR scope, method and mitigation. Those considered relevant to this chapter are summarised below with additional material also considered relevant. More detail on this additional material, and selected policies included in Chapter 6, is given in Appendix 14A.

Strategic Planning Context

14.2.3 The Applicant has a number of obligations to fulfil with regard to the management of Dublin Airport which are described in Chapter 6. The following regulations are relevant to noise:

- S.I. No 549/2018 – Environmental Noise Regulations 2018[1]

[1] Government of Ireland (2018). S.I. No. 549/2018 - European Communities (Environmental Noise) Regulations 2018, [Online]. Available at: http://www.irishstatutebook.ie/eli/2018/si/549/made/en/ [Checked 10/08/2021]

- Aircraft Noise (Dublin Airport) Regulation Act 2019 (the Aircraft Noise Act)[2]

14.2.4 The last of these implements European Union (EU) Regulation 598/2014[3] on the establishment of rules and procedures with regard to the introduction of noise related operating restrictions at EU airports within the ICAO Balanced Approach[4]. Further details of this regulation, and the two listed above are contained in Appendix 14A.

National Planning Policy

14.2.5 National planning policy which is relevant to the proposed Relevant Action is described in Chapter 6.

Local Planning Policy

14.2.6 Local planning policy which is relevant to the proposed Relevant Action is described in Chapter 6. The following policy documents are relevant to noise and are discussed further in Section 14.6.

- Fingal Development Plan 2017-2023;[5]
- Dublin Airport Local Area Plan (2020);[6] and
- Noise Action Plan for Dublin Airport (2019-2023).[7]

International Policy, Standards and Guidance

14.2.7 The following international policies, standards and guidance documents are considered relevant to this assessment. More detail is given in Appendix 14A.

- ICAO Convention on International Civil Aviation, Annex 16, Volume 1;[8]
- Environmental Noise Directive 2002/49/EC;[9]
- EU Commission Directive 2020/367;[10]
- WHO Guidelines for Community Noise (1999);[11]
- WHO Night Noise Guidelines for Europe (2009);[12]

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[2] Government of Ireland (2019). Aircraft Noise (Dublin Airport) Regulation Act 2019, [Online]. Available at: http://www.irishstatutebook.ie/eli/2019/act/12/enacted/en/html [Checked 10/08/2021]

[3] European Commission (2014). Regulation (EU) No 598/2014 of the European Parliament and of the Council of 16 April 2014 on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports within a Balanced Approach and repealing Directive 2002/30/EC, [Online]. Available at: https://eur-lex.europa.eu/eli/reg/2014/598/oj [Checked 10/08/2021]

[4] ICAO (2010). Doc 9829 Guidance on the Balanced Approach to Aircraft Noise Management, ICAO

[5] Fingal County Council (2017). Fingal Development Plan 2017-2023, [Online]. Available at: https://www.fingal.ie/fingal-development-plan-2017-2023 [Checked 10/08/2021]

[6] Fingal County Council (2020). Dublin Airport Local Area Plan, [Online]. Available at: https://www.fingal.ie/sites/default/files/2020-01/dublin-airport-lap-2020.pdf [Checked 10/08/2021]

[7] Fingal County Council (2019). Noise Action Plan for Dublin Airport 2019-2023, [Online]. Available at: https://www.fingal.ie/sites/default/files/2019-04/NAP%20Final.pdf [Checked 10/08/2021]

[8] ICAO (2014). Annex 16 to the Convention on International Civil Aviation, Environmental Protection, Volume 1 Aircraft Noise, 7th Edition, ICAO

[9] European Commission (2002). Directive 2002/49/EC Directive of the European Parliament and of the Council of 25th June 2002 relating to the assessment and management of environmental noise, [Online]. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0049&from=EN [Checked 10/08/2021]

[10] European Commission (2020). Commission Directive (EU) 2020/367 of 4 March 2020 amending Annex III to Directive 2002/49/EC of the European Parliament and of the Council as regards the establishment of assessment methods for harmful effects of environmental noise (Text with EEA relevance), [Online]. Available at: https://eur-lex.europa.eu/eli/dir/2020/367/oj [Checked 12/08/2021]

[11] Berglund, B. et al (1999). Guidelines for community noise, [Online]. Available at: http://apps.who.int/iris/bitstream/handle/10665/66217/a68672.pdf?sequence=1&isAllowed=y [Checked 10/08/2021]

[12] World Health Organisation Europe (2009). Night Noise Guidelines for Europe, [Online]. Available at: http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf [Checked 10/08/2021]

- WHO Environmental Noise Guidelines for the European Region (2018);[13] and
- ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.[14]

Relevant UK Policy, Standards and Guidance

14.2.8 The National and International Policy, Standards and Guidance described above set out the overall approach, and much of the subsequent detail required to implement it. There are however some areas where additional information is considered beneficial, such as in relation to the significance of particular noise levels and criteria for particular types of buildings.

14.2.9 To provide this, information has been taken from the following UK policies, standards and guidance documents are considered relevant to this assessment. More detail is given in Appendix 14A.

- Noise Policy Statement for England (2010);[15]
- UK Aviation Policy Framework (2013);[16]
- BS 8233:2014 Sound insulation and noise reduction in buildings – code of practice;[17]
- Department of Education - Acoustic design of schools: performance standards BB93 (2015);[18]
- Department of Health - Specialist Services, Health Technical Memorandum 08-01: Acoustics (2013);[19]
- CAP1616a Airspace Change: Environmental requirements technical annex;[20] and
- BS7445 Description and measurement of environmental noise.[21]

14.3 Assessment Methodology

14.3.1 This section describes the approach to the ground noise assessment and covers the methodology, terminology and significance criteria used.

14.3.2 Key sources of information that have been utilised for this assessment are:

- The physical location of the airport, in particular the runways, taxiways and stands (taken from the Aeronautical Information Package (AIP) for Dublin Airport);

[13] World Health Organization Regional Office for Europe (2018). Environmental Noise Guidelines for the European Region, [Online]. Available at: http://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf [Checked 10/08/2021]
[14] International Organization for Standardization (1996). ISO 9613 Acoustics — Attenuation of sound during propagation outdoors, [Online]. Available at: https://www.iso.org/ics/17.140.01/x/ [Checked 10/08/2021]
[15] Defra (2010). Noise Policy Statement for England, [Online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf [Checked 10/08/2021]
[16] UK Department for Transport (2013). Aviation Policy Framework, [Online]. Available at: https://www.gov.uk/government/publications/aviation-policy-framework [Checked 10/08/2021]
[17] British Standards Institution (2014). BS 8233:2014 Sound insulation and noise reduction for buildings – Code of practice, [Online]. Available at: https://shop.bsigroup.com/ProductDetail/?pid=000000000030241579 [Checked 10/08/2021]
[18] UK Department of Education (2015). BB93: acoustic design of schools – performance standards, [Online]. Available at: https://www.gov.uk/government/publications/bb93-acoustic-design-of-schools-performance-standards [Checked 10/08/2021]
[19] UK Department of Health (2013). Specialist Services, Health Technical Memorandum 08-01: Acoustics, [Online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/144248/HTM_08-01.pdf [Checked 10/08/2021]
[20] Civil Aviation Authority (2020). CAP1616a: Airspace Change: Environmental requirements technical annex, [Online]. Available at: https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8128 [Checked 10/08/2021]
[21] British Standards Institution (2003). BS 7445:2003 Description and measurement of environmental noise [Online]. Available at: https://shop.bsigroup.com/ProductDetail?pid=000000000030098820 [Checked 10/08/2021]

- The number of flights in each relevant assessment period, including their aircraft type, operation, and destination. This has been supplied by the Applicant for both actual (e.g. 2018) and air traffic movement forecasts (these forecasts prepared by Mott Macdonald); and
- The road traffic flows on a network of roads around the airport (provided by AECOM).

Ground Noise Modelling Methodology

14.3.3 The assessment of ground noise relies heavily on the modelling of noise levels. This has been carried out using the CadnaA noise modelling software produced by Datakustik. This industry standard software uses the methodology set out in ISO 9613-2:1996[22] to produce noise contours and to predict noise levels at specific locations. Details of the modelling methodology are given in Appendix 14B.

14.3.4 The ground operations associated with all aircraft taking off from or landing at Dublin Airport, with the exception of helicopter and military aircraft, have been assessed. Operations by helicopter and military aircraft make up a small proportion of the total and are not able to be assessed to the same level of accuracy. In 2018 there were 820 operations by helicopters and 2 operations by military aircraft, making up 0.4% of the annual total of aircraft movements. Their inclusion would have a negligible effect on the findings of this assessment.

14.3.5 The road traffic flows on a network of roads around the airport have been assessed. These flows comprise varying amounts of airport related traffic but in each case the total traffic is considered. Additional details of the modelling methodology relating to the road traffic noise assessment are given in Appendix 14F.

Primary Assessment Metrics

14.3.6 There are various noise metrics available for the assessment of aircraft ground noise. These are described in detail in Appendix 14A.

14.3.7 Aircraft ground noise has historically been assessed using different metrics and criteria depending on the application. It is, however, common for aircraft ground noise at busy airports such as Dublin Airport to be assessed using a metric based on L_{Aeq}, i.e. one that averages the noise energy over a defined time period and that accounts for the number, duration and noise level of aircraft ground operations over a typical day. For example many assessments at UK airports in recent years have used the L_{Aeq} metric, such as London Heathrow, London Stansted, Leeds Bradford, and Bristol. Adopted aircraft ground noise thresholds are typically not dissimilar from those used for air noise, and therefore the metrics used here mirror those that have been used for the air noise assessment in *Chapter 13: Aircraft Noise and Vibration*:

- L_{den}, which takes into account the annual activity throughout the 24-hour period, with a 5 dB penalty applied to noise in the evening (19:00-23:00) period and a 10 dB penalty applied to noise in the night (23:00-07:00) period. The key effect linked with this metric is annoyance; and
- L_{night}, which takes into account the annual activity during the night (23:00-07:00) period. The key effect linked with this metric is sleep disturbance.

14.3.8 The noise produced by road traffic has also been produced in these metrics. This is the same approach as used for the modelling undertaken to comply with the Environmental Noise Directive 2002/49/EC and reported in the Dublin Agglomeration Environmental Noise Action Plan December 2018 – July 2023[23].

14.3.9 The number of people 'highly sleep disturbed' and 'highly annoyed' by road traffic noise has also been predicted in accordance with the method set out in the World Health Organisation's Environmental Noise Guidelines 2018 as endorsed by the European Commission through Directive 2020/367. These metrics aim to give an overall picture of the noise exposure by assessing a percentage chance of people being

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[22] International Organization for Standardization (1996). ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation, [Online]. Available at: https://www.iso.org/standard/20649.html [Checked 10/08/2021].

[23] Dublin Agglomeration Action Plan Relating to The Assessment and Management of Environmental Noise December 2018 – July 2023 https://www.dublincity.ie/sites/default/files/2021-04/dcc-volume-1-dublin-agglomeration-noise-action-plan-dec-2018_july2023.pdf [Checked 10/08/21]

highly annoyed or highly sleep disturbed at different noise levels. For example, the association in the WHO Guidelines has around 8% of people assessed as being highly annoyed at a noise level of 45 dB L_{den}, increasing to around 28% of people at a noise level of 70 dB L_{den}.

14.3.10 This chapter does not assign significance to these results as there is not published guidance regarding significance thresholds for a collective community-level assessment. On an individual level however, high annoyance and high sleep disturbance is considered harmful to health, as outlined in EU Directive 2020/367.

Supplementary Noise Metrics

14.3.11 In some other jurisdictions, particularly the UK, aircraft ground noise is often assessed in terms of the $L_{Aeq,16h}$ metric for the daytime (07:00-23:00) period and the $L_{Aeq,8h}$ metric for the night-time (23:00-07:00) period. These periods relate to an average summer day. Summer in this instance is defined as the 92-day period between 16 June and 15 September inclusive. Noise contours and population assessments have also been carried out using these metrics.

14.3.12 For air noise it is common to utilise a number of additional supplementary metrics in order to fully describe the nature of the noise and its effects on the community. Compared to noise produced by airborne aircraft, aircraft ground noise is characterised by steady noise at a lower level but with a longer duration and, as a result, the metrics based on L_{Aeq} are considered sufficient for ground noise. Single noise events are not typically a concern, although to provide additional information details of the diurnal pattern of noise from ground operations during the night have been provided.

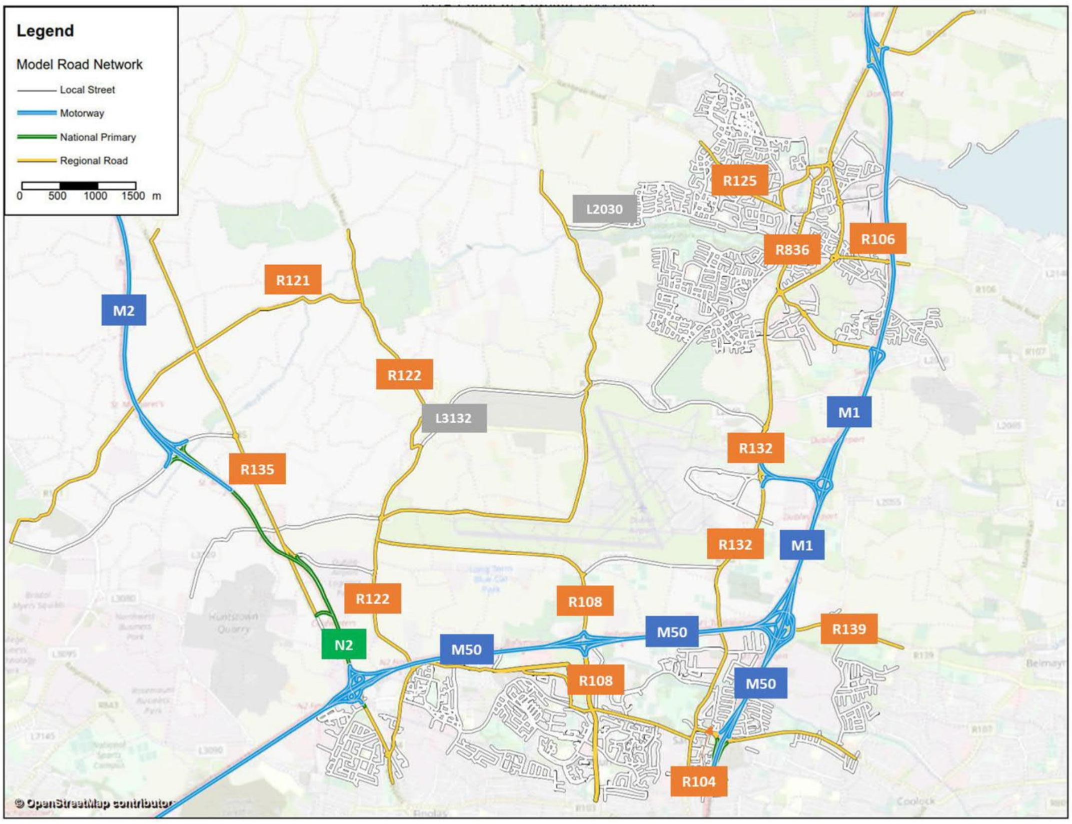
14.3.13 The exception to this is when high power engine running is carried out for testing and maintenance. When engines are run at high power, this can cause very high noise levels near the test location. However, historically at Dublin Airport this occurs no more than 1-2 times per day on average, only during daytime hours and is only permitted at a designated location, away from populated neighbouring areas. The noise from engine testing is considered negligible in the context of the overall airport ground noise and there is no expectation that this would change due to the proposed Relevant Action. Therefore it has not been included as part of this assessment.

Methodology for Determining Sensitive Receptors

14.3.14 The study area for aircraft ground noise is contained within a rectangle that extends approximately 3.5 km to the west, 5 km to the east, 4.5 km to the north and 3 km to the south of the centre of the existing main runway at Dublin Airport. The study area contains all receptors exposed to ground noise levels of at least 50 dB L_{den} or 45 dB L_{night}. This includes all of the receptors that have the potential to experience significant effects. Although significant effects can in theory be found down to 45 dB L_{den} and 40 dB L_{night}, the change in noise level required for this finding was not experienced at any of the assessed receptors.

14.3.15 The study area for the assessment of road traffic noise is the same as that for aircraft ground noise. This is illustrated in Plate 14-1 which also illustrates the road links included in the modelling. These links are the main roads in the area such as the motorways, and so do not include the majority of residential streets where no change to the flows due to the Relevant Action are expected.

Plate 14-1: Road Traffic Noise Study Area and Modelled Road Links



14.3.16 The following have been considered as potential receptors of high sensitivity for this assessment:

- Dwellings;
- Schools;
- Residential healthcare facilities; and
- Places of worship.

14.3.17 Receptors with a lower sensitivity to noise, such as offices and hotels, have not been considered as part of this assessment.

14.3.18 The assessment of dwellings includes an allowance for those which are consented but not yet constructed. These have been presented separately to the totals for existing dwellings.

Methodology for Determining Construction Effects

14.3.19 As the proposed Relevant Action will result in no changes to the design or construction of the North Runway, or any other part of Dublin Airport, there will be no physical changes in any part of the airport or its surroundings. As a result, the proposed Relevant Action will not result in any new effects on the noise environment arising from construction, and further assessment is therefore not required.

Methodology for Determining Operational Effects

14.3.20 The Regulation 598 assessment considered a number of different options for the use of the runway system at night. The resulting preferred option, presented in this EIAR as the Proposed Scenario, is described in *Chapter 1: Introduction*.

14.3.21 The effects of the Proposed Scenario are determined by comparison with the Permitted Scenario for the relevant Assessment Year. The Permitted Scenario represents the situation if the proposed Relevant Action is not consented and is also described in *Chapter 1: Introduction*.

14.3.22 The effects of a separate planning application that seeks to develop 12 aircraft stands 'Apron 5H' in the north east of the airport site have also been considered cumulatively with the Proposed Scenario. That application, if successful, would not result in any change to the number of aircraft operations, but would re-distribute some of them to the Apron 5H stands. In general, this would result in a small increase in noise levels for receptors to the north of the airport, and a small decrease for receptors to the south. Where the Proposed Scenario has been assessed with this change also in place, it is referred to as the Apron 5H Scenario.

14.3.23 The Permitted, Proposed and Apron 5H Scenarios are examined in the Assessment Years 2022, 2025 and 2035.

14.3.24 The general assessment methodology involves the following:

- Derivation of assessment criteria;
- Computation of existing and future noise levels under the scenarios and Assessment Years described above;
- Assessment of magnitude of impacts (absolute) on sensitive receptors, for each scenario;
- Determination of the change in noise levels, and associated impacts (relative) as a result of the proposed Relevant Action;
- Consideration of the likely significant effects of the proposed Relevant Action, based on both the absolute and relative noise levels;
- Description of the potential effects (beneficial and adverse) associated with the proposed Relevant Action; and
- Description of any mitigation measures, where appropriate, in relation to the proposed Relevant Action and description of any residual effects.

Significance Criteria – Aircraft Ground Noise

14.3.25 The effects from aircraft ground noise are considered in terms of both the absolute noise level and the change in noise level due to the proposed Relevant Action to determine their significance. Both need to be considered to determine whether a significant effect arises from the proposed Relevant Action in an EIA context; for example if a receptor experiences a high absolute noise level but no change due to the proposed Relevant Action then this is not a significant effect. Equally if a receptor experiences a large change in noise level but the resulting level is still very low then this receptor is not considered to be significantly affected.

Residential Receptors

14.3.26 Absolute noise impact criteria for residential receptors have been developed against an effect scale and are given in Table 14-1. The derivation of these is discussed in Appendix 14A.

Table 14-1: Aircraft Ground Noise Impact Criteria (Absolute) – Residential

Scale Description	Annual dB L_{den}	Annual dB L_{night}
Negligible	<45	<40
Very Low	45 – 49.9	40 – 44.9
Low	50 – 54.9	45 – 49.9
Medium	55 – 64.9	50 – 54.9
High	65 – 69.9	55 – 59.9
Very High	≥70	≥60

14.3.27 The effect scale used to assess the change in noise level is given in Table 14-2. A semantic scale of this type, following the format of examples given in the Institute of Environmental Management and Assessment (IEMA[24]) guidelines, has been applied in previous air noise assessments and accepted in

[24] Institute of Environmental Management and Assessment (2014). Guidelines for Environmental Noise Impact Assessment. London: IEMA.

Public Inquiries for airport developments in the UK and Ireland, for example the application for the North Runway at Dublin Airport. The thresholds are derived from the difference contour bands recommended in CAP1616a[25].

Table 14-2: Aircraft Ground Noise Impact Criteria (Relative)

Scale Description	Change in noise level, dB(A)
Negligible	0 – 0.9
Very Low	1 – 1-9
Low	2 – 2.9
Medium	3 – 5.9
High	6 – 8.9
Very High	≥9

14.3.28 The effect of a change in noise level tends to increase with the absolute level of noise experienced at a receptor. If, for example, the night-time noise level at a dwelling were to change from 45 dB to 50 dB L_{night}, the overall effect for the occupants would be less than if the night-time noise level were to increase by the same amount from 55 dB to 60 dB L_{night}.

14.3.29 There is no clearly accepted method of how to rate the magnitude of the effect of a change in ground noise level and the associated absolute noise level. Some guidance, however, is provided in the UK's Planning Practice Guidance (PPG[26]) which states:

14.3.30 *"In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise may result in a significant adverse effect occurring even though little or no change in behaviour would be likely to occur."*

14.3.31 The magnitude of an effect from changing between one scenario and another (i.e. Permitted Scenario to Proposed Scenario) has been established by considering both the absolute noise level in the higher of the two scenarios and the relative change in noise level that occurs at a given receptor.

14.3.32 Table 14-3 shows how the absolute and relative impacts are interpreted into magnitude of effect. This takes into account the criteria presented above, other guidance and professional judgement. The effect rating scale is taken from the Environmental Protection Agency (EPA) Draft EIAR Guidelines[27].

Table 14-3: Summary of Magnitude of Effect – Aircraft Ground Noise

Absolute Noise Level Rating	Change in Noise Level Rating					
	Negligible	Very Low	Low	Medium	High	Very High
Negligible	Imperceptible	Imperceptible	Imperceptible	Not Significant	Slight	Moderate
Very Low	Imperceptible	Imperceptible	Not Significant	Slight	Moderate	Significant
Low	Imperceptible	Not Significant	Slight	Moderate	Significant	Significant
Medium	Not Significant	Slight	Moderate	Significant	Significant	Very Significant
High	Slight	Moderate	Significant	Significant	Very Significant	Profound
Very High	Moderate	Significant	Significant	Very Significant	Profound	Profound

14.3.33 A potential significant effect (adverse or beneficial) would be considered to arise if in Table 14-3 the magnitude of the effect was rated as significant or higher.

[25] Civil Aviation Authority (2020). CAP 1616a Airspace Change: Environmental requirements technical annex https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8128 [Checked 12/08/2021]
[26] Ministry of Housing, Communities & Local Government, Planning practice guidance Noise (2019) https://www.gov.uk/guidance/noise--2 [Checked 12/08/2021]
[27] Environmental Protection Agency (2017). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, [Online]. Available at: https://www.epa.ie/publications/monitoring--assessment/assessment/draft-guidelines-on-the-information-to-be-contained-in-environmental-impact-asse.php [Checked 10/08/2021]

Non-Residential Receptors

14.3.34 For receptors other than dwellings, absolute levels rated as medium have been derived from the relevant guidance documents, as described in Appendix 14A. These are given in Table 14-4. The impact on each non-residential receptor has been rated as significant if the absolute noise level is above this threshold and the change in noise level is also rated medium or higher, i.e. at least 3 dB(A).

Table 14-4: Aircraft Ground Noise Impact Criteria (Absolute) – Non-Residential

Receptor Type	Threshold for Medium Absolute Effect
Schools (08:00-16:00)	55 dB $L_{Aeq,30m}$ (approx. 55 dB L_{den})
Residential Healthcare Facilities – Day (07:00-23:00)	55 dB $L_{Aeq,1h}$ (approx. 55 dB L_{den})
Residential Healthcare Facilities – Night (23:00-07:00)	50 dB $L_{Aeq,1h}$ (approx. 45 dB L_{night})
Places of Worship	55 dB L_{den}

Significance Criteria – Road Traffic Noise

14.3.35 For the ground noise effects from road traffic noise a full set of significance criteria have not been developed as the initial work indicated that the resulting changes would be limited.

14.3.36 The criteria utilised has been that changes of less than 1 dB are negligible and do not give rise to significant effects. This is consistent with the other sources of noise considered, and also with the guidance in the UK's Design Manual for Road and Bridges[28]. That document sets out the magnitude of changes, with short term changes of less than 1.0 dB described as negligible, over the long term changes of less than 3.0 dB are described as negligible. It goes on to state that *where the magnitude of change in the short term is negligible at noise sensitive buildings, it shall be concluded that the noise change will not cause changes to behaviour or response to noise and as such, will not give rise to a likely significant effect*.

14.3.37 Consideration has also been limited to residential receptors, which are the most numerous and are considered the most noise sensitive. They also cover a larger area, so if there are no significant effects for them it is not expected there will be for any non-residential receptors.

Consultation

14.3.38 *Chapter 5: Consultation* details the consultation on this application.

Limitations and Assumptions

14.3.39 Planned background noise surveys have been hampered by the Covid-19 pandemic, which means that even if measurements were taken at this time, the ambient conditions may not currently be representative. A detailed survey was carried out in 2016. In any event, the ground noise assessment criteria are dependent on the absolute levels from the aircraft and road traffic rather than the background noise.

14.3.40 There is always some uncertainty associated with forecasting future aircraft traffic, and this has been increased by the Covid-19 pandemic, particularly in the short term. It is currently expected that a throughput of 32 mppa will be reached in 2025 under the Proposed Scenario.

14.3.41 Some aircraft in the forecasts are either not currently in service or have limited noise data available. Although there is some data that suggests newer aircraft types will perform similarly or slightly better than those they replace, a conservative assumption of no improvement over current aircraft types has been made.

14.3.42 Although a number of aircraft using Dublin Airport use Fixed Electrical Ground Power (FEGP) rather than the noisier Auxiliary Power Units (APUs), data on the extent of FEGP use was not available. This

[28] Design Manual for Road and Bridges LA 111 Noise and vibration
https://www.standardsforhighways.co.uk/dmrb/search/cc8cfcf7-c235-4052-8d32-d5398796b364 [Checked 10/08/21]

ground noise assessment has taken a conservative assumption that all aircraft use APUs. In practice there is likely to be significant use of FEGP at some stands in all assessment years which will lead to lower noise levels than assessed here.

14.3.43 In addition to ‘high annoyance’ and ‘high sleep disturbance’ EU Directive 2020/367 lists ischaemic heart disease (IHD) as a harmful effect that should be considered and provides a calculation procedure to estimate the number of cases based on the road traffic noise level. This calculation has not been carried out due to the focus of the assessment being the aircraft ground noise effects and the limited changes to the road traffic noise levels.

14.4 Current State of the Environment

14.4.1 This section describes the current state of the environment in the vicinity of Dublin Airport. In view of the location of the airport, the surrounding community is affected primarily by noise from the local road network and airport operations.

14.4.2 This assessment of the current state of the environment relates to the long-term situation and considers the noise levels prior to the onset of the Covid-19 pandemic, and utilises field studies undertaken in 2016 and 2019. Due to the ongoing pandemic the noise conditions at the present time are likely to differ but this effect is expected to be temporary, although the precise timescale is uncertain.

14.4.3 Noise surveys were carried out in 2016 at key receptor positions around Dublin Airport to establish the prevailing ambient and background noise conditions during both the daytime and night-time. Additionally, an attended survey of aircraft taxi operations was undertaken in 2019 to measure aircraft taxi noise levels for use in the modelling of current and future ground noise scenarios. These surveys are summarised in this section and reported in more detail in Appendix 14D.

14.4.4 Aircraft ground noise levels have been modelled for 2018. The primary assessment metrics are presented later in this section, and the supplementary metrics are presented in Appendix 14C.

14.4.5 Road traffic noise levels have been modelled for 2018 based on actual recorded flows from Transport Infrastructure Ireland (TII) permanent traffic counters, as well as survey flows from 2019, factored to reflect observed differences between 2018 and 2019 flows at relevant adjacent TII count sites. The primary assessment metrics are presented later in this section.

Noise Surveys

Methodology

14.4.6 The survey work described here comprises three discrete elements: long- and short-term surveys undertaken by AWN Consulting Ltd in 2016, and an aircraft taxi noise survey undertaken by BAP in 2019. These surveys are reported in more detail in Appendix 14D.

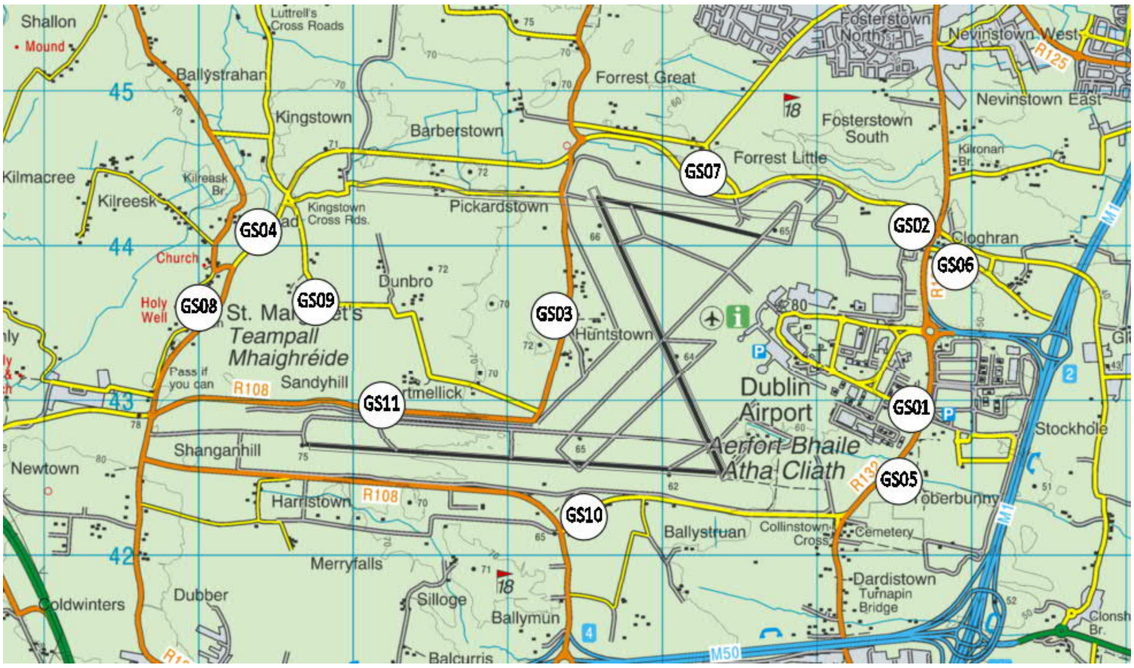
14.4.7 The survey locations and dates are summarised in Table 14-5 and illustrated in Plate 14-2. Survey monitoring locations were selected to obtain representative ambient and background noise levels close to the airport. Because ground noise does not reach as far as air noise, the area covered is more focused compared to the air noise survey receptor set.

Table 14-5: Aircraft Ground Noise Survey Locations and Dates

Receptor	Survey	Location	Dates of Survey
GS01	Short-term	Cloughran House car park off the R132, E of airport	25/07/2016 - 28/07/2016
GS02	Short-term	Creche off Naul Road, NE of airport	25/07/2016 - 28/07/2016
GS03	Short-term	Residential properties on the R108, W of airport	25/07/2016 - 28/07/2016
GS04	Short-term	Field off the R122 at St. Margaret’s, W of airport	25/07/2016 - 28/07/2016
GS05	Long-term	daa owned site on the R132, SE of airport	02/08/2016 - 10/08/2016
GS06	Long-term	daa owned site on Old Stockhole Lane, NE of airport	02/08/2016 - 10/08/2016
GS07	Long-term	Field adjacent to Cooks Road and Forest Road, N of airport	24/08/2016 - 01/09/2016

Receptor	Survey	Location	Dates of Survey
GS08	Long-term	Field adjacent to St. Margaret's School, W of airport	28/07/2016 - 29/07/2016
GS09	Long-term	daa owned site on Dunbro lane, W of airport	10/08/2016 - 17/08/2016
GS10	Long-term	daa owned site on Old Airport Road, S of airport	11/08/2016 - 17/08/2016
GS11	Aircraft Taxi	Airport perimeter road, facing taxiways S5 and S6	02/10/2019

Plate 14-2: Ground Noise Survey Locations



14.4.8 Noise levels have been presented in terms of the $L_{Aeq,T}$ and $L_{AF90,T}$ metrics for the 16 hour daytime (07:00-23:00) and 8 hour night-time (23:00-07:00) periods.

14.4.9 $L_{Aeq,T}$ is commonly used to denote the ambient noise level and signifies the average noise level which is equivalent in energy terms to that produced by the various fluctuating noise levels that occur in the measurement period.

14.4.10 $L_{AF90,T}$ is commonly used to denote the prevailing background noise level and signifies the level of noise which is exceeded for 90% of the time.

14.4.11 For the aircraft taxi noise survey, both spectral and A-weighted $L_{eq,T}$ measurements were taken and used to estimate the sound power L_{WA} of each aircraft type. Each measurement typically lasted around 90 seconds and was taken at a fixed position on the airport perimeter road, approximately 70 m from the junction of taxiway S6 and taxiway S. This was the primary exit from the runway used by R28 arrivals on the day of the survey.

Results – Short-Term Noise Monitoring

14.4.12 A summary of average values for each measurement location is given in Table 14-6. Detailed results are provided in Appendix 14D.

Table 14-6: Short-Term Noise Monitoring Results Summary

Metric		Location			
		GS01	**GS02**	**GS03**	**GS04**
Daytime (07:00 to 23:00)	$L_{Aeq,T}$ (dB)	59	57	56	70
	L_{AF90} (dB)[1]	55	53	44	51
Night-time (23:00 to 07:00)	$L_{Aeq,T}$ (dB)	54	53	52	64
	L_{AF90} (dB)[1]	49	48	41	49

[1] Arithmetic average of $L_{AF90,15min}$ measurements

Results – Long-Term Noise Monitoring

14.4.13 A summary of average values for each measurement location is given in Table 14-7. Detailed results are provided in Appendix 14D.

14.4.14 The results indicate that the ambient noise level around Dublin Airport lies in the range of 50 to 70 dB $L_{Aeq,16h}$ during the daytime with an underlying background noise level in the range of 45 to 55 dB L_{AF90}. The wide range of ambient noise levels indicate that this is dependent on the proximity to local noise sources, for example airborne aircraft, road traffic, or schools.

14.4.15 During the night, ambient noise levels are generally around 3-5 dB lower than during the day and background noise levels are typically 5-10 dB quieter. Road traffic is again a factor, with roadside locations tending to have higher ambient noise levels.

Table 14-7: Long-Term Noise Monitoring Results Summary

Metric	Location					
	GS05	**GS06**	**GS07**	**GS08**	**GS09**	**GS10**
$L_{Aeq,16h}$ (dB)	71	53	58	65	59	66
$L_{AF90,day}$ (dB)[1]	50	49	52	51[2]	47	55
$L_{Aeq,8h}$ (dB)	68	50	56	57	54	63
$L_{AF90,night}$ (dB)[1]	45	45	48	38[2]	39	48

[1] Arithmetic average of $L_{AF90,15min}$ measurements

[2] Arithmetic average of $L_{AF90,5min}$ measurements

Results – Aircraft Taxi Noise Survey

14.4.16 The results of the aircraft taxi noise survey are summarised in Table 14-8 by aircraft type. Movements by Airbus A320 and Boeing 737-800 aircraft types constitute the bulk of operations at Dublin Airport, and this is reflected in the data.

Table 14-8: Location GS11, Aircraft Taxi Noise Survey Results by Aircraft Type

Aircraft Type	No. Measured	Sound Power, dB L_{WA}
Airbus A220	1	123
Airbus A320	14	128
Airbus A321	1	130
Airbus A330	2	135
Boeing 737-800	15	129

Aircraft Type	No. Measured	Sound Power, dB L_{WA}
Boeing 787	1	129
Embraer E190	1	127
Learjet 60	1	121

Noise Modelling L_{den} Metric – Aircraft Ground Noise

14.4.17 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. These are based on the actual aircraft movements in 2018.

14.4.18 The results are detailed below and are also presented in Appendix 14C along with the noise contours, and the results for the supplementary noise metrics.

14.4.19 The noise contours representing a high impact, 65 dB L_{den}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors. The noise contours representing a medium impact, 55 dB L_{den}, extend to the west to Shanganhill, to the north into Forrest Great, to the east just past the R132 and to the south up to the M50. The noise contours representing a low impact, 50 dB L_{den}, extend to the west to St. Margaret's, to the north into Ridgewood, to the east to Glebe and to the south just past the R104 into Santry. These contours can be seen in Figure 14C-1 (Appendix 14C).

14.4.20 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results for 2018 in terms of the L_{den} metric are given in Table 14-9.

Plate 14-3: Representative Location Points

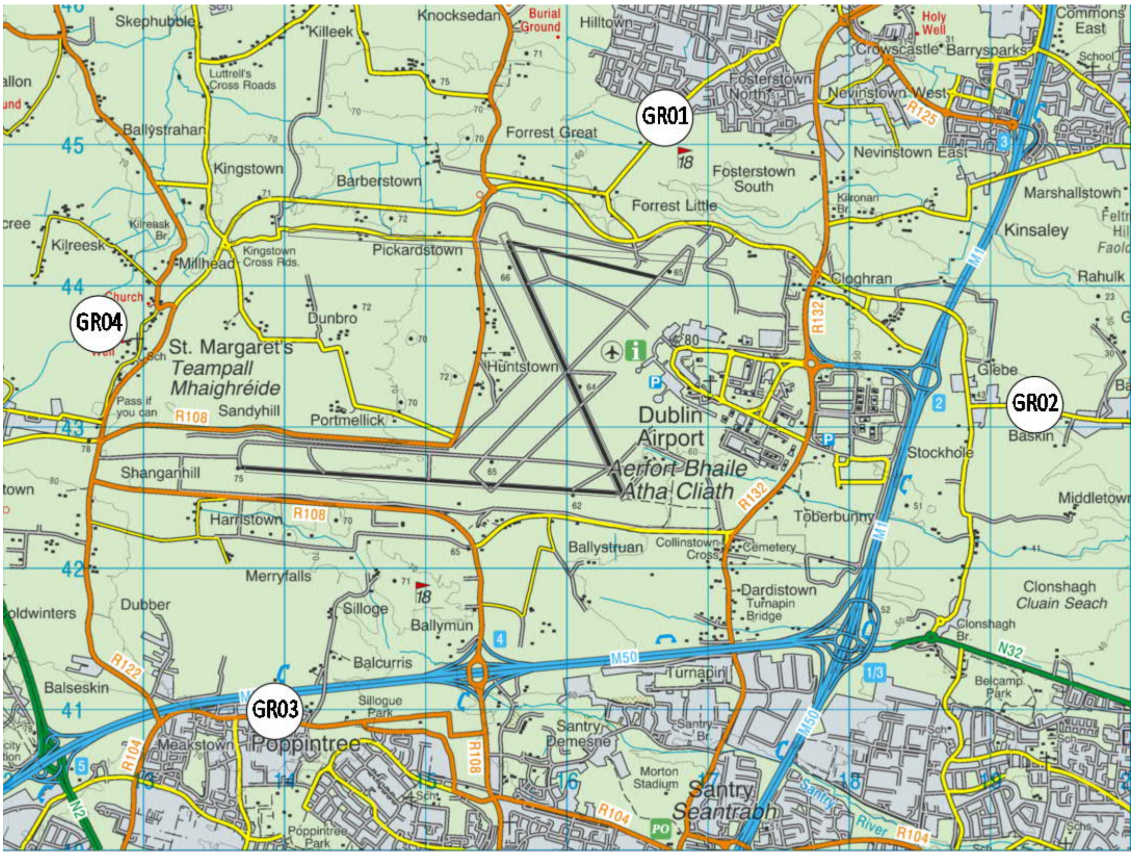


Table 14-9: 2018 Aircraft Ground Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	2018 Aircraft Ground Noise Level, dB (L_{den})
Ridgewood	GR01	53
The Baskins	GR02	47
Mayeston Hall	GR03	55
St Margret's	GR04	49
Note – noise levels rounded to nearest whole number.		

14.4.21 For each contour, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given in Table 14-10.

Table 14-10: Number of Dwellings and Population in 2018 Annual L_{den} Contours – Aircraft Ground Noise

Scenario	2018			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	8,100	22,614	8,632	24,267
55	63	166	63	166
60	13	37	13	37
65	1	3	1	3
70	0	0	0	0

14.4.22 The World Health Organisation's Environmental Noise Guidelines 2018, as endorsed by the European Commission through Directive 2020/367, provide methods for calculating the number of people highly annoyed by specific noise sources, one of which uses road traffic noise and so the numbers have been determined where road traffic noise is considered in this Chapter. There is also a comparable method for airborne aircraft noise, and this has been used in *Chapter 13: Aircraft Noise and Vibration*, where that noise source is considered, but it has not been used here for aircraft ground noise. The difference in approach relates to the different characteristics of the noise sources.

14.4.23 Section 1.2 of the Environmental Noise Guidelines relates to its interface with the EU policy and states that the main aim of the Environmental Noise Directive (END) is "to define a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise". It also notes that the END obliges the European Commission to adapt the END Annexes I–III to technical and scientific progress.

14.4.24 Annex II of the END was replaced by EU Directive 2015/996[29]. Section 2.7.1 of the Annex to the Directive states that noise from taxiing and use of APUs may not contribute materially to the overall population exposure to aircraft noise.

14.4.25 Where noise generating activities associated with airport operations do not contribute materially to the overall population exposure to aircraft noise and associated noise contours, they may be excluded. These activities include: helicopters, taxiing, engine testing and use of APUs. This does not necessarily mean that their impact is insignificant and where these activities occur assessment of the sources can be undertaken as set out in paragraphs 2.7.21 and 2.7.22 of the Annex to Directive 2015/996.

14.4.26 Section 2.7.1 advises that where taxiing and APUs are assessed this can be undertaken as set out in paragraph 2.7.22. This advises that where noise associated with engine testing and APUs is to be

[29] COMMISSION DIRECTIVE (EU) 2015/996 of 19 May 2015 establishing common noise assessment methods according to Directive 2002/49/EC of the European Parliament and of the Council https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015L0996 [Checked 15/07/21]

modelled, it is modelled according to the chapter on industrial noise. This requires that, when calculating the attenuation due to atmospheric absorption, the temperature and humidity conditions are used in the calculation according to ISO 9613-1:1993[14]. The ground noise predictions have utilised this standard.

14.4.27 Annex III of the END was replaced by EU Directive 2020/367[30]. This notes in paragraph (4) that currently, limited knowledge is available on the harmful effects of industrial noise so that it is not possible to propose a common method for its assessment. This means there is no common method of assessment for taxiing and APUs as they are treated by the Directive as industrial noise.

14.4.28 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship.

14.4.29 There are no schools, residential healthcare facilities or places of worship above the L_{den} thresholds given in Table 14-4 for 2018.

Noise Modelling L_{night} Metric – Aircraft Ground Noise

14.4.30 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. These are based on the actual aircraft movements in 2018.

14.4.31 The results are detailed below and are also presented in Appendix 14C along with the noise contours, and results for supplementary noise metrics.

14.4.32 The noise contours representing a high impact, 55 dB L_{night}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors. The noise contours representing a medium impact, 50 dB L_{night}, extend to the west to Shanganhill, to the north to Forrest Little, to the east up to the R132 and to the south to Ballymun. The noise contours representing a low impact, 45 dB L_{night}, extend to the west to Shanganhill, to the north to Ridgewood, to the east to the M1 and to the south past the M50 towards Santry. These contours can be seen in Figure 14C-2 (Appendix 14C).

14.4.33 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results for 2018 in terms of the L_{night} metric are given in Table 14-11.

Table 14-11: 2018 Aircraft Ground Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	2018 Aircraft Ground Noise Level, dB (L_{night})
Ridgewood	GR01	44
The Baskins	GR02	39
Mayeston Hall	GR03	47
St Margret's	GR04	41
Note – noise levels rounded to nearest whole number.		

14.4.34 For each contour, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given in Table 14-12.

[30] COMMISSION DIRECTIVE (EU) 2020/367 of 4 March 2020 amending Annex III to Directive 2002/49/EC of the European Parliament and of the Council as regards the establishment of assessment methods for harmful effects of environmental noise https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020L0367 [Checked 15/07/21]

Table 14-12: Number of Dwellings and Population in 2018 Annual L_{night} Contours – Aircraft Ground Noise

Scenario	2018			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	668	1,620	668	1,620
50	24	65	24	65
55	7	22	7	22
60	0	0	0	0
65	0	0	0	0

14.4.35 The World Health Organisation's Environmental Noise Guidelines 2018, as endorsed by the European Commission through Directive 2020/367, provide methods for calculating the number of people highly sleep disturbed by specific noise sources, one of which uses road traffic noise and so the numbers have been determined where road traffic noise is considered in this Chapter. There is also a comparable method for airborne aircraft noise, and this has been used in *Chapter 13: Aircraft Noise and Vibration* where that noise source is considered. It has not been used here for aircraft ground noise for the same reasons as set out earlier in relation to not using the airborne aircraft noise method to determine the number of people highly annoyed from aircraft ground noise.

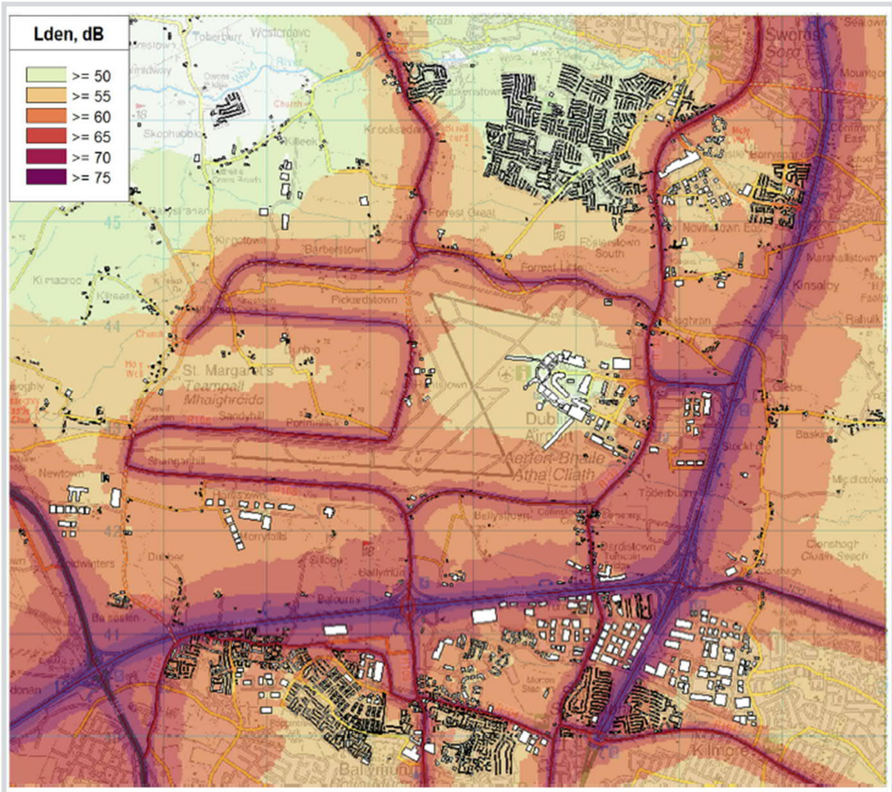
14.4.36 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night and there are none above the L_{night} thresholds given in Table 14-4 for 2018.

Noise Modelling L_{den} Metric – Road Traffic Noise

14.4.37 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. The results are detailed below and are also presented in Appendix 14F.

14.4.38 The noise contours are shown in Plate 14-4.

Plate 14-4: 2018 L_{den} Road Traffic Noise Contours



14.4.39 The noise contours show that the highest noise levels of 70 dB L_{den} and above are concentrated along the M1 and M50 motorways. Closer to the other roads modelled noise levels are often above 65 dB L_{den} and in almost all areas the noise levels are above 50 dB L_{den}.

14.4.40 Lower levels are shown near the R122 in St Margaret's compared to the surrounding roads. This is due to the absence of road traffic information for 2018 for these road links. However, road traffic information is available for the Assessment Years of 2022, 2025 and 2035, and so any changes due to the Relevant Action can still be assessed.

14.4.41 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results for 2018 in terms of the L_{den} metric are given in Table 14-13.

Table 14-13: 2018, Road Traffic Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Road Traffic Noise Level, dB (L_{den})
Ridgewood	GR01	52
The Baskins	GR02	60
Mayeston Hall	GR03	73
St Margret's	GR04	55
Note – noise levels rounded to nearest whole number.		

14.4.42 For each contour, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given in Table 14-14.

Table 14-14: Number of Dwellings and Population in 2018 Annual L_{den} Contours – Road Traffic Noise

Scenario	2018			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	16,520	47,419	17,789	51,161
55	12,495	35,326	13,714	38,874
60	6,813	19,371	7,858	22,385
65	3,581	9,933	4,179	11,598
70	2,351	6,402	2,726	7,418

14.4.43 The number of people assessed to be highly annoyed by road traffic noise in 2018 is given in Table 14-15.

Table 14-15: Number of People Highly Annoyed by Road Traffic Noise – 2018

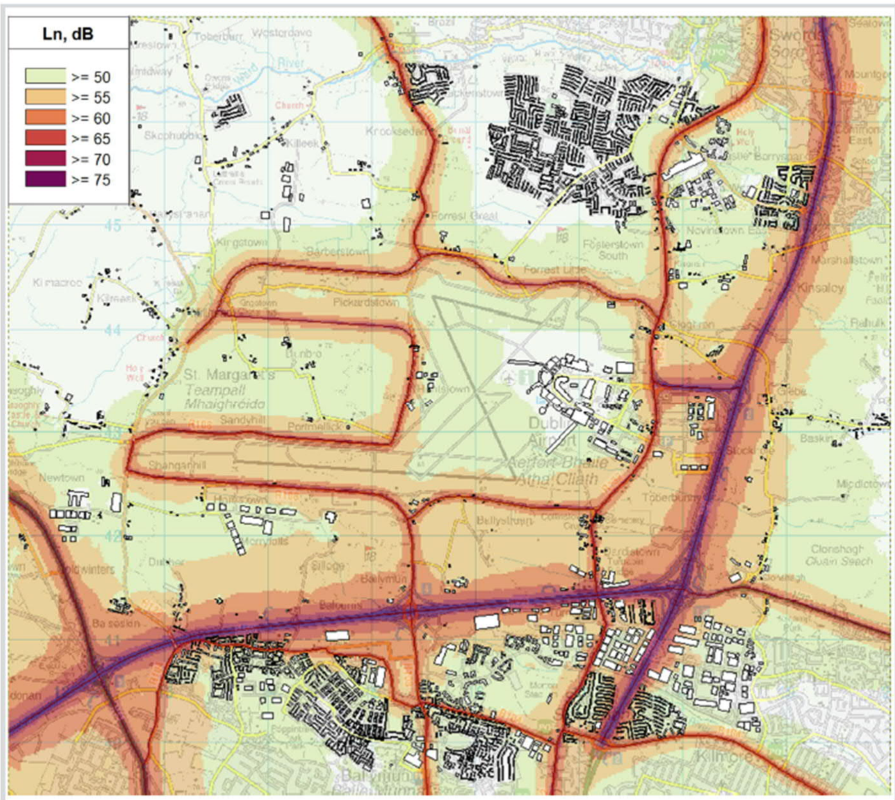
Scenario	No. People Highly Annoyed by Road Traffic Noise	
	Excluding Consented Developments	**Including Consented Developments**
2018	7,987	8,824

Noise Modelling L_{night} Metric – Road Traffic Noise

14.4.44 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. The results are detailed below and are also presented in Appendix 14F.

14.4.45 The noise contours are shown in Plate 14-5.

Plate 14-5: 2018 L_{night} Road Traffic Noise Contours



14.4.46 The noise contours show that the highest noise levels of 65 dB L_{night} and above are concentrated along the M1 and M50 motorways. Closer to the other roads modelled noise levels are often above 55 dB L_{night} and in most areas the noise levels are above 50 dB L_{night}.

14.4.47 Lower levels are shown near the R122 in St Margaret's compared to the surrounding roads. This is due to the absence of road traffic information for 2018 for these road links. However, road traffic information is available for the Assessment Years of 2022, 2025 and 2035, and so any changes due to the Relevant Action can still be assessed.

14.4.48 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results for 2018 in terms of the L_{night} metric are given in Table 14-16.

Table 14-16: 2018, Road Traffic Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Road Traffic Noise Level, dB (L_{night})
Ridgewood	GR01	44
The Baskins	GR02	52
Mayeston Hall	GR03	64
St Margret's	GR04	47
Note – noise levels rounded to nearest whole number.		

14.4.49 For each contour, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given in Table 14-17.

Table 14-17: Number of Dwellings and Population in 2018 Annual L_{night} Contours – Road Traffic Noise

Scenario	2018			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	13,922	39,586	15,141	43,134
50	9,378	26,442	10,462	29,578
55	4,514	12,486	5,220	14,482
60	2,668	7,340	3,136	8,626
65	1,365	3,842	1,528	4,281

14.4.50 The number of people assessed to be highly sleep disturbed by road traffic noise in 2018 is given in Table 14-18.

Table 14-18: Number of People Highly Sleep Disturbed by Road Traffic Noise – 2018

Scenario	No. People Highly Sleep Disturbed by Road Traffic Noise	
	Excluding Consented Developments	Including Consented Developments
2018	2,434	2,709

14.5 Future Receiving Environment

14.5.1 This section describes the future receiving environment in the Assessment Years of 2022, 2025 and 2035. This is the environment in the absence of the proposed Relevant Action and is represented by the Permitted Scenario in each Assessment Year.

14.5.2 Aircraft ground noise levels have been modelled for the Permitted Scenario in each Assessment Year. The primary assessment metrics are presented later in this section, and the supplementary metrics are presented in Appendix 14C.

14.5.3 Road traffic noise levels have been modelled for the Permitted Scenario in each Assessment Year. The primary assessment metrics are presented later in this section.

Noise Modelling L_{den} Metric – Aircraft Ground Noise

14.5.4 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. For the future Assessment Years these are based on forecast aircraft movements.

14.5.5 The results are detailed below and are also presented in Appendix 14C along with the noise contours, and the results for the supplementary noise metrics.

14.5.6 The noise contours representing a high impact, 65 dB L_{den}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors. The noise contours representing a medium impact, 55 dB L_{den}, extend to the west to Shanganhill, to the north to Forrest Great, to the east just past the R132 and to the south up to the M50. The noise contours representing a low impact, 50 dB L_{den}, extend to the west to St. Margaret's, to the north to Brackenstown, to the east to Glebe and to the south past the M50 and into Santry. The extent of the contours is similar in all Assessment Years, but increases from 2022 to 2025. The contours can be seen in Figures 14C-5, 14C-17 and 14C-29 (Appendix 14C).

14.5.7 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the Permitted Scenario in terms of the L_{den} metric are given in Table 14-19.

Table 14-19: Permitted Scenario Aircraft Ground Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Permitted Scenario Aircraft Ground Noise Level, dB (L_{den})		
		2022	*2025*	*2035*
Ridgewood	GR01	54	55	55
The Baskins	GR02	46	47	47
Mayeston Hall	GR03	53	55	55
St Margret's	GR04	48	49	49
Note – noise levels rounded to nearest whole number.				

14.5.8 For each set of contours, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by scenario and contour in Table 14-20 to Table 14-22.

Table 14-20: Number of Dwellings and Population in 2022 Permitted Scenario Annual L_{den} Contours – Aircraft Ground Noise

Scenario	2022 Permitted			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	4,520	12,310	4,885	13,399
55	39	104	39	104
60	15	44	15	44
65	1	3	1	3
70	0	0	0	0

Table 14-21: Number of Dwellings and Population in 2025 Permitted Scenario Annual L_{den} Contours – Aircraft Ground Noise

Scenario	2025 Permitted			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	7,729	21,381	8,193	22,791
55	57	148	57	148
60	16	47	16	47
65	1	3	1	3
70	0	0	0	0

Table 14-22: Number of Dwellings and Population in 2035 Permitted Scenario Annual L_{den} Contours – Aircraft Ground Noise

Scenario	2035 Permitted			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	7,895	21,880	8,359	23,290
55	69	182	69	182
60	18	53	18	53
65	1	3	1	3
70	0	0	0	0

14.5.9 The number of people exposed to aircraft ground noise, when measured using the L_{den} metric, is forecast to increase from 2022 up to 2035 with most of the change occurring between 2022 and 2025. However, there are no additional dwellings forecast to be exposed to a high level of aircraft ground noise (i.e. at least 65 dB L_{den} or above) in any future Permitted Scenario.

14.5.10 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship.

14.5.11 There are no schools, residential healthcare facilities or places of worship above the L_{den} thresholds given in Table 14-4 for the Permitted Scenario.

Noise Modelling L_{night} Metric – Aircraft Ground Noise

14.5.12 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. For the future Assessment Years these are based on forecast aircraft movements.

14.5.13 The results are detailed below and are also presented in Appendix 14C along with the noise contours, and the results for supplementary noise metrics.

14.5.14 The noise contours representing a high impact, 55 dB L_{night}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors. The noise contours representing a medium impact, 50 dB L_{night}, extend to the west to Shanganhill, to the north to Forrest Little, to the east to the R132 and to the south to Ballymun. The noise contours representing a low impact, 45 dB L_{night}, extend to the west to Shanganhill, to the north to Forrest Great, to the east just past the R132 and to the south to the M50. The extent of the contours is similar in all Assessment Years but increases from 2022 to 2025. These contours can be seen in Figures 14C-6, 14C-18 and 14C-30 (Appendix 14C).

14.5.15 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the Permitted Scenario in terms of the L_{night} metric are given in Table 14-23.

Table 14-23: Permitted Scenario Aircraft Ground Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Permitted Scenario Aircraft Ground Noise Level, dB (L_{night})		
		2022	*2025*	*2035*
Ridgewood	GR01	42	43	43
The Baskins	GR02	37	38	37
Mayeston Hall	GR03	45	46	46
St Margret's	GR04	39	40	40

Note – noise levels rounded to nearest whole number.

14.5.16 For each set of contours, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by scenario and contour in Table 14-24 to Table 14-26.

Table 14-24: Number of Dwellings and Population in 2022 Permitted Scenario Annual L_{night} Contours – Aircraft Ground Noise

Scenario	2022 Permitted			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	53	139	53	139
50	13	37	13	37
55	1	3	1	3
60	0	0	0	0
65	0	0	0	0

Table 14-25: Number of Dwellings and Population in 2025 Permitted Scenario Annual L_{night} Contours – Aircraft Ground Noise

Scenario	2025 Permitted			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	61	156	61	156
50	13	37	13	37
55	1	3	1	3
60	0	0	0	0
65	0	0	0	0

Table 14-26: Number of Dwellings and Population in 2035 Permitted Scenario Annual L_{night} Contours – Aircraft Ground Noise

Scenario	**2035 Permitted**			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	61	156	61	156
50	13	37	13	37
55	1	3	1	3
60	0	0	0	0
65	0	0	0	0

14.5.17 The number of people exposed to aircraft ground noise, when measured using the L_{night} metric, is forecast to increase slightly from 2022 up to 2025 before levelling off up to 2035. There are no additional dwellings forecast to be exposed to a high level of aircraft ground noise (i.e. at least 55 dB L_{night} or above) in any Permitted Scenario Assessment Year.

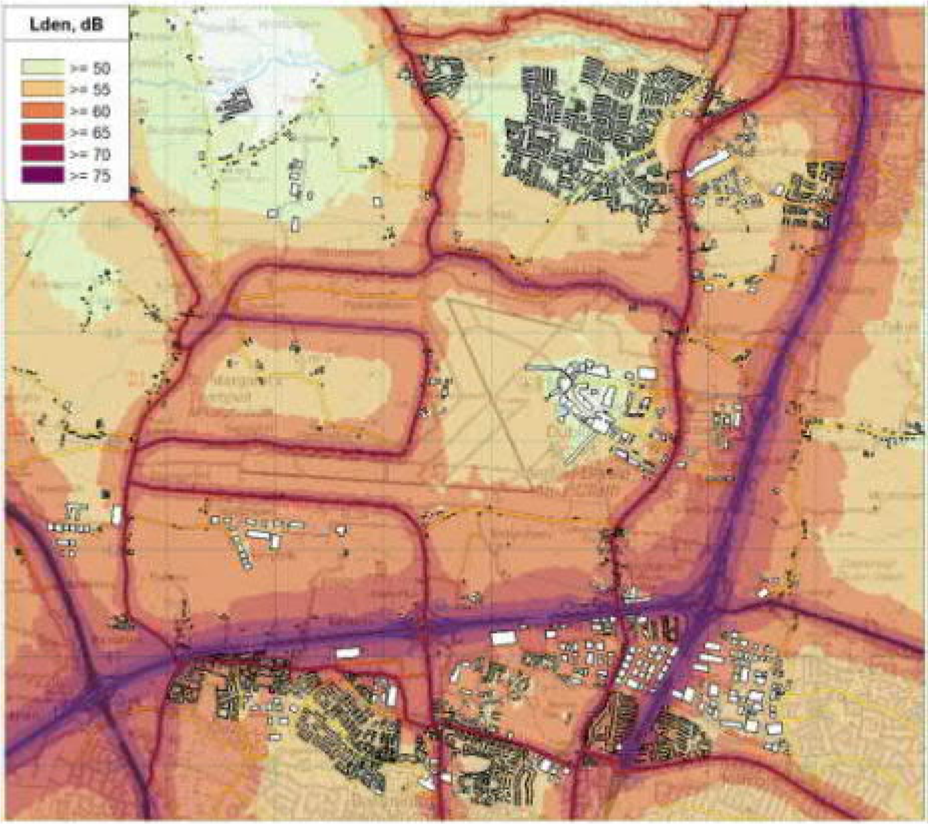
14.5.18 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night and there are none above the L_{night} thresholds given in Table 14-4 for any of the Permitted Scenario Assessment Years.

Noise Modelling L_{den} Metric – Road Traffic Noise

14.5.19 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. For the future Assessment Years these are based on forecast road traffic flows. The results are detailed below and are also presented in Appendix 14F.

14.5.20 The noise contours for 2022 are shown in Plate 14-6.

Plate 14-6: 2022 L_{den} Road Traffic Noise Contours



14.5.21 The noise contours show that the highest noise levels of 70 dB L_{den} and above are concentrated along the M1 and M50 motorways. Closer to the other roads modelled noise levels are often above 65 dB L_{den} and in almost all areas the noise levels are above 50 dB L_{den}.

14.5.22 The noise contours for 2025 are shown in Plate 14-7 and those for 2035 in Plate 14-8. They show a similar situation to that in 2022.

Plate 14-7: 2025 L_{den} Road Traffic Noise Contours

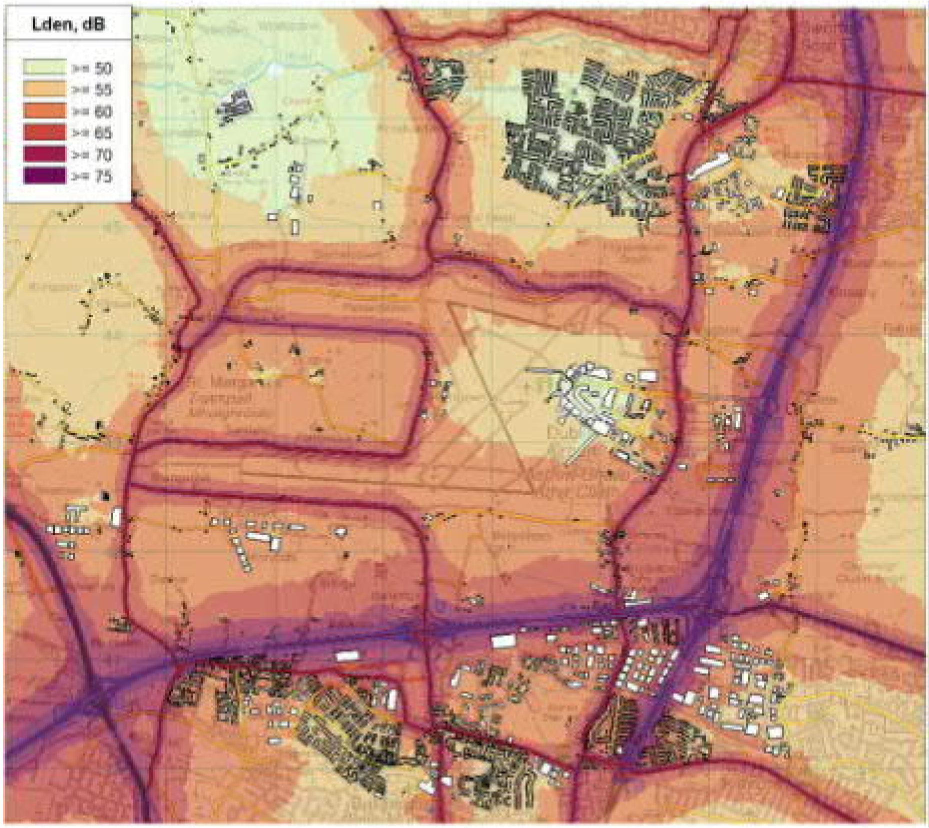
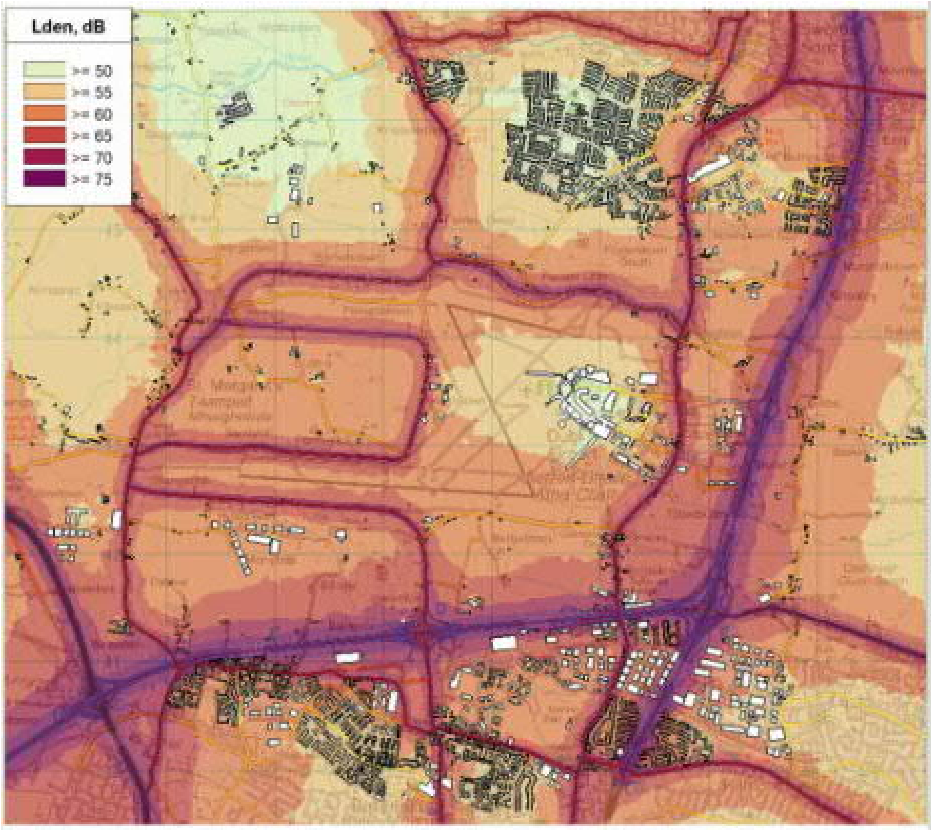


Plate 14-8: 2035 L_{den} Road Traffic Noise Contours



14.5.23 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the Permitted Scenario in terms of the L_{den} metric are given in Table 14-27.

Table 14-27: Permitted Scenario Road Traffic Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Permitted Scenario Road Traffic Noise Level, dB (L_{den})		
		2022	*2025*	*2035*
Ridgewood	GR01	52	53	54
The Baskins	GR02	58	60	60
Mayeston Hall	GR03	71	73	73
St Margret's	GR04	56	57	58

Note – noise levels rounded to nearest whole number.

14.5.24 For each set of contours, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by scenario and contour in Table 14-28 to Table 14-30.

Table 14-28: Number of Dwellings and Population in 2022 Permitted Scenario Annual L_{den} Contours – Road Traffic Noise

Scenario	2022 Permitted			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	15,866	45,483	17,135	49,225
55	11,687	33,104	12,906	36,652
60	6,236	17,647	7,261	20,596
65	3,266	8,968	3,835	10,565
70	2,206	5,996	2,455	6,647

Table 14-29: Number of Dwellings and Population in 2025 Permitted Scenario Annual L_{den} Contours – Road Traffic Noise

Scenario	2025 Permitted			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	17,511	50,511	18,780	54,253
55	13,165	37,380	14,384	40,928
60	7,850	22,112	8,918	25,180
65	3,983	11,013	4,666	12,894
70	2,502	6,840	2,939	8,026

Table 14-30: Number of Dwellings and Population in 2035 Permitted Scenario Annual L_{den} Contours – Road Traffic Noise

Scenario	2035 Permitted			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	17,717	51,177	18,986	54,919

Scenario	2035 Permitted			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
55	13,505	38,404	14,724	41,952
60	8,140	22,966	9,208	26,034
65	4,051	11,197	4,767	13,185
70	2,583	7,084	3,051	8,370

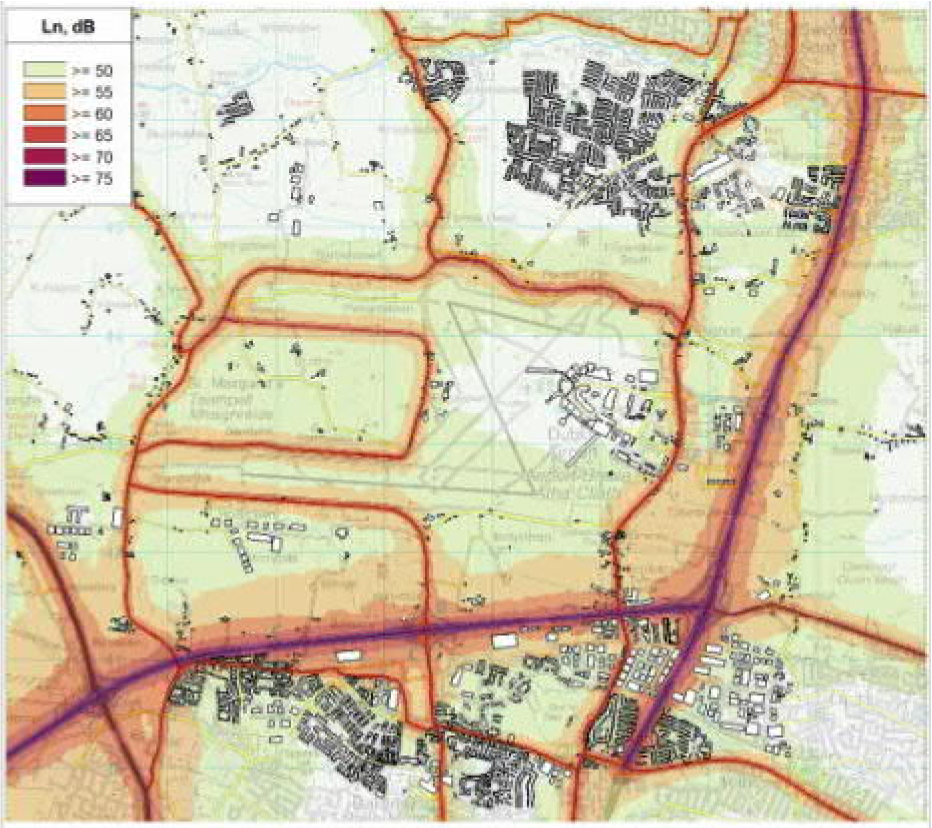
14.5.25 The number of people exposed to road traffic noise, when measured using the L_{den} metric, is forecast to increase from 2022 up to 2035 with most of the change occurring between 2022 and 2025.

Noise Modelling L_{night} Metric – Road Traffic Noise

14.5.26 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. For the future Assessment Years these are based on forecast road traffic flows. The results are detailed below and are also presented in Appendix 14F.

14.5.27 The noise contours for 2022 are shown in Plate 14-9.

Plate 14-9: 2022 L_{night} Road Traffic Noise Contours



14.5.28 The noise contours show that the highest noise levels of 65 dB L_{night} and above are concentrated along the M1 and M50 motorways. Closer to the other roads modelled noise levels are often above 55 dB L_{night} and in most areas the noise levels are above 50 dB L_{night}.

14.5.29 The noise contours for 2025 are shown in Plate 14-10 and those for 2035 in Plate 14-11. They show a similar situation to that in 2022.

Plate 14-10: 2025 L_{night} Road Traffic Noise Contours

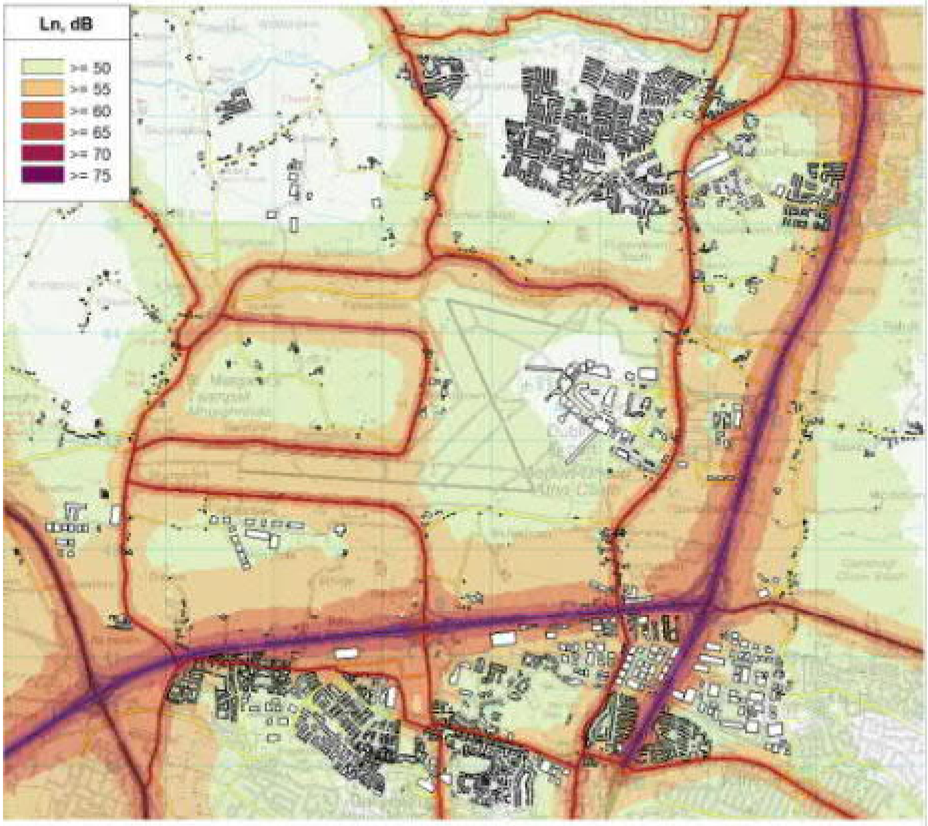
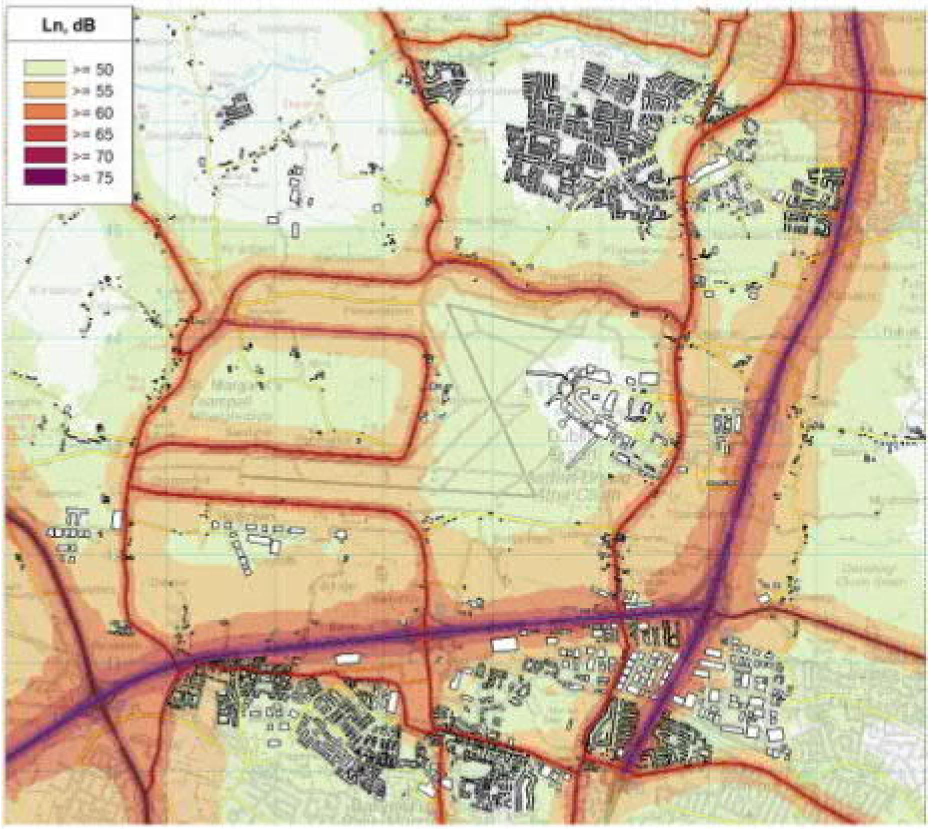


Plate 14-11: 2035 L_{night} Road Traffic Noise Contours



14.5.30 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the Permitted Scenario in terms of the L_{night} metric are given in Table 14-31.

Table 14-31: Permitted Scenario Road Traffic Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Permitted Scenario Road Traffic Noise Level, dB (L_{night})		
		2022	*2025*	*2035*
Ridgewood	GR01	44	46	46
The Baskins	GR02	50	52	52
Mayeston Hall	GR03	63	64	65
St Margret's	GR04	48	50	50
Note – noise levels rounded to nearest whole number.				

14.5.31 For each set of contours, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by scenario and contour in Table 14-32 to Table 14-34.

Table 14-32: Number of Dwellings and Population in 2022 Permitted Scenario Annual L_{night} Contours – Road Traffic Noise

Scenario	2022 Permitted			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	13,409	38,106	14,628	41,654
50	8,152	23,033	9,230	26,138
55	4,135	11,441	4,822	13,361
60	2,591	7,087	3,059	8,373
65	1,074	3,011	1,229	3,430

Table 14-33: Number of Dwellings and Population in 2025 Permitted Scenario Annual L_{night} Contours – Road Traffic Noise

Scenario	2025 Permitted			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	14,643	41,841	15,912	45,583
50	9,671	27,305	10,777	30,504
55	4,706	13,056	5,518	15,314
60	2,830	7,798	3,298	9,084
65	1,774	4,935	1,981	5,482

Table 14-34: Number of Dwellings and Population in 2035 Permitted Scenario Annual L_{night} Contours – Road Traffic Noise

Scenario	**2035 Permitted**			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	15,016	42,972	16,285	46,714

Scenario	2035 Permitted			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	10,088	28,490	11,203	31,722
55	4,976	13,866	5,794	16,143
60	2,863	7,895	3,366	9,278
65	1,866	5,070	2,073	5,617

14.5.32 The number of people exposed to road traffic noise, when measured using the L_{night} metric, is forecast to increase from 2022 up to 2035 with most of the change occurring between 2022 and 2025.

14.6 Environmental Design and Management

14.6.1 There are a number of measures already in place at Dublin Airport that reduce or mitigate aircraft ground noise effects. These are described in this section.

Reduction of Noise at Source

14.6.2 Over the past 20 years, the models and types of aircraft using Dublin Airport have evolved, and improvements in technology have meant that the typical aircraft using the airport are quieter than they used to be.

14.6.3 The ICAO Noise 'Chapter' rating defines specific air noise performance criteria which aircraft must meet in order to be certificated. Equivalent certification for ground noise does not exist, and therefore it is difficult to predict the noise levels of aircraft which do not currently operate in significant numbers at Dublin Airport but are forecast to do so in the future, such as the Airbus A320neo and Boeing 737 MAX 8.

14.6.4 It is expected that aircraft such as these will be quieter than those they replace when carrying out ground operations, although the improvement is expected to be of a smaller magnitude than for air noise. For this assessment, a conservative assumption has been made that future aircraft perform similarly to those operating today.

14.6.5 The Applicant plans to incentivise quieter aircraft particularly at night in accordance with Action 1 of the approved Dublin Airport Noise Action Plan 2019-2023[31]. An initial noise charging consultation was circulated to airlines at the end of November 2020. This consultation outlined a range of questions relating to the implementation of noise charging and the potential methodology. Airline responses were received in mid-February. A follow-on consultation outlining the more prescript next steps of noise charging application to airlines is due in Summer 2021. This will detail the proposal for the implementation of noise charging between 23:30-06:00, as well as the potential introduction of a modification discount to incentivise quieter aircraft. It is intended that noise charging will be fully implemented during the Winter 2021/22 season.

Land Use Planning and Management

Noise Zones

14.6.6 Noise Zones have been in use for a number of years in the Fingal Development Plan. Most recently they were updated in the 2020 Dublin Airport Local Area Plan (LAP). The LAP dedicates an entire Section (section 9.1) to noise. In that section it notes the following:.

"The Dublin Airport LAP is a land use plan for the purposes of effective land-use planning and safeguarding the use of the Airport. Noise zones relating to Dublin Airport have been in place for many years to aid land use planning. Since the publication of previous noise zones in 2005, and over the last decade, further evidence has emerged that has updated understanding of how aircraft noise can affect health and quality of life. With the north runway set to become operational in 2022, updated information

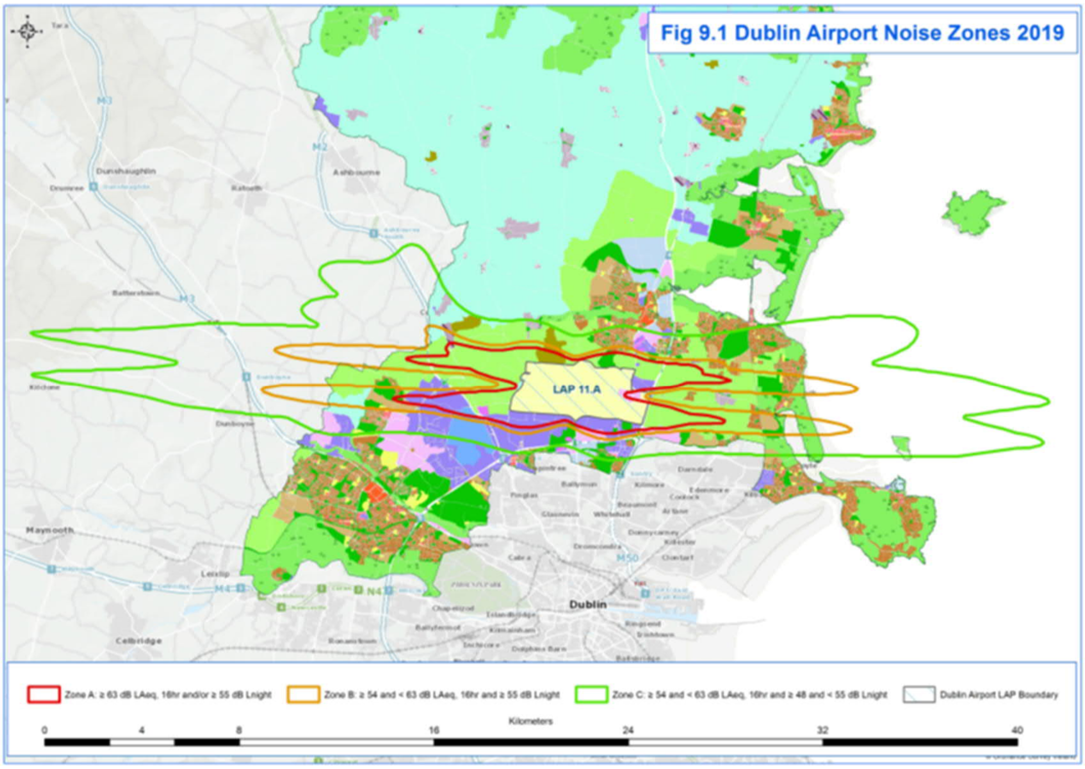
[31] Fngal County Council Noise Action Plan for Dublin Airport 2019 – 2023 December 2018 https://www.fingal.ie/sites/default/files/2019-04/NAP%20Final.pdf [Checked 12/08/21]

is available relating to aircraft noise performance and flight paths. For these reasons, it was considered appropriate to update the noise zones for Dublin Airport to allow for more effective land use planning for development within airport noise zones.

The updated noise zones are set out in Fig. 9.1. Dublin Airport Noise Zones and policies relating to development in Noise Zones are set out in Variation No. 1 to the Fingal Development Plan 2017 - 2023."

14.6.7 This figure is reproduced as Plate 14-12 below.

Plate 14-12: Extract of Figure 9.1 from Dublin Airport Local Area Plan



14.6.8 The actions to restrict inappropriate development in the noise zones are described in the Fingal Development Plan 2017-2023 Variation No. 1, which states:

"Three noise zones are shown in the Development Plan maps, Zones B and C within which the Council will continue to restrict inappropriate development, and Zone A within which new provisions for residential development and other noise sensitive uses will be actively resisted. An additional assessment zone, Zone D is also proposed to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment."

14.6.9 Table 7.2 of the Fingal Development Plan 2017-2023 Variation No. 1 is reproduced below for reference asTable14.35. The table considers two noise metrics, L_{night} which is one of the primary metrics used in this chapter, and $L_{Aeq,16hr}$ which is one of the supplementary noise metrics. Due to the distribution of flights across the day, evening and night periods at larger airports, the noise exposure expressed using the $L_{Aeq,16hr}$ metric is typically 2 dB lower than if it is expressed using the L_{den} metric, the other primary metric used in this chapter.

Table 14-35: Extract from Fingal Development Plan 2017-2023 (Table 7.2)

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
D	≥ 50 and < 54 dB $L_{Aeq,16hr}$ and ≥ 40 and < 48 dB L_{night}	To identify noise sensitive developments which could potentially be affected by aircraft noise and to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment. All noise sensitive development within this zone is likely to be acceptable from a noise perspective. An associated application would not normally be refused on noise grounds, however where the development is residential-led and comprises non-residential noise sensitive uses, or comprises 50 residential units or more, it may be necessary for the applicant to demonstrate that a good acoustic design has been followed. Applicants are advised to seek expert advice.
C	≥ 54 and < 63 dB $L_{Aeq,16hr}$ and ≥ 48 and < 55 dB L_{night}	To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure, where appropriate, noise insulation is incorporated within the development Noise sensitive development in this zone is less suitable from a noise perspective than in Zone D. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed. The noise assessment must demonstrate that relevant internal noise guidelines will be met. This may require noise insulation measures. An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels. Applicants are strongly advised to seek expert advice.
B	≥ 54 and < 63 dB $L_{Aeq,16hr}$ and ≥ 55 dB L_{night}	To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure noise insulation is incorporated within the development. Noise sensitive development in this zone is less suitable from a noise perspective than in Zone C. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed. Appropriate well-designed noise insulation measures must be incorporated into the development in order to meet relevant internal noise guidelines. An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the developments design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels. Applicants must seek expert advice.
A	≥ 63 dB $L_{Aeq,16hr}$ and/or ≥ 55 dB L_{night}	To resist new provision for residential development and other noise sensitive uses. All noise sensitive developments within this zone may potentially be exposed to high levels of aircraft noise, which may be harmful to health or otherwise unacceptable. The provision of new noise sensitive developments will be resisted

Notes:

- 'Good acoustic design' means following the principles of assessment and design as described in ProPG: 'Planning & Noise – New Residential Development', May 2017;
- Internal and external amenity and the design of noise insulation measures should follow the guidance provided in British Standard BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

Residential Sound Insulation Schemes

14.6.10 Dublin Airport operates sound insulation schemes for dwellings and schools based on the level of air noise they are exposed to. Although not based on the aircraft ground noise or road traffic noise levels, many of the properties with the highest ground noise levels are eligible for insulation works through these existing schemes which are described in *Chapter 13: Aircraft Noise and Vibration*.

Operational Procedures

14.6.11 Dublin Airport have in place a range of operational procedures which serve to minimise aircraft ground noise. These include:

- Engine test runs are only permitted at certain times, to minimise aircraft ground noise.
- The engine test site which was located at the northern end of the airfield has been relocated to the centre of the airfield, away from populated neighbouring areas.
- Fixed Electrical Ground Power (FEGP) is a ground power system that allows aircraft to plug directly into a fixed, electrical power source while they are parked on the airfield. This has noise (and other environmental) benefits when compared to aircraft using Auxiliary Power Units (APUs) or engine-driven Ground Power Units (GPUs). FEGP is available at a large number of stands at Dublin Airport, and aircraft are required to use it where available, in preference to APUs or GPUs.

Operating Restrictions

14.6.12 The relevant operating restrictions are detailed in *Chapter 2: Characteristics of the Project*.

14.7 Assessment of Effects and Significance

14.7.1 The effects have been assessed first for the Proposed Scenario in isolation, and then for the Apron 5H Scenario which is the cumulative effect of the Proposed Scenario and the Apron 5H application.

Effects During Operation with Proposed Relevant Action

2022 Proposed Scenario L_{den} Metric – Aircraft Ground Noise

14.7.2 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. For the 2022 Proposed Scenario these are based on forecast aircraft movements.

14.7.3 Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 65 dB L_{den}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors in the 2022 Proposed Scenario or the 2022 Permitted Scenario.

14.7.4 The 2022 Proposed Scenario noise contours representing a medium impact, 55 dB L_{den}, and a low impact, 50 dB L_{den}, are a similar shape to the 2022 Permitted Scenario but extend further in all directions. The noise contours representing a medium impact, 55 dB L_{den}, extend to the west to Shanganhill, to the north up to Ridgewood, to the east past the R132 and to the south up to the M50. The noise contours representing a low impact, 50 dB L_{den}, extend to the west to St. Margaret's, to the north to Brackenstown, to the east to Glebe and to the south up to the R104 and Santry. These contours can be seen in Figure 14C-9 (Appendix 14C).

14.7.5 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2022 Proposed Scenario in terms of the L_{den} metric are given in Table 14-36, where they are compared with the 2022 Permitted Scenario.

Table 14-36: 2022 Proposed Scenario Aircraft Ground Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{den})	
		2022 Proposed Scenario	*Difference to 2022 Permitted Scenario*
Ridgewood	GR01	56	+2
The Baskins	GR02	47	+1
Mayeston Hall	GR03	55	+1

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{den})	
St Margret's	GR04	49	+1
Note – values rounded to nearest whole number. Differences based on unrounded values.			

14.7.6 L_{den} noise levels at receptors close to the north of the airport site, for example Ridgewood, are forecast to increase by around 2 dB(A) compared to the 2022 Permitted Scenario. Receptors in other locations are forecast to increase by around 1 dB(A).

14.7.7 For the 2022 Proposed Scenario L_{den} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-37.

Table 14-37: Number of Dwellings and Population in 2022 Proposed Scenario L_{den} Contours – Aircraft Ground Noise

Scenario	2022 Proposed Scenario			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	7,547	20,872	8,009	22,275
55	88	251	88	251
60	18	53	18	53
65	1	3	1	3
70	0	0	0	0

14.7.8 Comparing the 2022 Proposed Scenario with the 2022 Permitted Scenario, the number of people exposed to at least a low level of aircraft ground noise (i.e. 50 dB L_{den} or above) is forecast to increase from 12,310 to 20,872 excluding consented developments. The number of people exposed to at least a high level of aircraft ground noise (i.e. 65 dB L_{den} or above) is not forecast to change.

14.7.9 It is also important to consider the change in noise level when assessing the differences between the scenarios. Section 14.3, and specifically Table 14-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2022 Proposed Scenario is compared with the 2022 Permitted Scenario in Table 14-38. This table includes all people in existing dwellings who are within the study area and are exposed to at least 45 dB L_{den} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios or are outside the study area are assessed as not being subject to significant effects and so have not been included.

Table 14-38: Aircraft Ground Noise (L_{den}) Number of People by Magnitude of Effect – 2022 Proposed Scenario vs 2022 Permitted Scenario

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	0	28,458
Not Significant	0	20,632
Slight	0	230
Moderate	0	3
Significant	0	0
Very Significant	0	0
Profound	0	0

14.7.10 Going from the 2022 Permitted Scenario to the 2022 Proposed Scenario, no people are assessed as having a significant effect, either beneficial or adverse.

14.7.11 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship.

14.7.12 There are no schools, residential healthcare facilities or places of worship above the L_{den} thresholds given in Table 14-4 for the 2022 Proposed Scenario or the 2022 Permitted Scenario.

2022 Proposed Scenario L_{night} Metric – Aircraft Ground Noise

14.7.13 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. For the 2022 Proposed Scenario these are based on forecast aircraft movements.

14.7.14 Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 55 dB L_{night}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors in the 2022 Proposed Scenario or the 2022 Permitted Scenario.

14.7.15 The 2022 Proposed Scenario noise contours representing a medium impact, 50 dB L_{night}, and a low impact, 45 dB L_{night}, are a similar shape to the 2022 Permitted Scenario but extend further in all directions. The 50 dB L_{night} contour extends to the west to Shanganhill, to the north to Forrest Little, to the east up to the R132 and to the south to Ballymun. The 45 dB L_{night} contour extends to the west nearly to the R122, to the north into Ridgewood, to the east past the R132 and to the south past the M50. These contours can be seen in Figure 14C-10 (Appendix 14C).

14.7.16 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2022 Proposed Scenario in terms of the L_{night} metric are given in Table 14-39, where they are compared with the 2022 Permitted Scenario.

Table 14-39: 2022 Proposed Scenario Aircraft Ground Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{night})	
		2022 Proposed Scenario	*Difference to 2022 Permitted Scenario*
Ridgewood	GR01	47	+5
The Baskins	GR02	39	+3
Mayeston Hall	GR03	47	+2
St Margret's	GR04	41	+3
Note – values rounded to nearest whole number. Differences based on unrounded values.			

14.7.17 L_{night} noise levels at receptors close to the north of the airport site, for example Ridgewood, are forecast to increase by around 5 dB(A) compared to the 2022 Permitted Scenario. Receptors in other locations are forecast to increase by 2-3 dB(A).

14.7.18 For the 2022 Proposed Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-40.

Table 14-40: Number of Dwellings and Population in 2022 Proposed Scenario L_{night} Contours – Aircraft Ground Noise

Scenario	2022 Proposed Scenario			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population*	*Dwellings*	*Population*
45	937	2,580	937	2,580

Scenario		2022 Proposed Scenario		
50	28	77	28	77
55	3	9	3	9
60	0	0	0	0
65	0	0	0	0

14.7.19 Comparing the 2022 Proposed Scenario with the 2022 Permitted Scenario, the number of people exposed to at least a low level of aircraft ground noise (i.e. 45 dB L_{night} or above) is forecast to increase from 139 to 2,580. The number of people exposed to at least a high level of aircraft ground noise (i.e. 55 dB L_{night} or above) is forecast to increase from 3 to 9.

14.7.20 It is also important to consider the change in noise level when assessing the differences between the scenarios. Section 14.3, and specifically Table 14-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2022 Proposed Scenario is compared with the 2022 Permitted Scenario in Table 14-41. This table includes all people in existing dwellings who are within the study area and are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios or are outside the study area are assessed as not being subject to significant effects and so have not been included.

Table 14-41: Aircraft Ground Noise (L_{night}) Number of People by Magnitude of Effect – 2022 Proposed Scenario vs 2022 Permitted Scenario

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	0	719
Not Significant	0	21,083
Slight	0	13,001
Moderate	0	1,753
Significant	0	35
Very Significant	0	0
Profound	0	0

14.7.21 Going from the 2022 Permitted Scenario to the 2022 Proposed Scenario, no people are assessed as having a significant beneficial effect, and 35 people are assessed as having a significant adverse effect. No people are assessed as having the highest effect levels, i.e. very significant and profound.

14.7.22 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night, and there are none above the L_{night} thresholds given in Table 14-4 for the 2022 Proposed Scenario or the 2022 Permitted Scenario.

2025 Proposed Scenario L_{den} Metric – Aircraft Ground Noise

14.7.23 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. For the 2025 Proposed Scenario these are based on forecast aircraft movements.

14.7.24 Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 65 dB L_{den}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors in the 2025 Proposed Scenario or the 2025 Permitted Scenario.

14.7.25 The 2025 Proposed Scenario noise contours representing a medium impact, 55 dB L_{den}, and a low impact, 50 dB L_{den}, are a similar shape to the 2025 Permitted Scenario but extend further in all directions. The noise contours representing a medium impact, 55 dB Lden, extend to the west to Shanganhill, to the north up to Ridgewood, to the east past the R132 and to the south up to the M50. The noise contours representing a low impact, 50 dB Lden, extend to the west to St. Margaret's, to the north to

Brackenstown, to the east to Glebe and to the south up to the R104 and Santry. These contours can be seen in Figure 14C-21 (Appendix 14C).

14.7.26 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2025 Proposed Scenario in terms of the L_{den} metric are given in Table 14-42, where they are compared with the 2025 Permitted Scenario.

Table 14-42: 2025 Proposed Scenario Aircraft Ground Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{den})	
		2025 Proposed Scenario	*Difference to 2025 Permitted Scenario*
Ridgewood	GR01	56	+1
The Baskins	GR02	48	+1
Mayeston Hall	GR03	56	+1
St Margret's	GR04	50	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

14.7.27 L_{den} noise levels at receptors close to the airport site in all directions are forecast to increase by around 1 dB(A) compared to the 2025 Permitted Scenario.

14.7.28 For the 2025 Proposed Scenario L_{den} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-43.

Table 14-43: Number of Dwellings and Population in 2025 Proposed Scenario L_{den} Contours – Aircraft Ground Noise

Scenario	2025 Proposed Scenario			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population*	*Dwellings*	*Population*
50	9,745	27,624	10,322	29,451
55	250	745	250	745
60	21	62	21	62
65	1	3	1	3
70	0	0	0	0

14.7.29 Comparing the 2025 Proposed Scenario with the 2025 Permitted Scenario, the number of people exposed to at least a low level of aircraft ground noise (i.e. 50 dB L_{den} or above) is forecast to increase from 21,381 to 27,624 excluding consented developments. The number of people exposed to at least a high level of aircraft ground noise (i.e. 65 dB L_{den} or above) is not forecast to change.

14.7.30 It is also important to consider the change in noise level when assessing the differences between the scenarios. Section 14.3, and specifically Table 14-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2025 Proposed Scenario is compared with the 2025 Permitted Scenario in Table 14-44. This includes all people in existing dwellings who are within the study area and are exposed to at least 45 dB L_{den} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios or are outside the study area are assessed as not being subject to significant effects and so have not been included.

Table 14-44: Aircraft Ground Noise (L_{den}) Number of People by Magnitude of Effect – 2025 Proposed Scenario vs 2025 Permitted Scenario

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	0	34,881
Not Significant	0	14,873
Slight	0	678
Moderate	0	0
Significant	0	0
Very Significant	0	0
Profound	0	0

14.7.31 Going from the 2025 Permitted Scenario to the 2025 Proposed Scenario, no people are assessed as having a significant effect, either beneficial or adverse.

14.7.32 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship.

14.7.33 There are no schools, residential healthcare facilities or places of worship above the L_{den} thresholds given in Table 14-4 for the 2025 Proposed Scenario or the 2025 Permitted Scenario.

2025 Proposed Scenario L_{night} Metric – Aircraft Ground Noise

14.7.34 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. For the 2025 Proposed Scenario these are based on forecast aircraft movements.

14.7.35 Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 55 dB L_{night}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors in the 2025 Proposed Scenario or the 2025 Permitted Scenario.

14.7.36 The 2025 Proposed Scenario noise contours representing a medium impact, 50 dB L_{night}, and a low impact, 45 dB L_{night}, are a similar shape to the 2025 Permitted Scenario but extend further in all directions. The 50 dB Lnight contour extends to the west to Shanganhill, to the north to Forrest Little, to the east up to the R132 and to the south to Ballymun. The 45 dB L_{night} contour extends to the west to St. Margaret's, to the north into Ridgewood, to the east up to the M1 and to the south past the M50 towards Santry. These contours can be seen in Figure 14C-22 (Appendix 14C).

14.7.37 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2025 Proposed Scenario in terms of the L_{night} metric are given in Table 14-45, where they are compared with the 2025 Permitted Scenario.

Table 14-45: 2025 Proposed Scenario Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{night})	
		2025 Proposed Scenario	*Difference to 2025 Permitted Scenario*
Ridgewood	GR01	47	+4
The Baskins	GR02	40	+3
Mayeston Hall	GR03	48	+2
St Margret's	GR04	42	+2

Note – values rounded to nearest whole number. Differences based on unrounded values.

14.7.38 L_{night} noise levels at receptors close to the north of the airport site, for example Ridgewood, are forecast to increase by around 4 dB(A) compared to the 2025 Permitted Scenario. Receptors in other location are forecast to increase by 2-3 dB(A).

14.7.39 For the 2025 Proposed Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-46.

Table 14-46: Number of Dwellings and Population in 2025 Proposed Scenario L_{night} Contours

Scenario	**2025 Proposed Scenario**			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	2,346	6,274	2,394	6,407
50	31	86	31	86
55	11	32	11	32
60	1	3	1	3
65	0	0	0	0

14.7.40 Comparing the 2025 Proposed Scenario with the 2025 Permitted Scenario, the number of people exposed to at least a low level of aircraft ground noise (i.e. 45 dB L_{night} or above) is forecast to increase from 156 to 6,274. The number of people exposed to at least a high level of aircraft ground noise (i.e. 55 dB L_{night} or above) is forecast to increase from 3 to 35.

14.7.41 It is also important to consider the change in noise level when assessing the differences between the scenarios. Section 14.3, and specifically Table 14-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2025 Proposed Scenario is compared with the 2025 Permitted Scenario in Table 14-47. This table includes all people in existing dwellings who are within the study area and are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios or are outside the study area are assessed as not being subject to significant effects and so have not been included.

Table 14-47: Aircraft Ground Noise (L_{night}) Number of People by Magnitude of Effect – 2025 Proposed Scenario vs 2025 Permitted Scenario

Magnitude of effect	**No. people with Beneficial Effect**	**No. people with Adverse Effect**
Imperceptible	0	4,988
Not Significant	0	19,018
Slight	0	14,721
Moderate	0	3,529
Significant	0	62
Very Significant	0	0
Profound	0	0

14.7.42 Going from the 2025 Permitted Scenario to the 2025 Proposed Scenario, no people are assessed as having a significant beneficial effect, and 62 people are assessed as having a significant adverse effect. No people are assessed as having the highest effect levels, i.e. very significant and profound.

14.7.43 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night.

14.7.44 There is one residential healthcare facility exposed to an L_{night} level above the threshold given in Table 14-4 (i.e. 45 dB L_{night} or above) in the 2025 Proposed Scenario. There are none in the 2025

Permitted Scenario. The property is located in Santry Demesne and the predicted noise exposure is 45 dB L_{night}.

2035 Proposed Scenario L_{den} Metric – Aircraft Ground Noise

14.7.45 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. For the 2035 Proposed Scenario these are based on forecast aircraft movements.

14.7.46 Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 65 dB L_{den}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors in the 2035 Proposed Scenario or the 2035 Permitted Scenario.

14.7.47 The 2035 Proposed Scenario noise contours representing a medium impact, 55 dB L_{den}, and a low impact, 50 dB L_{den}, are a similar shape to the 2035 Permitted Scenario but extend further in all directions. The noise contours representing a medium impact, 55 dB Lden, extend to the west to Shanganhill, to the north up to Ridgewood, to the east past the R132 and to the south up to the M50. The noise contours representing a low impact, 50 dB Lden, extend to the west to St. Margaret's to the north to Brackenstown, to the east to Glebe and to the south up to the R104 and Santry. These contours can be seen in Figure 14C-33 (Appendix 14C).

14.7.48 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2035 Proposed Scenario in terms of the L_{den} metric are given in Table 14-48, where they are compared with the 2035 Permitted Scenario.

Table 14-48: 2035 Proposed Scenario Aircraft Ground Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{den})	
		2035 Proposed Scenario	*Difference to 2035 Permitted Scenario*
Ridgewood	GR01	56	+1
The Baskins	GR02	48	+1
Mayeston Hall	GR03	56	+1
St Margret's	GR04	50	+1
Note – values rounded to nearest whole number. Differences based on unrounded values.			

14.7.49 L_{den} noise levels at receptors close to the airport site in all directions are forecast to increase by around 1 dB(A) when compared to the 2035 Permitted Scenario.

14.7.50 For the 2035 Permitted Scenario L_{den} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-49.

Table 14-49: Number of Dwellings and Population in 2035 Proposed Scenario L_{den} Contours – Aircraft Ground Noise

Scenario	2035 Proposed Scenario			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	9,745	27,624	10,322	29,451
55	250	745	250	745
60	21	62	21	62
65	1	3	1	3
70	0	0	0	0

14.7.51 Comparing the 2035 Proposed Scenario with the 2035 Permitted Scenario, the number of people exposed to at least a low level of aircraft ground noise (i.e. 50 dB L_{den} or above) is forecast to increase from 21,880 to 27,624. The number of people exposed to at least a high level of aircraft ground noise (i.e. 65 dB L_{den} or above) is not forecast to change.

14.7.52 It is also important to consider the change in noise level when assessing the differences between the scenarios. Section 14.3, and specifically Table 14-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2035 Proposed Scenario is compared with the 2035 Permitted Scenario in Table 14-50. This includes all people in existing dwellings who are within the study area and are exposed to at least 45 dB L_{den} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios or are outside the study area are assessed as not being subject to significant effects and so have not been included.

Table 14-50: Aircraft Ground Noise (L_{den}) Number of People by Magnitude of Effect – 2035 Proposed Scenario vs 2035 Permitted Scenario

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	0	38,130
Not Significant	0	11,669
Slight	0	634
Moderate	0	0
Significant	0	0
Very Significant	0	0
Profound	0	0

14.7.53 Going from the 2035 Permitted Scenario to the 2035 Proposed Scenario, no people are assessed as having a significant effect, either beneficial or adverse.

14.7.54 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship.

14.7.55 There are no schools, residential healthcare facilities or places of worship above the L_{den} thresholds given in Table 14-4 for the 2035 Proposed Scenario or the 2035 Permitted Scenario.

2035 Proposed Scenario L_{night} Metric – Aircraft Ground Noise

14.7.56 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. For the 2035 Proposed Scenario these are based on forecast aircraft movements.

14.7.57 Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 55 dB L_{night}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors in the 2035 Proposed Scenario or the 2035 Permitted Scenario.

14.7.58 The 2035 Proposed Scenario noise contours representing a medium impact, 50 dB L_{night}, and a low impact, 45 dB L_{night}, are a similar shape to the 2035 Permitted Scenario but extend further in all directions. The 50 dB L_{night} contour extends to the west to Shanganhill, to the north to Forrest Little, to the east up to the R132 and to the south to Ballymun. The 45 dB L_{night} contour extends to the west to St. Margaret's, to the north into Ridgewood, to the east up to the M1 and to the south past the M50 towards Santry. These contours can be seen in Figure 14C-34 (Appendix 14C).

14.7.59 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2035 Proposed Scenario in terms of the L_{night} metric are given in Table 14-51, where they are compared with the 2035 Permitted Scenario.

Table 14-51: 2035 Proposed Scenario Aircraft Ground Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{night})	
		2035 Proposed Scenario	*Difference to 2035 Permitted Scenario*
Ridgewood	GR01	47	+4
The Baskins	GR02	40	+3
Mayeston Hall	GR03	48	+2
St Margret's	GR04	42	+2
Note – values rounded to nearest whole number. Differences based on unrounded values.			

14.7.60 L_{night} noise levels at receptors close to the north of the airport site, for example Ridgewood, are forecast to increase by around 4 dB(A) compared to the 2035 Permitted Scenario. Receptors in other location are forecast to increase by 2-3 dB(A).

14.7.61 For the 2035 Proposed Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-52.

Table 14-52: Number of Dwellings and Population in 2035 Proposed Scenario L_{night} Contours – Aircraft Ground Noise

Scenario	2035 Proposed Scenario			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	2,346	6,274	2,394	6,407
50	31	86	31	86
55	11	32	11	32
60	1	3	1	3
65	0	0	0	0

14.7.62 Comparing the 2035 Proposed Scenario with the 2035 Permitted Scenario, the number of people exposed to at least a low level of aircraft ground noise (i.e. 45 dB L_{night} or above) is forecast to increase from 156 to 6,274. The number of people exposed to at least a high level of aircraft ground noise (i.e. 55 dB L_{night} or above) is forecast to increase from 3 to 35.

14.7.63 It is also important to consider the change in noise level when assessing the differences between the scenarios. Section 14.3, and specifically Table 14-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2035 Proposed Scenario is compared with the 2035 Permitted Scenario in Table 14-53. This table includes all people in existing dwellings who are within the study area and are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios or are outside the study area are assessed as not being subject to significant effects and so have not been included.

Table 14-53: Aircraft Ground Noise (L_{night}) Number of People by Magnitude of Effect – 2035 Proposed Scenario vs 2035 Permitted Scenario

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	0	4,958
Not Significant	0	19,048
Slight	0	14,721
Moderate	0	3,529

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Significant	0	62
Very Significant	0	0
Profound	0	0

14.7.64 Going from the 2035 Permitted Scenario to the 2035 Proposed Scenario, no people are assessed as having a significant beneficial effect, and 62 people are assessed as having a significant adverse effect. No people are assessed as having the highest effect levels, i.e. very significant and profound.

14.7.65 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night.

14.7.66 There is one residential healthcare facility exposed to an L_{night} level above the threshold given in Table 14-4 (i.e. 45 dB L_{night} or above) in the 2035 Proposed Scenario. There are none in the 2035 Permitted Scenario. The property is located in Santry Demesne and the predicted noise exposure is 45 dB L_{night}.

Effects During Operation with Proposed Relevant Action and Apron 5H

2022 Apron 5H L_{den} Metric – Aircraft Ground Noise

14.7.67 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. For the 2022 Apron 5H Scenario these are based on forecast aircraft movements.

14.7.68 Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 65 dB L_{den}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors in the 2022 Apron 5H Scenario or the 2022 Permitted Scenario.

14.7.69 The 2022 Apron 5H Scenario noise contours representing a medium impact, 55 dB L_{den}, and a low impact, 50 dB L_{den}, are a similar shape to the 2022 Permitted Scenario but extend further in all directions. The noise contours representing a medium impact, 55 dB L_{den}, extend to the west to Shanganhill, to the north up to Ridgewood, to the east past the R132 and to the south up to the M50. The noise contours representing a low impact, 50 dB L_{den}, extend to the west to St. Margaret's, to the north to Brackenstown, to the east to Glebe and to the south up to the R104 and Santry. The extent of the contours is similar to the 2022 Proposed Scenario. These contours can be seen in Figure 14C-13 (Appendix 14C).

14.7.70 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2022 Apron 5H Scenario in terms of the L_{den} metric are given in Table 14-54, where they are compared with the 2022 Permitted Scenario.

Table 14-54: 2022 Apron 5H Scenario Aircraft Ground Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{den})	
		2022 Apron 5H Scenario	*Difference to 2022 Permitted Scenario*
Ridgewood	GR01	56	+2
The Baskins	GR02	48	+2
Mayeston Hall	GR03	55	+1
St Margret's	GR04	49	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

14.7.71 L_{den} noise levels at receptors close to the north and east of the airport site, for example Ridgewood and the Baskins, are forecast to increase by around 2 dB(A) compared to the 2022 Permitted Scenario. Receptors in other locations are forecast to increase by around 1 dB(A).

14.7.72 For the 2022 Apron 5H Scenario L_{den} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-55.

Table 14-55: Number of Dwellings and Population in 2022 Apron 5H Scenario L_{den} Contours – Aircraft Ground Noise

Scenario	2022 Apron 5H Scenario			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	7,782	21,595	8,244	22,998
55	110	319	110	319
60	18	53	18	53
65	1	3	1	3
70	0	0	0	0

14.7.73 Comparing the 2022 Apron 5H Scenario with the 2022 Permitted Scenario, the number of people exposed to at least a low level of aircraft ground noise (i.e. 50 dB L_{den} or above) is forecast to increase from 12,310 to 21,595. The number of people exposed to at least a high level of aircraft ground noise (i.e. 65 dB L_{den} or above) is not forecast to change.

14.7.74 It is also important to consider the change in noise level when assessing the differences between the scenarios. Section 14.3, and specifically Table 14-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2022 Apron 5H Scenario is compared with the 2022 Permitted Scenario in Table 14-56. This table includes all people in existing dwellings who are within the study area and are exposed to at least 45 dB L_{den} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios or are outside the study area are assessed as not being subject to significant effects and so have not been included.

Table 14-56: Aircraft Ground Noise (L_{den}) Number of People by Magnitude of Effect – 2022 Apron 5H Scenario vs 2022 Permitted Scenario

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	0	27,838
Not Significant	0	21,442
Slight	0	313
Moderate	0	6
Significant	0	0
Very Significant	0	0
Profound	0	0

14.7.75 Going from the 2022 Permitted Scenario to the 2022 Apron 5H Scenario, no people are assessed as having a significant effect, either beneficial or adverse.

14.7.76 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship.

14.7.77 There are no schools, residential healthcare facilities or places of worship above the L_{den} thresholds given in Table 14-4 for the 2022 Apron 5H Scenario or the 2022 Permitted Scenario.

2022 Apron 5H Scenario L_{night} Metric – Aircraft Ground Noise

14.7.78 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. For the 2022 Apron 5H Scenario these are based on forecast aircraft movements.

14.7.79 Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 55 dB L_{night}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors in the 2022 Apron 5H Scenario or the 2022 Permitted Scenario.

14.7.80 The 2022 Apron 5H Scenario noise contours representing a medium impact, 50 dB L_{night}, and a low impact, 45 dB L_{night}, are a similar shape to the 2022 Permitted Scenario but extend further in all directions. The 50 dB L_{night} contour extends to the west to Shanganhill, to the north to Forrest Little, to the east up to the R132 and to the south to Ballymun. The 45 dB L_{night} contour extends to the west nearly to the R122, to the north into Ridgewood, to the east past the R132 and to the south past the M50. The extent of the contours is similar to the 2022 Proposed Scenario. These contours can be seen in Figure 14C-14 (Appendix 14C).

14.7.81 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2022 Apron 5H Scenario in terms of the L_{night} metric are given in Table 14-57, where they are compared with the 2022 Permitted Scenario.

Table 14-57: 2022 Apron 5H Scenario Aircraft Ground Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{night})	
		2022 Apron 5H Scenario	*Difference to 2022 Permitted Scenario*
Ridgewood	GR01	47	+5
The Baskins	GR02	40	+3
Mayeston Hall	GR03	47	+2
St Margret's	GR04	41	+3
Note – values rounded to nearest whole number. Differences based on unrounded values.			

14.7.82 L_{night} noise levels at receptors close to the north of the airport site, for example Ridgewood, are forecast to increase by around 5 dB(A) compared to the 2022 Permitted Scenario. Receptors in other locations are forecast to increase by 2-3 dB(A).

14.7.83 For the 2022 Apron 5H Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-58.

Table 14-58: Number of Dwellings and Population in 2022 Apron 5H Scenario L_{night} Contours – Aircraft Ground Noise

Scenario	2022 Apron 5H Scenario			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	1,187	3,305	1,187	3,305
50	29	80	29	80
55	3	9	3	9
60	0	0	0	0
65	0	0	0	0

14.7.84 Comparing the 2022 Apron 5H Scenario with the 2022 Permitted Scenario, the number of people exposed to at least a low level of aircraft ground noise (i.e. 45 dB L_{night} or above) is forecast to increase from 139 to 3,305. The number of people exposed to at least a high level of aircraft ground noise (i.e. 55 dB L_{night} or above) is forecast to increase from 3 to 9.

14.7.85 It is also important to consider the change in noise level when assessing the differences between the scenarios. Section 14.3, and specifically Table 14-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2022 Apron 5H Scenario is compared with the 2022 Permitted Scenario in Table 14-59. This table include all people in existing dwellings who are within the study area and are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios or are outside the study area are assessed as not being subject to significant effects and so have not been included.

Table 14-59: Aircraft Ground Noise (L_{night}) Number of People by Magnitude of Effect – 2022 Apron 5H Scenario vs 2022 Permitted Scenario

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	0	0
Not Significant	0	21,893
Slight	0	13,283
Moderate	0	2,479
Significant	0	41
Very Significant	0	0
Profound	0	0

14.7.86 Going from the 2022 Permitted Scenario to the 2022 Apron 5H Scenario, no people are assessed as having a significant beneficial effect, and 41 people are assessed as having a significant adverse effect. No people are assessed as having the highest effect levels, i.e. very significant and profound.

14.7.87 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night, and there are none above the L_{night} thresholds given in Table 14-4 for the 2022 Apron 5H Scenario or the 2022 Permitted Scenario.

2025 Apron 5H Scenario L_{den} Metric – Aircraft Ground Noise

14.7.88 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. For the 2025 Apron 5H Scenario these are based on forecast aircraft movements.

14.7.89 Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 65 dB L_{den}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors in the 2025 Apron 5H Scenario or the 2025 Permitted Scenario.

14.7.90 The 2025 Apron 5H Scenario noise contours representing a medium impact, 55 dB L_{den}, and a low impact, 50 dB L_{den}, are a similar shape to the 2025 Permitted Scenario but extend further in all directions. The noise contours representing a medium impact, 55 dB Lden, extend to the west to Shanganhill, to the north up to Ridgewood, to the east past the R132 and to the south up to the M50. The noise contours representing a low impact, 50 dB Lden, extend to the west to St. Margaret's, to the north to Brackenstown, to the east to Glebe and to the south up to the R104 and Santry. The extent of the contours is similar to the 2025 Proposed Scenario. These contours can be seen in Figure 14C-25 (Appendix 14C).

14.7.91 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2025 Apron 5H Scenario in terms of the L_{den} metric are given in Table 14-60, where they are compared with the 2025 Permitted Scenario.

Table 14-60: 2025 Apron 5H Scenario Aircraft Ground Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{den})	
		2025 Apron 5H Scenario	*Difference to 2025 Permitted Scenario*
Ridgewood	GR01	56	+1
The Baskins	GR02	48	+1
Mayeston Hall	GR03	56	+1
St Margret's	GR04	50	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

14.7.92 L_{den} noise levels at receptors close to the airport site in all directions are forecast to increase by around 1 dB(A) compared to the 2025 Permitted Scenario.

14.7.93 For the 2025 Apron 5H Scenario L_{den} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-61.

Table 14-61: Number of Dwellings and Population in 2025 Apron 5H Scenario L_{den} Contours – Aircraft Ground Noise

Scenario	2025 Apron 5H Scenario			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	9,741	27,599	10,368	29,620
55	276	826	276	826
60	21	62	21	62
65	1	3	1	3
70	0	0	0	0

14.7.94 Comparing the 2025 Apron 5H Scenario with the 2025 Permitted Scenario, the number of people exposed to at least a low level of aircraft ground noise (i.e. 50 dB L_{den} or above) is forecast to increase from 21,381 to 27,599. The number of people exposed to at least a high level of aircraft ground noise (i.e. 65 dB L_{den} or above) is not forecast to change.

14.7.95 It is also important to consider the change in noise level when assessing the differences between the scenarios. Section 14.3, and specifically Table 14-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2025 Apron 5H Scenario is compared with the 2025 Permitted Scenario in Table 14-62. This includes all people in existing dwellings who are within the study area and are exposed to at least 45 dB L_{den} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios or are outside the study area are assessed as not being subject to significant effects and so have not been included.

Table 14-62: Aircraft Ground Noise (L_{den}) Number of People by Magnitude of Effect – 2025 Apron 5H Scenario vs 2025 Permitted Scenario

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	0	36,523
Not Significant	0	13,171
Slight	0	760
Moderate	0	0
Significant	0	0

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Very Significant	0	0
Profound	0	0

14.7.96 Going from the 2025 Baseline to the 2025 Apron 5H scenario, no people are assessed as having a significant effect, either beneficial or adverse.

14.7.97 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship.

14.7.98 There are no schools, residential healthcare facilities or places of worship above the L_{den} thresholds given in Table 14-4 for the 2025 Apron 5H Scenario or the 2025 Permitted Scenario.

2025 Apron 5H L_{night} Metric – Aircraft Ground Noise

14.7.99 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. For the 2025 Apron 5H scenario these are based on forecast aircraft movements without Conditions 3(d) and 5 of the North Runway Permission. It has been assumed that the Apron 5H application is successful and the proposed stands are operational.

14.7.100 Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 55 dB L_{night}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors in the 2025 Apron 5H Scenario or the 2025 Permitted Scenario.

14.7.101 The 2025 Apron 5H Scenario noise contours representing a medium impact, 50 dB L_{night}, and a low impact, 45 dB L_{night}, are a similar shape to the 2025 Permitted Scenario but extend further in all directions. The 50 dB Lnight contour extends to the west to Shanganhill, to the north to Forrest Little, to the east up to the R132 and to the south to Ballymun. The 45 dB L_{night} contour extends to the west to St. Margaret's, to the north into Ridgewood, to the east up to the M1 and to the south past the M50 towards Santry. The extents of the contours are similar to the 2025 Proposed Scenario. These contours can be seen in Figure 14C-26 (Appendix 14C).

14.7.102 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2025 Apron 5H Scenario in terms of the L_{night} metric are given in Table 14-63, where they are compared with the 2025 Permitted Scenario.

Table 14-63: 2025 Apron 5H Scenario Aircraft Ground Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{night})	
		2025 Apron 5H Scenario	*Difference to 2025 Permitted Scenario*
Ridgewood	GR01	47	+4
The Baskins	GR02	40	+3
Mayeston Hall	GR03	48	+2
St Margret's	GR04	42	+2
Note – values rounded to nearest whole number. Differences based on unrounded values.			

14.7.103 L_{night} noise levels at receptors close to the north of the airport site, for example Ridgewood, are forecast to increase by around 4 dB(A) compared to the 2025 Permitted Scenario. Receptors in other location are forecast to increase by 2-3 dB(A).

14.7.104 For the 2025 Apron 5H Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and including consented developments. The results are given by contour in Table 14-64.

Table 14-64: Number of Dwellings and Population in 2025 Apron 5H Scenario L_{night} Contours – Aircraft Ground Noise

Scenario	2025 Apron 5H Scenario			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	2,451	6,615	2,499	6,748
50	31	86	31	86
55	11	32	11	32
60	1	3	1	3
65	0	0	0	0

14.7.105 Comparing the 2025 Apron 5H Scenario with the 2025 Permitted Scenario, the number of people exposed to at least a low level of aircraft ground noise (i.e. 45 dB L_{night} or above) is forecast to increase from 156 to 6,615, and the number of people exposed to at least a high level of aircraft ground noise (i.e. 55 dB L_{night} or above) is forecast to increase from 3 to 35.

14.7.106 It is also important to consider the change in noise level when assessing the differences between the scenarios. Section 14.3, and specifically Table 14-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2025 Apron 5H Scenario is compared with the 2025 Permitted Scenario in Table 14-65. This table includes all people in existing dwellings who are within the study area and are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios or are outside the study area are assessed as not being subject to significant effects and so have not been included.

Table 14-65: Aircraft Ground Noise (L_{night}) Number of People by Magnitude of Effect – 2025 Apron 5H Scenario vs 2025 Permitted Scenario

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	0	6,720
Not Significant	0	17,277
Slight	0	14,756
Moderate	0	4,003
Significant	0	62
Very Significant	0	0
Profound	0	0

14.7.107 Going from the 2025 Baseline to the 2025 Apron 5H scenario, no people are assessed as having a significant beneficial effect, and 62 people are assessed as having a significant adverse effect. No people are assessed as having the highest effect levels, i.e. very significant and profound.

14.7.108 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night.

14.7.109 There is one residential healthcare facility exposed to an L_{night} level above the threshold given in Table 14-4 (i.e. 45 dB L_{night} or above) in the 2025 Apron 5H Scenario. There are none in the 2025 Permitted Scenario. The property is located in Santry Demesne and the predicted noise exposure is 45 dB L_{night}.

2035 Apron 5H Scenario L_{den} Metric– Aircraft Ground Noise

14.7.110 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. For the 2035 Apron 5H Scenario these are based on forecast aircraft movements.

14.7.111 Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 65 dB L_{den}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors in the 2035 Apron 5H Scenario or the 2035 Permitted Scenario.

14.7.112 The 2035 Apron 5H Scenario noise contours representing a medium impact, 55 dB L_{den}, and a low impact, 50 dB L_{den}, are a similar shape to the 2035 Permitted Scenario but extend further in all directions. The noise contours representing a medium impact, 55 dB Lden, extend to the west to Shanganhill, to the north up to Ridgewood, to the east past the R132 and to the south up to the M50. The noise contours representing a low impact, 50 dB Lden, extend to the west to St. Margaret's to the north to Brackenstown, to the east to Glebe and to the south up to the R104 and Santry. The extent of the contours is similar to the 2035 Proposed Scenario. These contours can be seen in Figure 14C-37 (Appendix 14C).

14.7.113 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2035 Apron 5H Scenario in terms of the L_{den} metric are given in Table 14-66, where they are compared with the 2035 Permitted Scenario.

Table 14-66: 2035 Apron 5H Scenario Aircraft Ground Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{den})	
		2035 Apron 5H Scenario	*Difference to 2035 Permitted Scenario*
Ridgewood	GR01	56	+1
The Baskins	GR02	48	+1
Mayeston Hall	GR03	56	+1
St Margret's	GR04	50	+1
Note – values rounded to nearest whole number. Differences based on unrounded values.			

14.7.114 L_{den} noise levels at receptors close to the airport site in all directions are forecast to increase by around 1 dB(A) compared to the 2035 Permitted Scenario.

14.7.115 For the 2035 Apron 5H L_{den} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-67.

Table 14-67: Number of Dwellings and Population in 2035 Apron 5H Scenario L_{den} Contours – Aircraft Ground Noise

Scenario	2035 Apron 5H Scenario			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	9,741	27,599	10,368	29,620
55	276	826	276	826
60	21	62	21	62
65	1	3	1	3
70	0	0	0	0

14.7.116 Comparing the 2035 Apron 5H Scenario with the 2035 Permitted Scenario, the number of people exposed to at least a low level of aircraft ground noise (i.e. 50 dB L_{den} or above) is forecast to increase from 21,880 to 27,599. The number of people exposed to at least a high level of aircraft ground noise (i.e. 65 dB L_{den} or above) is not forecast to change.

14.7.117 It is also important to consider the change in noise level when assessing the differences between the scenarios. Section 14.3, and specifically Table 14-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2035 Apron 5H Scenario is compared with the 2035 Permitted Scenario in Table 14-68. This includes all people in existing dwellings who are within the study area and are exposed to at least 45 dB L_{den} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios or are outside the study area are assessed as not being subject to significant effects and so have not been included.

Table 14-68: Aircraft Ground Noise (L_{den}) Number of People by Magnitude of Effect – 2035 Apron 5H Scenario vs 2035 Permitted Scenario

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	0	37,989
Not Significant	0	11,736
Slight	0	728
Moderate	0	0
Significant	0	0
Very Significant	0	0
Profound	0	0

14.7.118 Going from the 2035 Baseline to the 2035 Apron 5H scenario, no people are assessed as having a significant effect, either beneficial or adverse.

14.7.119 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship.

14.7.120 There are no schools, residential healthcare facilities or places of worship above the L_{den} thresholds given in Table 14-4 for the 2035 Apron 5H Scenario or the 2035 Permitted Scenario.

2035 Apron 5H Scenario L_{night} Metric– Aircraft Ground Noise

14.7.121 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. For the 2035 Apron 5H scenario these are based on forecast aircraft movements.

14.7.122 Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 55 dB L_{night}, barely extend further than the airport site and as a result contain very few noise-sensitive receptors in the 2035 Apron 5H Scenario or the 2035 Permitted Scenario.

14.7.123 The 2035 Apron 5H Scenario noise contours representing a medium impact, 50 dB L_{night}, and a low impact, 45 dB L_{night}, are a similar shape to the 2035 Permitted Scenario but extend further in all directions. The 50 dB L_{night} contour extends to the west to Shanganhill, to the north to Forrest Little, to the east up to the R132 and to the south to Ballymun. The 45 dB L_{night} contour extends to the west to St. Margaret's, to the north into Ridgewood, to the east up to the M1 and to the south past the M50 towards Santry. The extent of the contours is similar to the 2035 Proposed Scenario. These contours can be seen in Figure 14C-34 (Appendix 14C).

14.7.124 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2035 Apron 5H Scenario in terms of the L_{night} metric are given in Table 14-69, where they are compared with the 2035 Permitted Scenario.

Table 14-69: 2035 Apron 5H Scenario Aircraft Ground Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Aircraft Ground Noise Level, dB (L_{night})	
		2035 Apron 5H Scenario	*Difference to 2035 Permitted Scenario*
Ridgewood	GR01	47	+4
The Baskins	GR02	40	+3
Mayeston Hall	GR03	48	+2
St Margret's	GR04	42	+2

Note – values rounded to nearest whole number. Differences based on unrounded values.

14.7.125 L_{night} noise levels at receptors close to the north of the airport site, for example Ridgewood, are forecast to increase by around 4 dB(A) compared to the 2035 Permitted Scenario. Receptors in other location are forecast to increase by 2-3 dB(A).

14.7.126 For the 2035 Apron 5H Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and including consented developments. The results are given by contour in Table 14-70.

Table 14-70: Number of Dwellings and Population in 2035 Apron 5H Scenario L_{night} Contours – Aircraft Ground Noise

Scenario	2035 Apron 5H Scenario			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	2,451	6,615	2,499	6,748
50	31	86	31	86
55	11	32	11	32
60	1	3	1	3
65	0	0	0	0

14.7.127 Comparing the 2035 Apron 5H Scenario with the 2035 Permitted Scenario, the number of people exposed to at least a low level of aircraft ground noise (i.e. 45 dB L_{night} or above) is forecast to increase from 156 to 6,615, and the number of people exposed to at least a high level of aircraft ground noise (i.e. 55 dB L_{night} or above) is forecast to increase from 3 to 35.

14.7.128 It is also important to consider the change in noise level when assessing the differences between the scenarios. Section 14.3, and specifically Table 14-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2035 Apron 5H Scenario is compared with the 2035 Permitted Scenario in Table 14-71. This table includes all people in existing dwellings who are within the study area and are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios or are outside the study area are assessed as not being subject to significant effects and so have not been included.

Table 14-71: Aircraft Ground Noise (L_{night}) Number of People by Magnitude of Effect – 2035 Apron 5H Scenario vs 2035 Permitted Scenario

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	0	6,646
Not Significant	0	17,350
Slight	0	14,752
Moderate	0	4,006

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Significant	0	62
Very Significant	0	0
Profound	0	0

14.7.129 Going from the 2035 Baseline to the 2035 Apron 5H scenario, no people are assessed as having a significant beneficial effect, and 62 people are assessed as having a significant adverse effect. No people are assessed as having the highest effect levels, i.e. very significant and profound.

14.7.130 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night.

14.7.131 There is one residential healthcare facility exposed to an L_{night} level above the threshold given in Table 14-4 (i.e. 45 dB L_{night} or above) in the 2035 Apron 5H Scenario. There are none in the 2035 Permitted Scenario. The property is located in Santry Demesne and the predicted noise exposure is 45 dB L_{night}.

Effects During Operation with Proposed Relevant Action

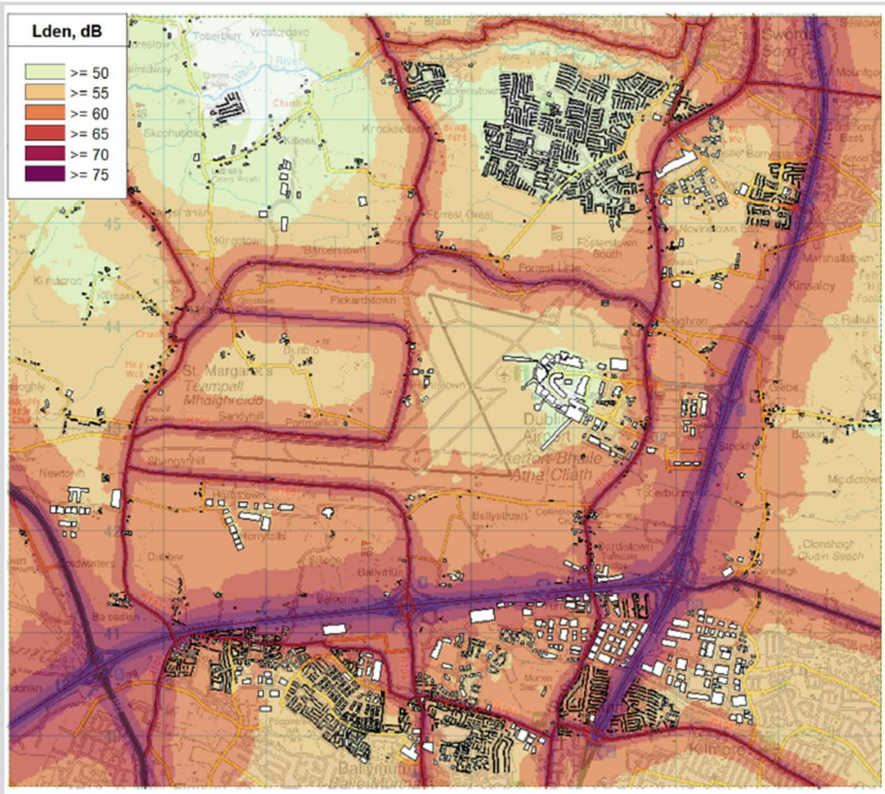
2022 Proposed Scenario L_{den} Metric – Road Traffic Noise

14.7.132 The presence or not of Apron 5H has no effect on the number of flights or the amount of road traffic to and from the airport. The road traffic noise under the Apron 5H scenario is therefore the same as that under the Proposed scenario which is discussed below.

14.7.133 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. For the 2022 Proposed Scenario these are based on forecast road traffic flows. The results are detailed below and are also presented in Appendix 14F.

14.7.134 The noise contours for 2022 are shown in Plate 14-13.

Plate 14-13: 2022 L_{den} Road Traffic Noise Contours



14.7.135 The noise contours show that the highest noise level of 70 dB L_{den} and above are concentrated along the M1 and M50 motorways. Closer to the other roads modelled noise levels are often above 65 dB L_{den} and in almost all areas the noise levels are above 50 dB L_{den}.

14.7.136 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2022 Proposed Scenario in terms of the L_{den} metric are given in Table 14-72, where they are compared with the 2022 Permitted Scenario.

Table 14-72: 2022 Proposed Scenario Road Traffic Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Road Traffic Noise Level, dB (L_{den})	
		2022 Proposed Scenario	*Difference to 2022 Permitted Scenario*
Ridgewood	GR01	52	+0
The Baskins	GR02	58	+0
Mayeston Hall	GR03	71	+0
St Margret's	GR04	56	+0

Note – values rounded to nearest whole number. Differences based on unrounded values.

14.7.137 L_{den} noise levels at the receptors are not forecast to increase compared to the 2022 Permitted Scenario when rounded to the nearest whole number. The changes that do arise are illustrated in Appendix 14F and are all under 1 dB.

14.7.138 For the 2022 Proposed Scenario L_{den} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-73.

Table 14-73: Number of Dwellings and Population in 2022 Proposed Scenario L_{den} Contours – Road Traffic Noise

Scenario	2022 Proposed Scenario			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	15,907	45,612	17,176	49,354
55	11,714	33,182	12,933	36,730
60	6,272	17,748	7,297	20,697
65	3,278	9,009	3,847	10,606
70	2,207	5,998	2,456	6,649

14.7.139 The number of people assessed to be highly annoyed by road traffic noise in the 2022 Proposed Scenario is given in Table 14-74, where it is compared with the 2022 Permitted Scenario.

Table 14-74: Number of People Highly Annoyed by Road Traffic Noise – 2022 Proposed vs 2022 Permitted

Scenario	No. People Highly Annoyed by Road Traffic Noise	
	Excluding Consented Developments	Including Consented Developments
2022 Proposed	7,527	8,330
2022 Permitted	7,497	8,297

14.7.140 Comparing the 2022 Proposed scenario with the 2022 Permitted Scenario, the number of people exposed to road traffic noise is forecast to remain almost constant, for all contour levels. The number of people assessed as highly annoyed by road traffic noise increases by under 0.5% from 7,497 to 7,527. The number of people exposed to at least a level of road traffic noise of 65 dB L_{den} or above increases from 8,968 to 9,009 (again an increase of less than 0.5%), excluding consented developments.

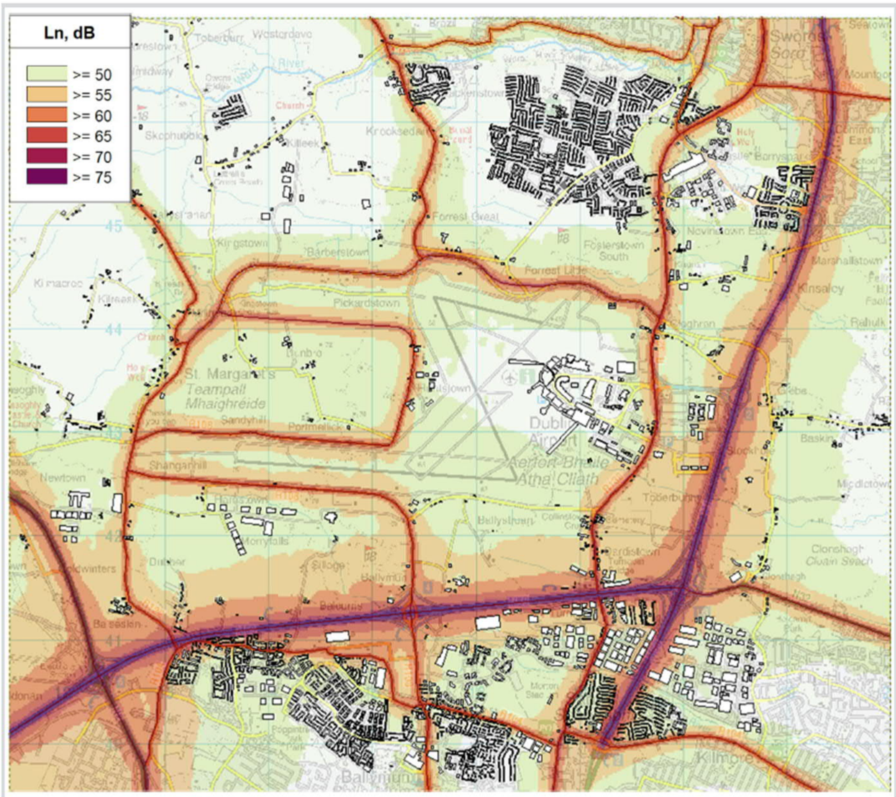
14.7.141 It is important to consider the change in noise level when assessing the differences between the scenarios. Going from the 2022 Permitted Scenario to the 2022 Proposed Scenario, the changes that do arise are under 0.5 dB(A). Consequently, no people are assessed as having a significant effect, either beneficial or adverse.

2022 Proposed Scenario L_{night} Metric – Road Traffic Noise

14.7.142 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. For the 2022 Proposed Scenario these are based on forecast road traffic flows. The results are detailed below and are also presented in Appendix 14F.

14.7.143 The noise contours for 2022 are shown in Plate 14-14.

Plate 14-14: 2022 L_{night} Road Traffic Noise Contours



14.7.144 The noise contours show that the highest noise level of 65 dB L_{night} and above are concentrated along the M1 and M50 motorways. Closer to the other roads modelled noise levels are often above 55 dB L_{night} and in most areas the noise levels are above 50 dB L_{night}.

14.7.145 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2022 Proposed Scenario in terms of the L_{night} metric are given in Table 14-75, where they are compared with the 2022 Permitted Scenario.

Table 14-75: 2022 Proposed Scenario Road Traffic Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Road Traffic Noise Level, dB (L_{night})	
		2022 Proposed Scenario	*Difference to 2022 Permitted Scenario*
Ridgewood	GR01	44	+0
The Baskins	GR02	50	+0
Mayeston Hall	GR03	63	+0
St Margret's	GR04	48	+0
Note – values rounded to nearest whole number. Differences based on unrounded values.			

14.7.146 L_{night} noise levels at the receptors are not forecast to increase compared to the 2022 Permitted Scenario when rounded to the nearest whole number. The changes that do arise are illustrated in Appendix 14F and are under 0.5 dB(A).

14.7.147 For the 2022 Proposed Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-76.

Table 14-76: Number of Dwellings and Population in 2022 Proposed Scenario L_{night} Contours – Road Traffic Noise

Scenario	2022 Proposed Scenario			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	13,456	38,243	14,675	41,791
50	8,234	23,271	9,312	26,376
55	4,158	11,511	4,845	13,431
60	2,650	7,275	3,118	8,561
65	1,088	3,050	1,243	3,469

14.7.148 The number of people assessed to be highly sleep disturbed by road traffic noise in the 2022 Proposed Scenario is given in Table 14-77, where it is compared with the 2022 Permitted Scenario.

Table 14-77: Number of People Highly Sleep Disturbed by Road Traffic Noise – 2022 Proposed vs 2022 Permitted

Scenario	No. People Highly Sleep Disturbed by Road Traffic Noise	
	Excluding Consented Developments	Including Consented Developments
2022 Proposed	2,282	2,548
2022 Permitted	2,263	2,529

14.7.149 Comparing the 2022 Proposed Scenario with the 2022 Permitted scenario, the number of people exposed to road traffic noise is forecast to remain almost constant, for all contour levels. The number of people assessed as highly sleep disturbed by road traffic noise increases by under 1% from 2,263 to 2,282. The number of people exposed to at least a level of road traffic noise of 60 dB L_{night} or above increases from 7,087 to 7,275, excluding consented developments.

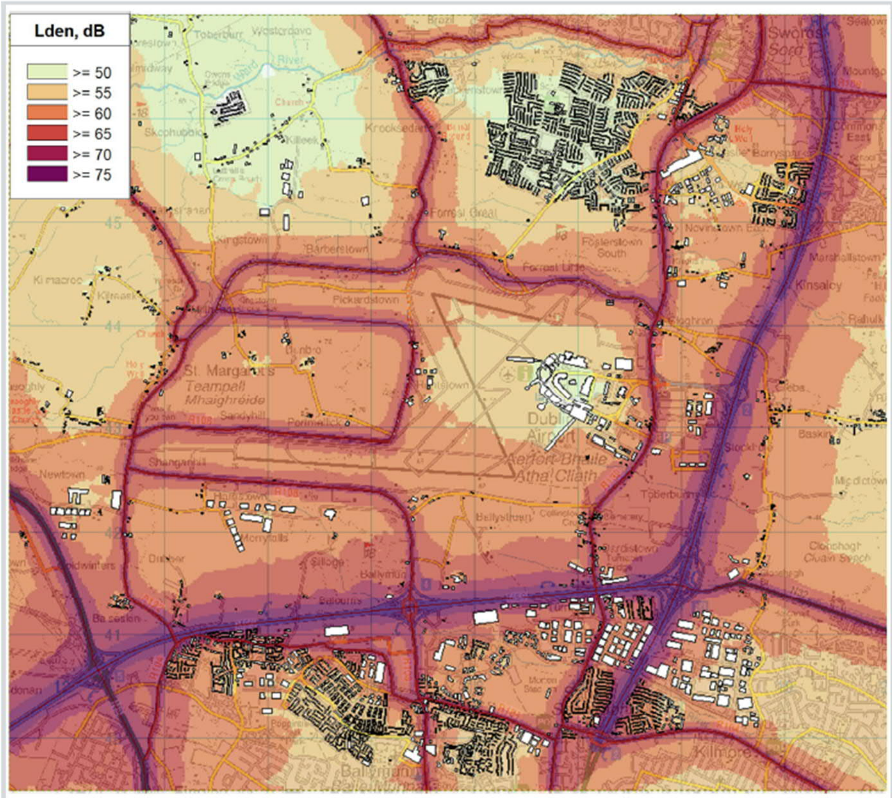
14.7.150 It is important to consider the change in noise level when assessing the differences between the scenarios. Going from the 2022 Permitted Scenario to the 2022 Proposed Scenario, the changes that do arise are under 0.5 dB(A). Consequently, no people are assessed as having a significant effect, either beneficial or adverse.

2025 Proposed Scenario L_{den} Metric – Road Traffic Noise

14.7.151 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. For the 2025 Proposed Scenario these are based on forecast road traffic flows. The results are detailed below and are also presented in Appendix 14F.

14.7.152 The noise contours for 2025 are shown in Plate 14-15.

Plate 14-15: 2025 L_{den} Road Traffic Noise Contours



14.7.153 The noise contours show that the highest noise level of 70 dB L_{den} and above are concentrated along the M1 and M50 motorways. Closer to the other roads modelled noise levels are often above 65 dB L_{den} and in almost all areas the noise levels are above 50 dB L_{den}.

14.7.154 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2025 Proposed Scenario in terms of the L_{den} metric are given in Table 14-78, where they are compared with the 2025 Permitted Scenario.

Table 14-78: 2025 Proposed Scenario Road Traffic Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Road Traffic Noise Level, dB (L_{den})	
		2025 Proposed Scenario	*Difference to 2025 Permitted Scenario*
Ridgewood	GR01	53	+0
The Baskins	GR02	60	+0
Mayeston Hall	GR03	73	+0

Representative Location	Reference No.	Road Traffic Noise Level, dB (L_{den})	
St Margret's	GR04	58	+0
Note – values rounded to nearest whole number. Differences based on unrounded values.			

14.7.155 L_{den} noise levels at the receptors are not forecast to increase compared to the 2025 Permitted Scenario when rounded to the nearest whole number. The changes that do arise are illustrated in Appendix 14F and are under 0.5 dB(A).

14.7.156 For the 2025 Proposed Scenario L_{den} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-79.

Table 14-79: Number of Dwellings and Population in 2025 Proposed Scenario L_{den} Contours – Road Traffic Noise

Scenario	2025 Proposed Scenario			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	17,534	50,587	18,803	54,329
55	13,186	37,443	14,405	40,991
60	7,880	22,202	8,948	25,270
65	3,990	11,038	4,673	12,919
70	2,505	6,850	2,942	8,036

14.7.157 The number of people assessed to be highly annoyed by road traffic noise in the 2025 Proposed Scenario is given in Table 14-80, where it is compared with the 2025 Permitted Scenario.

Table 14-80: Number of People Highly Annoyed by Road Traffic Noise – 2025 Proposed vs 2025 Permitted

Scenario	No. People Highly Annoyed by Road Traffic Noise	
	Excluding Consented Developments	Including Consented Developments
2025 Proposed	8,607	9,485
2025 Permitted	8,580	9,454

14.7.158 Comparing the 2025 Proposed scenario with the 2025 Permitted Scenario, the number of people exposed to road traffic noise is forecast to remain almost constant, for all contour levels. The number of people assessed as highly annoyed by road traffic noise increases by under 0.5% from 8,580 to 8,607. The number of people exposed to at least a level of road traffic noise of 65 dB L_{den} or above increases from 11,013 to 11,038 (an increase of less than 0.25%), excluding consented developments.

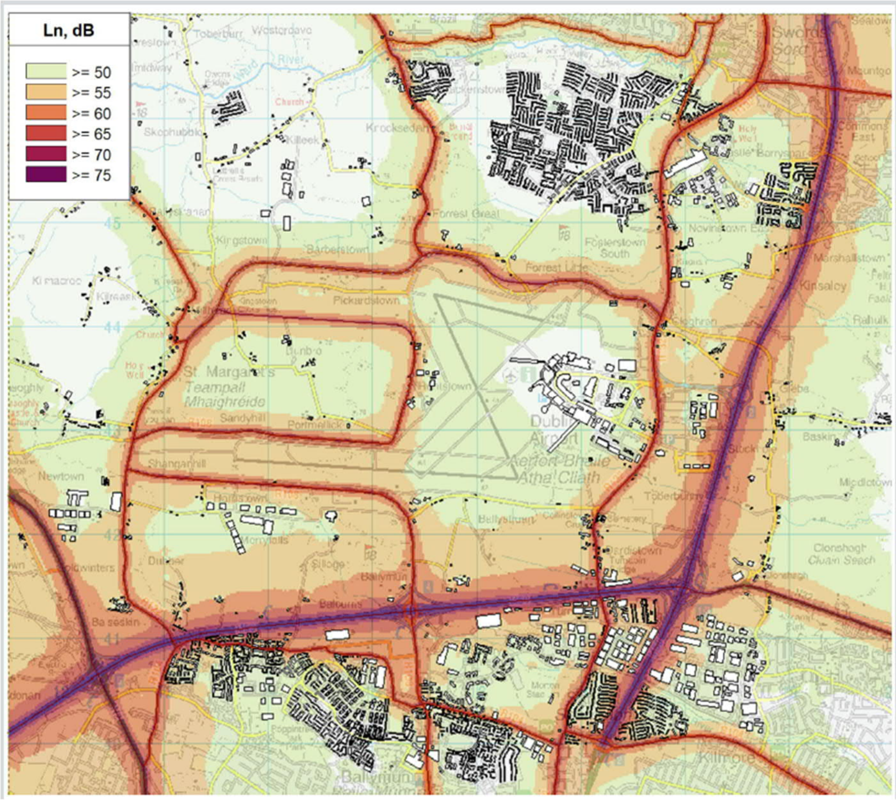
14.7.159 It is important to consider the change in noise level when assessing the differences between the scenarios. Going from the 2025 Permitted Scenario to the 2025 Proposed Scenario, the changes that do arise are under 0.5 dB(A). Consequently, no people are assessed as having a significant effect, either beneficial or adverse.

2025 Proposed Scenario L_{night} Metric – Road Traffic Noise

14.7.160 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. For the 2025 Proposed Scenario these are based on forecast road traffic flows. The results are detailed below and are also presented in Appendix 14F.

14.7.161 The noise contours for 2025 are shown in Plate 14-16.

Plate 14-16: 2025 L_{night} Road Traffic Noise Contours



14.7.162 The noise contours show that the highest noise level of 65 dB L_{night} and above are concentrated along the M1 and M50 motorways. Closer to the other roads modelled noise levels are often above 55 dB L_{night} and in most areas the noise levels are above 50 dB L_{night}.

14.7.163 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2025 Proposed Scenario in terms of the L_{night} metric are given in Table 14-81, where they are compared with the 2025 Permitted Scenario.

Table 14-81: 2025 Proposed Scenario Road Traffic Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Road Traffic Noise Level, dB (L_{night})	
		2025 Proposed Scenario	*Difference to 2025 Permitted Scenario*
Ridgewood	GR01	46	+0
The Baskins	GR02	52	+0
Mayeston Hall	GR03	64	+0
St Margret's	GR04	50	+0
Note – values rounded to nearest whole number. Differences based on unrounded values.			

14.7.164 L_{night} noise levels at receptors at the receptors are not forecast to increase compared to the 2025 Permitted Scenario when rounded to the nearest whole number. The changes that do arise are illustrated in Appendix 14F and are under 0.5 dB(A).

14.7.165 For the 2025 Proposed Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-82.

Table 14-82: Number of Dwellings and Population in 2025 Proposed Scenario L_{night} Contours – Road Traffic Noise

Scenario	2025 Proposed Scenario			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	14,694	42,003	15,963	45,745
50	9,791	27,664	10,906	30,896
55	4,792	13,317	5,604	15,575
60	2,838	7,819	3,306	9,105
65	1,784	4,942	1,991	5,489

14.7.166 The number of people assessed to be highly sleep disturbed by road traffic noise in the 2025 Proposed Scenario is given in Table 14-83, where it is compared with the 2025 Permitted Scenario.

Table 14-83: Number of People Highly Sleep Disturbed by Road Traffic Noise – 2025 Proposed vs 2025 Permitted

Scenario	**No. People Highly Sleep Disturbed by Road Traffic Noise**	
	Excluding Consented Developments	**Including Consented Developments**
2025 Proposed	2,619	2,916
2025 Permitted	2,598	2,893

14.7.167 Comparing 2025 Proposed Scenario with the 2025 Permitted scenario, the number of people exposed to road traffic noise is forecast to remain almost constant, for all contour levels. The number of people assessed as highly sleep disturbed by road traffic noise increases by under 1% from 2,598 to 2,619. The number of people exposed to at least a level of road traffic noise of 60 dB L_{night} or above increases from 7,798 to 7,819, excluding consented developments.

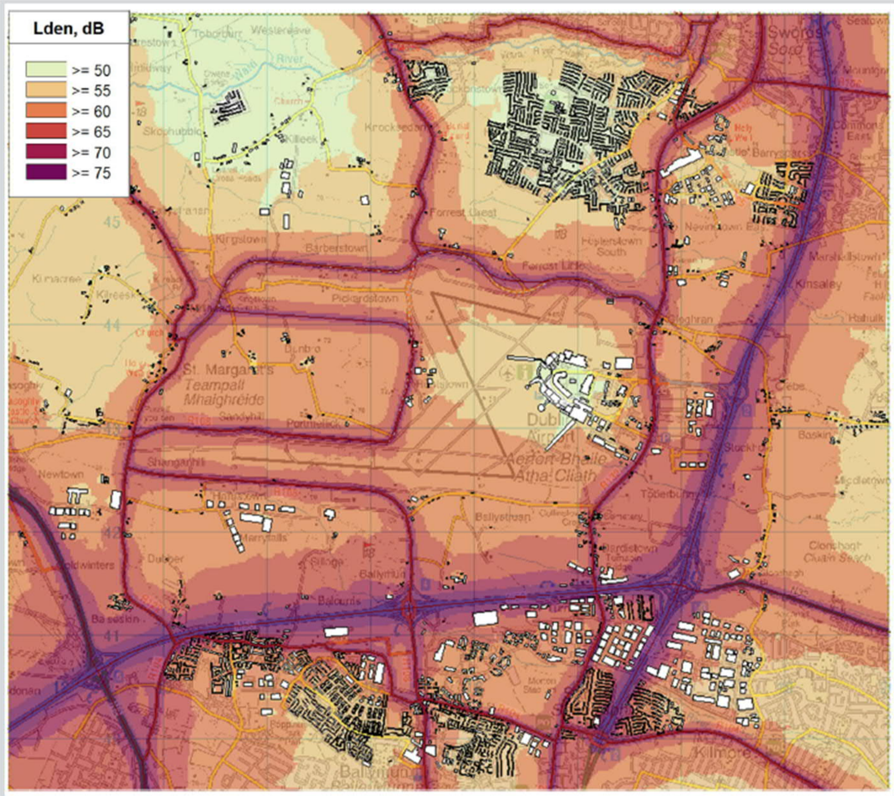
14.7.168 It is important to consider the change in noise level when assessing the differences between the scenarios. Going from the 2025 Permitted Scenario to the 2025 Proposed Scenario, the changes that do arise are under 0.5 dB(A). Consequently, no people are assessed as having a significant effect, either beneficial or adverse.

2035 Proposed Scenario L_{den} Metric – Road Traffic Noise

14.7.169 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 14.3. For the 2035 Proposed Scenario these are based on forecast road traffic flows. The results are detailed below and are also presented in Appendix 14F.

14.7.170 The noise contours for 2025 are shown in Plate 14-17.

Plate 14-17: 2035 L_{den} Road Traffic Noise Contours



14.7.171 The noise contours show that the highest noise level of 70 dB L_{den} and above are concentrated along the M1 and M50 motorways. Closer to the other roads modelled noise levels are often above 65 dB L_{den} and in almost all areas the noise levels are above 50 dB L_{den}.

14.7.172 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2035 Proposed Scenario in terms of the L_{den} metric are given in Table 14-84, where they are compared with the 2035 Permitted Scenario.

Table 14-84: 2035 Proposed Scenario Road Traffic Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Road Traffic Noise Level, dB (L_{den})	
		2035 Proposed Scenario	*Difference to 2035 Permitted Scenario*
Ridgewood	GR01	54	+0
The Baskins	GR02	60	+0
Mayeston Hall	GR03	73	+0
St Margret's	GR04	58	+0

Note – values rounded to nearest whole number. Differences based on unrounded values.

14.7.173 L_{den} noise levels at receptors not forecast to increase compared to the 2035 Permitted Scenario when rounded to the nearest whole number. The changes that do arise are illustrated in Appendix 14F and are under 0.5 dB(A).

14.7.174 For the 2035 Permitted Scenario L_{den} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-85.

Table 14-85: Number of Dwellings and Population in 2035 Proposed Scenario L_{den} Contours – Road Traffic Noise

Scenario	2035 Proposed Scenario			
Contour L_{den} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
50	17,719	51,184	18,988	54,926
55	13,525	38,463	14,744	42,011
60	8,173	23,070	9,249	26,168
65	4,084	11,292	4,800	13,280
70	2,583	7,084	3,051	8,370

14.7.175 The number of people assessed to be highly annoyed by road traffic noise in the 2035 Proposed Scenario is given in Table 14-86, where it is compared with the 2035 Permitted Scenario.

Table 14-86: Number of People Highly Annoyed by Road Traffic Noise – 2035 Proposed vs 2035 Permitted

Scenario	No. People Highly Annoyed by Road Traffic Noise	
	Excluding Consented Developments	Including Consented Developments
2035 Proposed	8,835	9,728
2035 Permitted	8,825	9,715

14.7.176 Comparing the 2035 Proposed scenario with the 2035 Permitted Scenario, the number of people exposed to road traffic noise is forecast to remain almost constant, for all contour levels. The number of people assessed as highly annoyed by road traffic noise increases by just over 0.1% from 8,825 to 8,835. The number of people exposed to at least a level of road traffic noise of 65 dB L_{den} or above increases from 11,197 to 11,292, excluding consented developments.

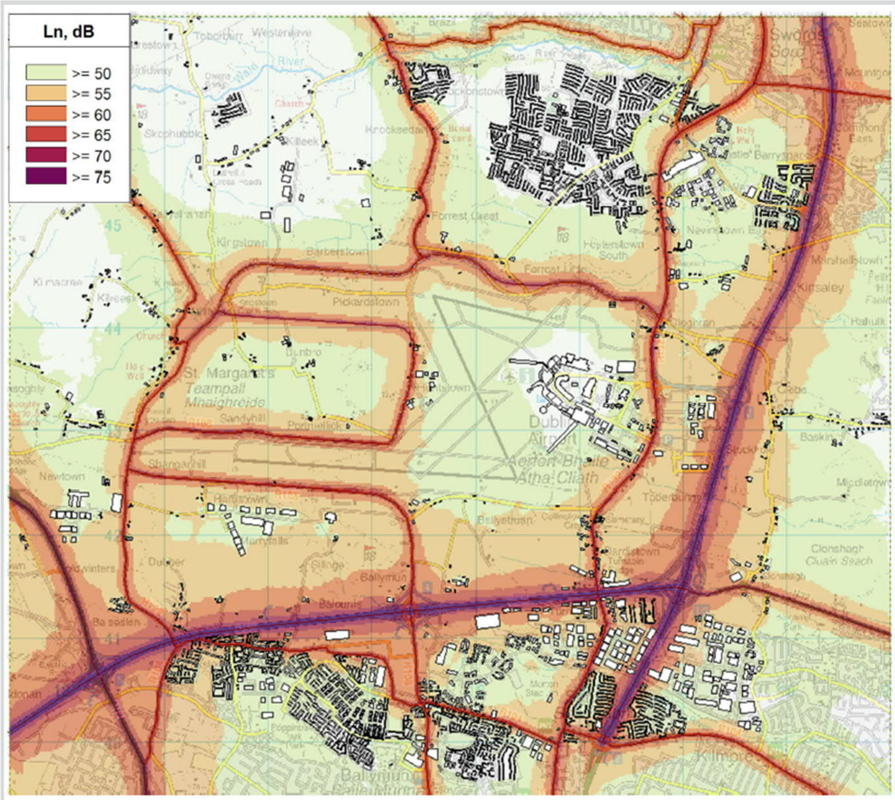
14.7.177 It is important to consider the change in noise level when assessing the differences between the scenarios. Going from the 2035 Permitted Scenario to the 2035 Proposed Scenario, the changes that do arise are under 0.5 dB(A). Consequently, no people are assessed as having a significant effect, either beneficial or adverse.

2035 Proposed Scenario L_{night} Metric – Road Traffic Noise

14.7.178 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 14.3. For the 2035 Proposed Scenario these are based on forecast road traffic flows. The results are detailed below and are also presented in Appendix 14F.

14.7.179 The noise contours for 2035 are shown in Plate 14-18.

Plate 14-18: 2035 L_{night} Road Traffic Noise Contours



14.7.180 The noise contours show that the highest noise level of 65 dB L_{night} and above are concentrated along the M1 and M50 motorways. Closer to the other roads modelled noise levels are often above 55 dB L_{night} and in most areas the noise levels are above 50 dB L_{night}.

14.7.181 To provide further information on changes in the noise environment for specific communities, the methodology described in Section 14.3 has also been used to make predictions of the noise levels at a number of representative locations which are shown on Plate 14-3. The results of these predictions for the 2035 Proposed Scenario in terms of the L_{night} metric are given in Table 14-87, where they are compared with the 2035 Permitted Scenario.

Table 14-87: 2035 Proposed Scenario Road Traffic Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Road Traffic Noise Level, dB (L_{night})	
		2035 Proposed Scenario	*Difference to 2035 Permitted Scenario*
Ridgewood	GR01	46	+0
The Baskins	GR02	52	+0
Mayeston Hall	GR03	65	+0
St Margret's	GR04	50	+0
Note – values rounded to nearest whole number. Differences based on unrounded values.			

14.7.182 L_{night} noise levels at receptors at the receptors are not forecast to increase compared to the 2035 Permitted Scenario when rounded to the nearest whole number. The changes that do arise are illustrated in Appendix 14F and are under 0.5 dB(A).

14.7.183 For the 2035 Proposed Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also including consented developments. The results are given by contour in Table 14-88.

Table 14-88: Number of Dwellings and Population in 2035 Proposed Scenario L_{night} Contours – Road Traffic Noise

Scenario	2035 Proposed Scenario			
Contour L_{night} (dB)	*Excluding Consented Developments*		*Including Consented Developments*	
	Dwellings	*Population.*	*Dwellings*	*Population*
45	15,094	43,206	16,363	46,948
50	10,131	28,621	11,250	31,869
55	5,085	14,210	5,936	16,594
60	2,865	7,901	3,368	9,284
65	1,868	5,077	2,075	5,624

14.7.184 The number of people assessed to be highly sleep disturbed by road traffic noise in the 2035 Proposed Scenario is given in Table 14-89, where it is compared with the 2035 Permitted Scenario.

Table 14-89: Number of People Highly Sleep Disturbed by Road Traffic Noise – 2035 Proposed vs 2035 Permitted

Scenario	No. People Highly Sleep Disturbed by Road Traffic Noise	
	Excluding Consented Developments	Including Consented Developments
2035 Proposed	2,715	3,017
2035 Permitted	2,698	2,998

14.7.185 Comparing 2035 Proposed Scenario with the 2035 Permitted scenario, the number of people exposed to road traffic noise is forecast to remain almost constant, for all contour levels. The number of people assessed as highly sleep disturbed by road traffic noise increases by under 1% from 2,698 to 2,715. The number of people exposed to at least a level of road traffic noise of 60 dB L_{night} or above increases from 7,895 to 7,901, excluding consented developments.

14.7.186 It is important to consider the change in noise level when assessing the differences between the scenarios. Going from the 2035 Permitted Scenario to the 2035 Proposed Scenario, the changes that do arise are under 0.5 dB(A). Consequently, no people are assessed as having a significant effect, either beneficial or adverse.

Effects During Operation with Proposed Relevant Action and Apron 5H

Total Ground Noise from Aircraft and Road Traffic

14.7.187 This chapter has considered noise from two different sources on the ground, namely aircraft ground noise and road traffic noise. The character of the two noise sources differs, with the aircraft ground noise a combination of periods of steady noise from auxiliary power units interspersed with noise from taxiing aircraft, whereas the road traffic noise is from multiple vehicle passbys which result in a relatively steady noise for busy roads, such as many of those in the vicinity of Dublin Airport.

14.7.188 As discussed previously in relation to assessing the number of people highly annoyed, the World Health Organisation's Environmental Noise Guidelines 2018, as endorsed by the European Commission through Directive 2020/367, provide methods for calculating the number of people highly annoyed by specific noise sources. It is therefore consistent, when considering the significance of noise effects to consider each of the noise sources in isolation.

14.7.189 Combining the noise levels from individual noise sources can be undertaken, subject to an assumption as to which noise metric best represents the in-combination noise emissions at receptors, but there are no current standards or guidance available specific to the consideration of in-combination noise effects associated with the Relevant Action.

14.7.190 When considering combined noise levels, a number of factors also need to be considered. While the resulting noise level will be higher than for the individual sources unless one source is much louder than the others (in which case the combined noise level will be the same as that of the loudest individual source), the change in noise level will be no higher than the largest change for any of the individual sources, often being lower than this in situations where more than one source is relevant to the combined noise level or the largest change is not by the loudest source. Consequently, the significance of a source that experiences the largest change in noise level might be under-represented if a louder source shows a smaller change.

14.7.191 Despite these limitations, to provide information on the relative contribution of the noise sources the L_{den} and L_{night} noise metrics have been used to represent the relative contributions of the noise sources in isolation and cumulatively under the Permitted scenario and the Apron 5H scenario. This has been undertaken for representative locations, with the L_{den} noise levels for the assessment years 2022, 2025 and 2035 given in Table 14-90 to Table 14-92.

Table 14-90: 2022 Aircraft Ground Noise and Road Traffic Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Ground Noise Level, dB (L_{den})						
		Permitted Scenario			*Apron 5H Scenario*			*Change*
		Aircraft	*Road*	*Total*	*Aircraft*	*Road*	*Total*	*Total*
Ridgewood	GR01	54	52	56	56	52	57	+1
The Baskins	GR02	46	58	59	48	58	59	+0
Mayeston Hall	GR03	53	71	71	55	71	72	+0
St Margret's	GR04	48	56	57	49	56	57	+0

Note – values rounded to nearest whole number. Differences based on unrounded values.

Table 14-91: 2025 Aircraft Ground Noise and Road Traffic Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Ground Noise Level, dB (L_{den})						
		Permitted Scenario			*Apron 5H Scenario*			*Change*
		Aircraft	*Road*	*Total*	*Aircraft*	*Road*	*Total*	*Total*
Ridgewood	GR01	55	53	57	56	53	58	+1
The Baskins	GR02	47	60	60	48	60	60	+0
Mayeston Hall	GR03	55	73	73	56	73	73	+0
St Margret's	GR04	49	57	58	50	58	58	+0

Note – values rounded to nearest whole number. Differences based on unrounded values.

Table 14-92: 2035 Aircraft Ground Noise and Road Traffic Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Ground Noise Level, dB (L_{den})						
		Permitted Scenario			*Apron 5H Scenario*			*Change*
		Aircraft	*Road*	*Total*	*Aircraft*	*Road*	*Total*	*Total*
Ridgewood	GR01	55	54	58	56	54	58	+1
The Baskins	GR02	47	60	61	48	60	61	+0
Mayeston Hall	GR03	55	73	73	56	73	73	+0
St Margret's	GR04	49	58	59	50	58	59	+0
Note – values rounded to nearest whole number. Differences based on unrounded values.								

14.7.192 For each of the three assessment years the situation is similar, but there is a difference depending on the location. For the location in Ridgewood (GR01) the aircraft ground noise is generally 2 dB(A) greater than the road traffic noise. This means that the resulting total ground noise is generally 2 dB(A) greater than the aircraft ground noise. In each assessment year the increase in the total ground noise from the Permitted scenario to the Apron 5H scenario is 1 dB(A), the same or just less than the increase in the aircraft ground noise.

14.7.193 For the other locations, the road traffic noise is considerably higher than the aircraft ground noise. This results in the total ground noise either being the same as the road traffic noise, when rounded to the nearest whole number, or 1 dB(A) higher. In each assessment year no change in the total ground noise from the Permitted scenario to the Apron 5H scenario is found, despite increases in the aircraft ground noise of 1 or 2 dB(A).

14.7.194 The relative contribution of the noise sources in terms of the L_{night} noise metric under the Permitted Scenario and the Apron 5H Scenario for the assessment years 2022, 2025 and 2035 given in Table 14-93 to Table 14-95.

Table 14-93: 2022 Aircraft Ground Noise and Road Traffic Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Ground Noise Level, dB (L_{night})						
		Permitted Scenario			*Apron 5H Scenario*			*Change*
		Aircraft	*Road*	*Total*	*Aircraft*	*Road*	*Total*	*Total*
Ridgewood	GR01	42	44	46	47	44	49	+3
The Baskins	GR02	37	50	50	40	50	51	+0
Mayeston Hall	GR03	45	63	63	47	63	63	+0
St Margret's	GR04	39	48	49	41	48	49	+0
Note – values rounded to nearest whole number. Differences based on unrounded values.								

Table 14-94: 2025 Aircraft Ground Noise and Road Traffic Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Ground Noise Level, dB (L_{night})						
		Permitted Scenario			*Apron 5H Scenario*			*Change*
		Aircraft	*Road*	*Total*	*Aircraft*	*Road*	*Total*	*Total*
Ridgewood	GR01	43	46	47	47	46	50	+2
The Baskins	GR02	38	52	52	40	52	52	+0
Mayeston Hall	GR03	46	64	64	48	64	65	+0
St Margret's	GR04	40	50	50	42	50	50	+0

Note – values rounded to nearest whole number. Differences based on unrounded values.

Table 14-95: 2035 Aircraft Ground Noise and Road Traffic Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Ground Noise Level, dB (L_{night})						
		Permitted Scenario			*Apron 5H Scenario*			*Change*
		Aircraft	*Road*	*Total*	*Aircraft*	*Road*	*Total*	*Total*
Ridgewood	GR01	43	46	48	47	46	50	+2
The Baskins	GR02	37	52	52	40	52	53	+0
Mayeston Hall	GR03	46	65	65	48	65	65	+0
St Margret's	GR04	40	50	51	42	50	51	+0

Note – values rounded to nearest whole number. Differences based on unrounded values.

14.7.195 For each of the three assessment years the situation is similar, but there is a difference depending on the location. For the location in Ridgewood (GR01) the aircraft ground noise is less than the road traffic noise under the Permitted Scenario but is greater than the road traffic noise under the Apron 5H Scenario. This means that the change in the total ground noise between the two scenarios is less than the change in aircraft ground noise in isolation. In each assessment year the increase in the total ground noise from the Permitted Scenario to the Apron 5H Scenario is 2 or 3 dB(A), 2 dB(A) less than the increase in the aircraft ground noise.

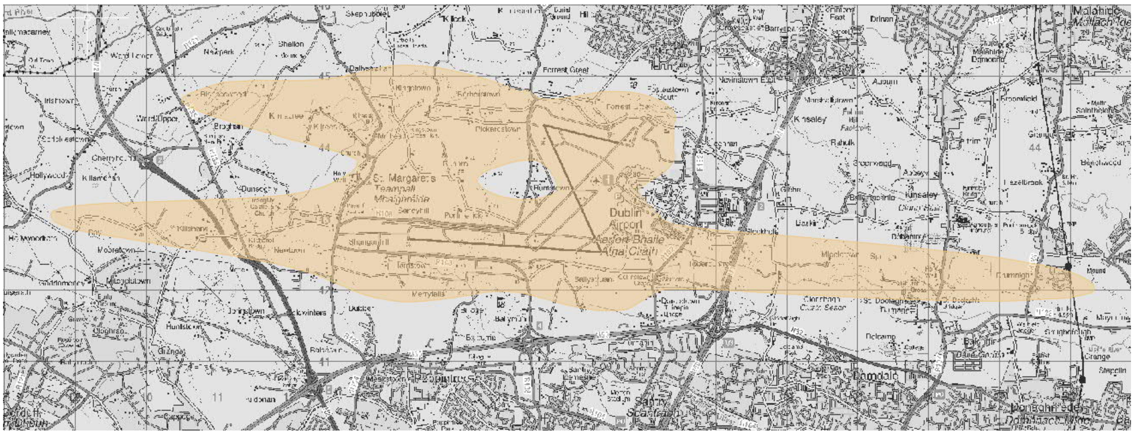
14.7.196 For the other locations, the road traffic noise is considerably higher than the aircraft ground noise. This results in the total ground noise either being the same as the road traffic noise, when rounded to the nearest whole number, or 1 dB(A) higher. In each assessment year no change in the total ground noise from the Permitted scenario to the Apron 5H Scenario is found, despite increases in the aircraft ground noise of 2 or 3 dB(A).

14.8 Mitigation and Monitoring

Mitigation During Operation of Proposed Relevant Action

14.8.1 In addition to the mitigation measures already in place at Dublin Airport, as part of this application the Applicant is proposing mitigation measures in relation to the air noise effects which are described in *Chapter 13: Aircraft Noise and Vibration*. Of relevance to the ground noise effects is the proposal to enhance the sound insulation scheme such that dwellings will be eligible for a grant to pay for sound insulation improvement works based on their night time air noise level. The area this is expected to include is shown in Plate 14-19. No specific mitigation is proposed based on ground noise, however properties which benefit from this scheme based on their air noise level will also benefit from a reduction in the ground noise level. The area forecast to be eligible for the proposed insulation scheme in 2025 is shown in Plate 14-19.

Plate 14-19: Forecast Boundary of Proposed Sound Insulation Scheme – 2025



14.9 Residual Effects and Conclusions

14.9.1 In relation to road traffic noise the expected changes are such that no people are assessed as having a significant effect, either beneficial or adverse. There are therefore no residual effects from road traffic noise as a result of the Relevant Action.

14.9.2 When it comes to aircraft ground noise, the commonly accepted metrics for assessment all relate to external noise levels. Therefore, the assessment of effects presented in Section 14.7 does not allow for any benefit of the residential sound insulation schemes, as sound insulation reduces the internal noise level. However, the internal noise level is more representative of the effects, in particular for night noise which is the main focus of this application.

14.9.3 To assess the residual effects, the benefit of the residential sound insulation schemes has been allowed for by considering a residual effective noise level for properties with sound insulation of 5 dB(A) lower than the modelled noise level.

14.9.4 Dwellings eligible for the existing schemes in a given scenario have been considered here as having a reduction of 5 dB for both their L_{den} and L_{night} exposure, on the basis that the existing schemes offer to insulate the whole property.

14.9.5 Dwellings not eligible for the existing schemes but eligible for the new scheme proposed as part of this application have been considered here as having a reduction of 5 dB for their L_{night} exposure, and a reduction of 5 dB for the night component of their L_{den} exposure, on the basis that the new scheme is intended to cover insulation of bedrooms.

14.9.6 The assumed 5 dB(A) reduction is based on testing carried out on a sample of the properties treated under the existing scheme, which found that a reduction of at least 5 dB(A) in the internal noise level has been achieved in almost all cases.

14.9.7 This residual effective noise level has then been used to determine residual effects, following the same methodology as the assessment of effects in Section 14.7.

14.9.8 Allowing for the benefit of the residential sound insulation schemes in general reduces the number of people assessed with significant adverse effects and increases the number of people assessed with significant beneficial effects.

Likely Significant Environmental Effects

14.9.9 The residual effects, after the benefit of the residential sound insulation schemes has been allowed for, are summarised in Table 14-96 for the Proposed Scenario and Table 14-97 for the Apron 5H Scenario. These tables include all people in existing dwellings who are within the study area and are exposed to at least 45 dB L_{den} or 40 dB L_{night} in at least one of the scenarios.

Table 14-96: Summary of Residual Aircraft Ground Noise Effects, Proposed Scenario

Year	L_{den} Residual Effects Proposed Scenario			L_{night} Residual Effects Proposed Scenario		
	Significant Beneficial	Significant Adverse	Not Significant	Significant Beneficial	Significant Adverse	Not Significant
2022	0	0	49,156	0	3	36,426
2025	0	0	50,291	0	12	42,130
2035	0	0	50,291	0	12	42,130

Table 14-97: Summary of Residual Aircraft Ground Noise Effects, Apron 5H Scenario

Year	L_{den} Residual Effects Apron 5H Scenario			L_{night} Residual Effects Apron 5H Scenario		
	Significant Beneficial	Significant Adverse	Not Significant	Significant Beneficial	Significant Adverse	Not Significant
2022	0	0	49,432	0	6	37,523
2025	0	0	50,311	0	12	42,629
2035	0	0	50,311	0	12	42,629

14.9.10 Taking the L_{den} metric, there are no significant effects either beneficial or adverse under either the Proposed Scenario or the Apron 5H Scenario.

14.9.11 Taking the L_{night} metric, under the Proposed Scenario there are 3 people exposed to significant adverse effects in 2022, rising to 12 people in 2025 and 2035. Under the Apron 5H Scenario there are 6 people exposed to significant adverse effects in 2022, again rising to 12 people in 2025 and 2035.

14.9.12 Using a similar method, the residual noise levels assessed as high or very high can be calculated. These are presented in Table 14-98.

Table 14-98: Summary of People Exposed to High Residual Aircraft Ground Noise Levels

Scenario	No. People Exposed to High or Very High Residual L_{den} Noise Level	No. People Exposed to High or Very High Residual L_{night} Noise Level
2018	0	3
2022 Permitted	0	0
2025 Permitted	0	0
2035 Permitted	0	0
2022 Proposed	0	3
2025 Proposed	0	6
2035 Proposed	0	6
2022 Apron 5H	0	3
2025 Apron 5H	0	6
2035 Apron 5H	0	6

14.9.13 Considering the L_{den} results, there are no people exposed to a high residual noise level in any of the assessed scenarios.

14.9.14 Considering the L_{night} results, the number of people exposed to a high residual noise level is 0 in the Permitted scenarios, 3 in the 2018, 2022 Proposed Scenario and 2022 Apron 5H Scenario, and 6 in 2025 and 2035 under the Proposed Scenario and Apron 5H Scenario.

14.10 Cumulative Noise Effects

14.10.1 In addition to the ground noise from aircraft and road traffic considered by this chapter the Relevant Action will have an effect on the air noise generated by aircraft operations at the airport, as considered in *Chapter 13 : Aircraft Noise and Vibration*. This relates to the noise from the aircraft as they use the runway and the airspace around the airport.

14.10.2 Aircraft ground noise (i.e. the noise from aircraft on the ground) and air noise (i.e. the noise from aircraft in the air) have different characteristics. Aircraft ground noise consists of periods of relatively steady noise from APUs or taxiing aircraft which will last for at least a few minutes, whereas air noise consists of isolated events that will rise to a peak before falling again, generally lasting for less than a minute in total. Consequently, it is standard practice to consider the noise from each separately. This is consistent with the statement in the European Commission through Directive 2020/367 that:

"The exposure of the population shall be assessed independently for each noise source and harmful effect. Where the same people are simultaneously exposed to different noise sources, the harmful effects may -in general- not be cumulated. However, those effects may be compared to assess the relative importance of each noise."

14.10.3 Furthermore, the Dublin Airport Noise Action Plan 2019-2023 states that:

"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:

o Air noise; and

o Ground noise"

14.10.4 Consequently, the Residual effects for the Relevant Action are those described in Section 14.9 above and those given in Section 13.9 of *Chapter 13: Aircraft Noise and Vibration*.

14.10.5 Combining the noise levels can be undertaken, although there are no current standards or guidance available specific to the consideration of in-combination noise effects associated with the Relevant Action.

14.10.6 When considering combined noise levels, a number of factors also need to be considered. While the resulting noise level will be higher than for the individual sources unless one source is much louder than the others (in which case the combined noise level will be the same as that of the loudest individual source), the change in noise level will be no higher than the largest change for any of the individual sources, often being lower than this in situations where more than one source is relevant to the combined noise level or the largest change is not by the loudest source. Consequently, the significance of a source that experiences the largest change in noise level might be under-represented if a louder source shows a smaller change.

14.10.7 Despite these limitations, to provide information on the relative contribution of the air noise and total ground noise the L_{den} and L_{night} noise metrics have been used to represent the relative contributions in isolation and cumulatively under the Permitted Scenario and the Apron 5H Scenario. This has been undertaken for representative locations, with the L_{den} noise levels for the assessment years 2022, 2025 and 2035 is given in Table 14-99 to Table 14-101.

14.10.8 The representative locations are those used for the ground noise assessment. Additional locations were also used for the air noise assessment but they are further from the airport where aircraft ground noise levels would be very low.

Table 14-99: 2022 Total Ground Noise and Air Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			*Apron 5H Scenario*			*Change*
		Total Ground	*Air*	*Total*	*Total Ground*	*Air*	*Total*	*Total*
Ridgewood	GR01	56	56	59	57	58	61	+2
The Baskins	GR02	59	57	61	59	57	61	+0
Mayeston Hall	GR03	71	53	72	72	52	72	+0
St Margret's	GR04	57	61	63	57	62	63	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

Table 14-100: 2025 Total Ground Noise and Air Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			*Apron 5H Scenario*			*Change*
		Total Ground	*Air*	*Total*	*Total Ground*	*Air*	*Total*	*Total*
Ridgewood	GR01	57	56	60	58	59	61	+1
The Baskins	GR02	60	57	62	60	58	63	+0
Mayeston Hall	GR03	73	54	73	73	54	73	+0
St Margret's	GR04	58	62	64	58	63	64	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

Table 14-101: 2035 Total Ground Noise and Air Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			*Apron 5H Scenario*			*Change*
		Total Ground	*Air*	*Total*	*Total Ground*	*Air*	*Total*	*Total*
Ridgewood	GR01	58	54	59	58	56	60	+1
The Baskins	GR02	61	56	62	61	57	62	+0
Mayeston Hall	GR03	73	52	73	73	52	73	+0
St Margret's	GR04	59	60	62	59	60	63	+0

Note – values rounded to nearest whole number. Differences based on unrounded values.

14.10.9 The relative contribution from the noise sources is similar by scenario but varies by location. For Mayeston Hall (GR03) the total ground noise is considerably higher than the air noise from aircraft. This results in the total noise either being the same as the total ground noise, when rounded to the nearest whole number, or 1 dB(A) higher.

14.10.10 For the other locations the total ground noise and air noise are closer together, particularly for Ridgewood (GR01). For The Baskins (GR02) the total ground noise is higher with the difference increasing from 2 dB(A) in 2022 to 5 dB(A) in 2035 under the Permitted Scenario. For St Margret's (GR04) the air noise is higher with the difference reducing from 4 dB(A) in 2022 to 1 dB(A) in 2035 under the Permitted Scenario.

14.10.11 Considering the total noise, the increase from the Permitted Scenario to the Apron 5H Scenario for the location in Ridgewood (GR01) is 2 dB(A) in 2022 and 1 dB(A) in 2025 and 2035. For The Baskins (GR02) and Mayeston Hall (GR03) in each assessment year no change in the total noise is found. For St Margret's (GR04) an increase of 1 dB(A) is found in 2022 and 2025 but none in 2035.

14.10.12 The relative contribution of the air noise and total ground noise in terms of the L_{night} noise metric under the Permitted Scenario and the Apron 5H Scenario for the assessment years 2022, 2025 and 2035 is given in Table 14-102 to Table 14-104.

Table 14-102: 2022 Total Ground Noise and Air Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Noise Level, dB (L_{night})						
		Permitted Scenario			*Apron 5H Scenario*			*Change*
		Total Ground	*Air*	*Total*	*Total Ground*	*Air*	*Total*	*Total*
Ridgewood	GR01	46	41	47	49	49	52	+5
The Baskins	GR02	50	48	52	51	49	53	+1
Mayeston Hall	GR03	63	46	63	63	45	63	+0
St Margret's	GR04	49	52	53	49	54	55	+2
Note – values rounded to nearest whole number. Differences based on unrounded values.								

Table 14-103: 2025 Total Ground Noise and Air Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			*Apron 5H Scenario*			*Change*
		Total Ground	*Air*	*Total*	*Total Ground*	*Air*	*Total*	*Total*
Ridgewood	GR01	47	41	48	50	50	53	+4
The Baskins	GR02	52	48	54	52	50	54	+1
Mayeston Hall	GR03	64	47	64	65	47	65	+0
St Margret's	GR04	50	52	54	50	54	56	+1
Note – values rounded to nearest whole number. Differences based on unrounded values.								

Table 14-104: 2035 Total Ground Noise and Air Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{night})						
		Permitted Scenario			*Apron 5H Scenario*			*Change*
		Total Ground	*Air*	*Total*	*Total Ground*	*Air*	*Total*	*Total*
Ridgewood	GR01	48	39	48	50	47	52	+3
The Baskins	GR02	52	47	53	53	49	54	+1
Mayeston Hall	GR03	65	45	65	65	45	65	+0
St Margret's	GR04	51	50	53	51	52	54	+1
Note – values rounded to nearest whole number. Differences based on unrounded values.								

14.10.13 With the exception of Ridgewood (GR01) the relative contribution from the noise sources is similar by scenario but varies by location. For The Baskins (GR02) the total ground noise is higher with the difference highest in 2035. For St Margaret's (GR04) the air noise is generally higher but the difference reduces from 2022 such that by 2035 under the Permitted Scenario the total ground noise is just higher.

14.10.14 For Mayeston Hall (GR03) the total ground noise is considerably higher than the air noise due to the dominant effect of road traffic noise. This results in the total noise being the same as the total ground noise, when rounded to the nearest whole number.

14.10.15 For Ridgewood (GR01) under the Permitted Scenario the total ground noise is considerably higher, and the amount increases from 2022 to 2035. Under the Apron 5H Scenario the air noise is equal to the total ground noise in 2022 and 2025 but 3 dB(A) less in 2035.

14.10.16 Considering the total noise, the increase from the Permitted Scenario to the Apron 5H Scenario for the location in Ridgewood (GR01) is 5 dB(A) in 2022 and reduces to 3 dB(A) in 2035. In each assessment year for The Baskins (GR02) the increase is 1 dB(A) and for Mayeston Hall (GR03) no change in the total noise is found. For St Margaret's (GR04) an increase of 2 dB(A) is found in 2022 which reduces to 1 dB(A) in 2025 and 2035.

14.10.17 If similar criteria were used to assess the significance of the cumulative noise level as those which were used for the individual air noise and ground noise assessments presented in *Chapter 13: Aircraft Noise and Vibration* and in this chapter, none of the changes in L_{den} noise levels would be considered significant. The change in L_{night} noise levels would be considered significant for the Ridgewood location only. These conclusions are consistent with those of the assessments of individual noise sources.

14.11 Summary

14.11.1 This chapter has presented the likely significant effects from aircraft ground noise and road traffic noise as a result of the proposed Relevant Action.

14.11.2 This chapter has considered future forecast scenarios for the Assessment Years of 2022, 2025 and 2035 and has compared the situation in the Permitted and Proposed Scenarios. The current noise environment (2018) has also been described.

14.11.3 Consideration has also been given to the combined effect of the Relevant Action and the separate Apron 5H application. This resulted in larger effects so residual results have been presented based on the combined situation.

14.11.4 The chapter separately considers both the ground noise from aircraft ground operations, specifically taxiing and the use of auxiliary power units, and road traffic noise. Consideration is also given to the combined noise from these two sources, and also to the cumulative effects of the total ground noise (aircraft ground noise and road traffic noise) and the air noise considered in *Chapter 13: Aircraft Noise and Vibration*.

14.11.5 Two primary assessment metrics have been considered, one relating to the overall situation (L_{den}) and one just the situation at night (L_{night}). For each of these metrics the number of people exposed to various noise levels has been determined for each assessment scenario and an assessment of significant effects has been carried out.

14.11.6 Considering first the road traffic noise, due to the limited changes in the predicted noise levels no significant effects either beneficial or adverse are predicted with the Relevant Action. This finding is unaffected by whether the Apron 5H development proceeds.

14.11.7 For the aircraft ground noise, looking at the predicted number of people with significant residual effects, firstly considering the overall situation (L_{den} metric), in 2022, 2025 or 2035 with the Relevant Action and Apron 5H there are no forecast significant effects when compared with the corresponding Permitted Scenario.

14.11.8 Considering the night situation (L_{night} metric), looking at the predicted number of people with significant residual effects, there are no forecast significant beneficial effects with the Relevant Action and Apron 5H. In 2022 there are 3 people exposed to significant adverse effects under the Apron 5H Scenario and none under the Proposed Scenario. In 2025 and 2035 under both scenarios there are 9 people exposed to significant adverse effects in 2025 and 2035.

14.11.9 In accordance with standard industry practice it is generally not considered appropriate to combine the noise levels from the different noise sources for assessment purposes as they have different characteristics, and as such there are no current standards or guidance available to assess the effects of the in-combination noise levels. However, information is provided on their relative contributions to the overall noise environment at representative locations in accordance with the request from FCC.

What has changed since the EIAR was submitted in December?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections, including minor removals from and additions to the earlier text, the chapter has been revised to:

- Address additional assessment years requested by the Council
- Respond to the latest passenger growth forecasts at Dublin Airport
- Include detailed assessment of road traffic noise
- Include in-combination assessment of different noise sources

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

15. Terrestrial Biodiversity

15.1 Introduction

15.1.1 This chapter of the EIAR reports the finding of an appraisal of the effects of the proposed Relevant Action on terrestrial ecological features. The chapter sets out the relevant aspects of the Current State of the Environment and the Future Receiving Environment in terms of terrestrial biodiversity. It goes on to consider the impact of the proposed Relevant Action, which will be an operational change, to remove the numerical cap on the average number of flights permitted between the hours of 23:00 and 07:00 in the Permitted Scenario, replacing it with an annual night-time noise quota, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00.

15.1.2 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2027 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario. Around 7.1 million additional passengers will have used the airport in in the period 2022-2026 in the Proposed Scenario.

15.1.3 Also relevant to this chapter is the Appropriate Assessment (AA) Screening Report prepared for the proposed Relevant Action. This describes the screening exercise conducted, in accordance with the requirements of Article 6(3) of the Habitats Directive (see Section 15.2), to determine with the proposed Relevant Action, either individually or in combination with other plans or projects, would be likely to have a significant effect on a European site in view of the site's Conservation Objectives. This chapter and the AA Screening Report can be read in isolation and do not rely on one another.

15.2 Legislation and Planning Policy Context

Legislation

15.2.1 The following legislation is relevant to this chapter and has been considered during the assessment presented within it:

- Council Directive 1992/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive);
- Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (the Birds Directive);
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (as amended) (hereafter referred to as the Water Framework Directive (WFD));
- Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment and Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the EIA Directive);
- The Planning & Development Acts 2000 to 2020;
- The Wildlife Acts 1976 to 2018;
- Flora (Protection) Order 2015 S.I 356/2015 (the 'Flora Protection Order');
- Fisheries Acts 1959 to 2019;

- Inland Fisheries Acts 1959 to 2017; and
- Local Government (Water Pollution Acts) 1977-2007.

National Planning Policy and Guidance

15.2.2 The following national planning policies and guidance documents are also relevant to this chapter and have been considered throughout the assessment presented within it:

- Project Ireland 2040 – National Planning Framework (2018);
- Draft Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2017); and,
- National Biodiversity Action Plan 2017 – 2021.

Regional and Local Planning Policy

15.2.3 The following local planning policy is considered relevant to this assessment.

- Regional Spatial & Economic Strategy for the Eastern and Midland Region 2019-2031;
- Fingal Development Plan 2017-2023;
- Dublin Airport Local Area Plan (2020); and
- Dublin Airport Noise Action Plan 2019-2023**.**

International Guidance

15.2.4 The following international guidance documents are considered relevant to this assessment.

- Environmental Impact Assessment of Projects: Guidance on Screening (EC, 2017); and,
- Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment *in the UK and Ireland* (CIEEM, 2018).

15.3 Assessment Methodology

Ecological Impact Assessment

15.3.1 The assessment of ecological impacts described in this chapter has been conducted in accordance with the industry-standard best practice guidelines published by CIEEM (2018). The CIEEM guidelines require that assessment is only carried out for any ecological features identified within the Zone of influence (ZoI) which are sufficiently 'important' (e.g. designated sites, or habitats or species which are rare, threatened or rapidly declining (CIEEM, 2018)) and which could be significantly affected[1] by the particular project.

15.3.2 CIEEM (2018) methodology states that it is not necessary to carry out detailed assessment of features that are sufficiently widespread, unthreatened and resilient to project impacts and which will remain viable and sustainable, as these can be scoped out at an early stage of the assessment. Likewise, only the impacts of a project which could result in significant effects on important ecological features need to be assessed.

Zone of Influence

15.3.3 The ZoI of a proposed project is the area over which ecological features may be subject to significant effects (CIEEM, 2018) as a result of the proposed project and any associated activities.

[1] CIEEM (2018) defines a significant effect as follows: "… 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features'… In broad terms, significant effects encompass impacts on the structure and function of defined sites, habits or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)."

15.3.4 The ZoI will vary for different ecological features depending on their sensitivity to an environmental change. It is therefore appropriate to identify different ZoI for different features. The features affected could include designated sites, habitats, species, and the processes on which they depend.

15.3.5 It is also important to acknowledge, as per EPA (2017) draft guidance, "*that the absence of a designation or documented feature does not mean that no such feature exists within the site*". As such, ZoI should be identified for all features potentially occurring within or near to the proposed Relevant Action, in addition to any known to occur. Thus, the ZoI for effects on terrestrial biodiversity arising as a result of the proposed Relevant Action was taken to be 5 km.

15.3.6 Note that the ZoI used in the AA Screening Report was taken to be all 'European sites' (SACs and SPAs) which will be subject to maximum noise levels (LMax) of greater than 60 dB(A) from passing aircraft, and which have animal species (not including snails) as QI / SCI. On a precautionary basis, sites further afield in and around Dublin Bay were also included. A larger ZoI was used for the AA Screening than in this EIAR as European sites, which are designated under the Habitats Directive and Birds Directive, are inherently more important and require to be assessed in accordance with the requirements to article 6(3) of the Habitats Directive. There is no contradiction between this EIAR chapter and the AA Screening Report by virtue of the different ZoI.

15.3.7 There is one European site within the 5 km ZoI of the North Runway – Malahide Estuary SPA.

Baseline Surveys and Sensitive Receptors

15.3.8 An ecological walkover survey of the North Runway was carried out on 11 March 2020. Habitats were classified according to *A Guide to Habitats in Ireland* (Fossitt, 2000)[2] and were visually assessed to determine their potential to support protected species. Where safe access was possible, the surveyors searched for signs of any protected or notable species within the North Runway site.

15.3.9 The North Runway was under construction during the ecological walkover survey carried out in March 2020. No evidence of protected species was found during the survey in March 2020 and the habitats present were almost entirely hard-standing, an active construction site, bare ground, or heavily managed, mown grassland. These habitats are of very low ecological value and provide very limited opportunity for protected species (e.g. for resting or foraging).

15.3.10 Wintering bird surveys were also completed in 2018/19 from the road network surrounding the North Runway. There were very few birds of high conservation concern in the vicinity of the North Runway, with only single observations of curlew *Numenius arquata*, golden plover *Pluvialis apricaria* and lapwing *Vanellus vanellus*, and multiple (but still a small number) of observations of herring gull *Larus argentatus* and black-headed gull *Croicocephalus ridibundus*. Details are given in Appendix 15.A.

Methodology for Determining Construction Effects

15.3.11 There will be no change to the extent of excavation or size of structures required due to there being no changes to the physical infrastructure of North Runway, or wider airport. Therefore, the proposed Relevant Action will not result in any construction related terrestrial habitat effects, and further assessment of construction effects is not required.

Methodology for Determining Operational Effects

15.3.12 The potential operational impacts on terrestrial biodiversity include:

- Noise disturbance to important fauna species as a result of additional night-time flights; and
- Killing of or injury to important fauna species as a result of additional night-time flights.

15.3.13 The potential for operational effects on European sites is considered in detail in the AA Screening Report and not repeated here as they are outside the study area for this chapter.

[2] Fossitt, J. A. (2000). A Guide to Habitats in Ireland. The Heritage Council, Ireland

Limitations and Assumptions

15.3.14 There are no limitations to the assessment of potential effects on ecological features presented in this chapter.

15.4 Current State of the Environment

15.4.1 The study area for this chapter is the airport campus, including the North Runway, and the ZoI defined in section 15.3.

European Sites

15.4.2 The Malahide Estuary SPA and SAC is located approximately 4 km north-east of North Runway and is the only 'European site' in the ZoI. The SPA and SAC encompasses the estuary, saltmarsh habitats and shallow subtidal areas at the mouth of the estuary. Following construction of a railway viaduct in the 19th century, the estuary became lagoonal in character and is only partly tidal.

15.4.3 There are extensive intertidal flats which are exposed at low tide, with substantial stands of eelgrass (both *Zostera noltii* and *Zostera angustifolia*), and saltmarshes which provide important foraging and roost sites for 14 SCI bird species[3] at high tide. During winter the site regularly supports 1% or more of the following species of waterbirds: great crested grebe *Podiceps cristatus*, light-bellied Brent goose *Branta bernicla hrota*, shelduck *Tadorna tadorna*, pintail *Anas acuta*, goldeneye *Bucephala clangula*, red-breasted merganser *Mergus serrator*, oystercatcher *Haematopus ostralegus*, golden plover *Pluvialis apricaria*, Grey Plover *Pluvialis squatarola*, Knot *Calidris canutus*, Dunlin *Calidris alpina*, black-tailed godwit *Limosa limosa*, bar-tailed godwit *Limosa lapponica*, redshank *Tringa totanus*.

Terrestrial Habitats

15.4.4 The North Runway was under construction during the ecological walkover survey carried out in March 2020. No evidence of any protected or notable species were identified during the survey. The dominant habitats present comprised artificial surfaces (Fossitt code: BL3) (i.e. airplane runway and roads), spoil and bare soil (Fossitt code: ED2), and recently seeded sections of amenity grassland (Fossitt code: GA2) which are all of no or negligible ecological value.

15.4.5 The landcover within the airport is industrial / commercial, comprising the terminals, hangers, piers and support facilities. Thus, no semi-natural habitats[4] are present within the airport boundary which may be affected by the proposed Relevant Action (as the site has been dug up and/or is under hard-standing).

15.4.6 Habitat in the surrounding area is largely limited to improved grassland and other agricultural land, dissected by species poor hedgerows and ditches.

15.5 Future Receiving Environment

15.5.1 For the purposes of the EIAR, the Current State of the Environment described above is taken to be the Future Receiving Environment in all Assessment Years: 2022, 2025 and 2035, when assessing for the effects of the Relevant Action.

15.5.2 In the absence of the proposed Relevant Action, the Permitted Scenario with its predicted passenger and ATM forecasts, will come into effect once the North Runway becomes operational.

[3] National Parts & Wildlife Service (2013). Malahide Estuary SPA: conservation objectives supporting document. Version 1. Available online: https://www.npws.ie/sites/default/files/publications/pdf/004025_Malahide%20Estuary%20SPA%20Supporting%20Doc_V1.pdf
[4] A semi-natural habitat is defined as: "An ecosystem with most of its processes and biodiversity intact, though altered by human activity in strength or abundance relative to the natural state."

15.6 Environmental Design and Management

15.6.1 The assessment has taken into account the Wildlife Management Plan, which is implemented under licence at Dublin Airport. This prevents flocks of hazardous birds[5] including gulls, waders, geese and swans and/or other animals (e.g. Irish hare) from occurring in areas within which they could present a risk to aircraft.

15.7 Assessment of Effects and Significance

15.7.1 As stated above, according to industry-standard best practice guidelines published by CIEEM, an assessment of significance of effects is only required for ecological features which are considered to be important, and for which potentially significant impacts may arise as a result of a proposed action.

15.7.2 There is no new pathway for pollution impacts as a result of the proposed Relevant Action and no increase in pollution loading is anticipated (see *Chapter 12: Water* for a discussion of the operation of the drainage system) and the number of passengers using the airport has no bearing on terrestrial biodiversity in the study area.

Noise Disturbance to Important Fauna Species

15.7.3 The proposed Relevant Action will mean that there is an increase in the number of night-time flights in 2022 and 2025 in the Proposed Scenario. Given that any fauna species which occur in the vicinity of the airport campus and the North Runway will necessarily be habituated to the presence of aircraft based on the historic activity at the airport and that in both the permitted and proposed scenarios the daytime hours of activity on the runway system are unchanged and it is only the night shoulder hours where any change in activity occurs, the Proposed Scenario will result in a negligible change in the potential magnitude of disturbance. As noted above, there are very few examples of important species occurring within the airport campus, these are actively discouraged from occurring in the vicinity of the airport and thus have negligible value. Therefore, it is concluded that there would be an imperceptible noise disturbance effect as a result of the proposed Relevant Action.

Killing of or Injury to Important Fauna Species

15.7.4 Regarding bird collision, the existing licensed bird disturbance programme operating at Dublin Airport has a zero-tolerance approach to flocks of hazardous species precisely to avoid collisions occurring on safety grounds (see *Chapter 8: Major Accidents and Disasters* for additional information). Due to the implementation of the Wildlife Management Plan, flocks of birds and other fauna species which may be considered important are actively prevented from occurring in the vicinity of Dublin Airport. As a result, there will be no impacts from the proposed Relevant Action.

Summary

15.7.5 Neither the resulting increase in the number of night-time flights in the Proposed Scenario compared with the Permitted Scenario nor the increase in the number of passengers in the 2022 and 2025 Assessment Years will have any impact on terrestrial biodiversity.

15.8 Mitigation and Monitoring

15.8.1 As the proposed Relevant Action will not have any significant effects on terrestrial ecological features, there is no requirement for mitigation to be implemented. No monitoring measures are proposed.

15.9 Residual Effects and Conclusions

15.9.1 There are no residual significant effects on ecological features from the proposed Relevant Action.

[5] Which are in particular, birds weighing significantly in excess of 110g, birds which flock, and birds which remain at the airfield despite the long-grass maintenance program.

What has changed since the December EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections and additions, the chapter has been revised to:

- Address additional assessment years requested by the Council
- Set out more clearly the scenarios for assessment in the EIAR
- Respond to the latest passenger growth forecasts at Dublin Airport
- European sites are dealt with in the Appropriate Assessment Screening Report

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

16. Aquatic Biodiversity

16.1 Introduction

16.1.1 This chapter of the EIAR reports the findings of an appraisal of the effects of the proposed Relevant Action on aquatic ecological features. The chapter sets out the relevant aspects of the Current State of the Environment and the Future Receiving Environment in terms of aquatic biodiversity. It goes on to consider the impact of the proposed Relevant Action, which will be an operational change, to remove the numerical cap on the average number of flights permitted between the hours of 23:00 and 07:00 in the Permitted Scenario, replacing it with an annual night-time noise quota (between 2330 and 0600), and to allow flights to take off from and/or land on the North Runway for an additional two hours (i.e. 23:00 to 00:00 and 06:00 to 07:00).

16.1.2 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2027 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario. Around 7.1 million additional passengers will have used the airport in in the period 2022-2026 in the Proposed Scenario.

16.1.3 Also relevant to this chapter is the Appropriate Assessment (AA) Screening Report prepared for the proposed Relevant Action. This describes the screening exercise conducted, in accordance with the requirements of Article 6(3) of the Habitats Directive (see Section 16.2), to determine with the proposed Relevant Action, either individually or in combination with other plans or projects, would be likely to have a significant effect on a European site in view of the site's Conservation Objectives. This chapter and the AA Screening Report can be read in isolation and do not rely on one another.

16.2 Legislation and Planning Policy Context

Legislation

16.2.1 The following legislation is relevant to this chapter and has been considered in the assessment:

- Council Directive 1992/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive);
- Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (the Birds Directive);
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (as amended) (the Water Framework Directive (WFD));
- Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment and Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the EIA Directive);
- The Planning & Development Acts 2000 to 2020;
- The Wildlife Acts 1976 to 2018;
- Flora (Protection) Order 2015 S.I 356/2015 (the 'Flora Protection Order');
- Fisheries Acts 1959 to 2019;
- Inland Fisheries Acts 1959 to 2017;

- Local Government (Water Pollution Acts) 1977-2007; and
- The Wildlife Acts 1976 to 2018.

National Planning Policy and Guidance

16.2.2 The following national planning policies and guidance documents are also relevant to this chapter and have been considered throughout the assessment presented within it:

- Project Ireland 2040 – National Planning Framework (2018);
- Draft Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2017); and
- National Biodiversity Action Plan 2017 – 2021.

Regional and Local Planning Policy

16.2.3 The following local planning policies are considered relevant to this assessment.

- Regional Spatial & Economic Strategy for the Eastern and Midland Region 2019-2031;
- Fingal Development Plan 2017-2023;
- Dublin Airport Local Area Plan (2020); and
- Dublin Airport Noise Action Plan 2019-2023.

International Guidance

16.2.4 The following international guidance documents are considered relevant to this assessment:

- Environmental Impact Assessment of Projects: Guidance on Screening (EC, 2017); and
- Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018).

16.3 Assessment Methodology

Ecological Impact Assessment

16.3.1 The assessment of ecological impacts described in this chapter has been conducted in accordance with the industry-standard best practice guidelines published by CIEEM (2018). The guidelines require that assessment is only carried out for any ecological features identified within the Zone of Influence (ZoI) which are sufficiently 'important' (e.g. designated sites, or habitats or species which are rare, threatened or rapidly declining (CIEEM, 2018)) and which could be significantly affected[1] by the particular project.

16.3.2 CIEEM (2018) methodology states that it is not necessary to carry out detailed assessment of features that are sufficiently widespread, unthreatened and resilient to project impacts and which will remain viable and sustainable, as these can be scoped out at an early stage of the assessment. Likewise, only the impacts of a project which could result in significant effects on important ecological features need to be assessed.

Zone of Influence

16.3.3 The ZoI of a project is the area over which ecological features may be subject to significant effects (CIIEM, 2018) as a result of the proposed project and any associated activities.

[1] CIEEM (2018) define Significant Effect as follows: "… 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features'… In broad terms, significant effects encompass impacts on the structure and function of defined sites, habits or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)."

16.3.4 The ZoI will vary for different ecological features depending on their sensitivity to an environmental change. It is therefore appropriate to identify different ZoI for different features. The features affected could include designated sites, habitats, species, and the processes on which they depend.

16.3.5 It is also important to acknowledge, as per EPA (2017) draft guidance "*that the absence of a designation or documented feature does not mean that no such feature exists within the site*". As such, ZoI should be identified for all features potentially occurring within or near to the proposed Relevant Action, in addition to any known to occur.

16.3.6 The proposed Relevant Action relates solely to proposals to amend condition no. 3(d) and replace no. condition 5 of the North Runway Permission and does not comprise or require the development of any physical or other infrastructure (see Chapter 2). The flight paths of aircraft using the runway system at Dublin Airport will be the same under either the Permitted Scenario or the Proposed Scenario.

16.3.7 Neither the resulting increase in the number of night flights in the Proposed Scenario compared with the Permitted Scenario nor the increase in the number of passengers in the 2022 and 2025 Assessment Years (and the faster recovery) will have any impact on aquatic biodiversity, as there here is no new pathway for pollution impacts as a result of the proposed Relevant Action and no increase in pollution loading is anticipated (see *Chapter 12: Water* for a discussion of the operation of the drainage system).

16.3.8 Given that the proposed Relevant Action will have no impact on aquatic biodiversity and because there are no known 'important'[2] ecological features in the airport campus boundary, the ZoI adopted for the description of the Current State of the Environment for aquatic biodiversity was taken to be 5 km.

16.3.9 As noted in *Chapter 15: Terrestrial Biodiversity*, there is one European site within the 5 km ZoI of the North Runway which is the Malahide Estuary SPA.

Baseline Surveys

16.3.10 No aquatic biodiversity surveys were undertaken for this EIAR, given that there is no potential for impact from the proposed Relevant Action in respect to aquatic biodiversity. A significant volume of other ecological surveys, assessments, and environmental reporting have been completed at the airport:

- Discharge of planning conditions for the North Runway Planning Permission, primarily relating to pre-construction surveys and mitigation;
- Historical and ongoing implementation of the Applicant's Wildlife Management Plan; and
- Aquatic biodiversity surveys were undertaken in watercourses across the airport in July 2016 to support a previous report[3].

Methodology for Determining Construction Effects

16.3.11 There will be no change to the extent of excavation or size of structures required due to there being no changes to the physical infrastructure of North Runway, or wider airport. As a result, the proposed Relevant Action will result in no construction impacts to the water environment (*see Chapter 12: Water*). therefore, the proposed Relevant Action will not result in any construction related aquatic ecological effects, and further assessment of construction effects is not required.

Methodology for Determining Operational Effects

16.3.12 Operationally, the proposed Relevant Action will increase the number of flights at night permitted to take off from, or land at, Dublin Airport, and would facilitate a faster recovery to the 32mppa Cap in the number of passengers in the Proposed Scenario compared with the Permitted Scenario. This is likely to result in a temporary increase in the overall number of passengers in the Assessment Years 2022 and 2025, as detailed in *Chapter 1: Introduction* and *Chapter 2: Characteristics of the Project*. Any

[2] CIEEM (2018) define Important Ecological Features as follows: "Ecological features can be important for a variety of reasons… Importance may relate, for example, to the quality or extent of designated sites or habitats, to habitat/species rarity, to the extent to which they are threatened throughout their range, or to their rate of decline." This includes Designated Sites; National Biodiversity Lists; Diversity Action Plan Lists; and Red Listed, Rare, Legally Protected Species.
[3] Dublin Airport (2017) Proposal to Change Permitted Operations at Dublin Airport. Prepared by RPS for daa, August 2017.

operational effects would be similar in magnitude to those experienced in 2018, when the airport was operating at close to 32mppa.

16.3.13 Potential impacts on aquatic biodiversity would include:

- Indirect effects from pollution of watercourses as a result of additional flights.

16.3.14 As explained in *Chapter 12: Water*, there are no changes to the physical infrastructure of the North Runway, or the wider airport, and as such no changes to the drainage infrastructure or associated pollution control infrastructure on North Runway or any other part of the airport as a result of the proposed Relevant Action, including the frequency and pollution control of de-icing. Accordingly, there is no new pathway for pollution impacts as a result of the proposed Relevant Action and no increase in pollution loading is anticipated. Thus, it is considered that the proposed Relevant Action will not result in any change to impacts on aquatic biodiversity assets during operation, as detailed in *Chapter 12: Water*. Further assessment is therefore not required.

Limitations and Assumptions

16.3.15 There are no limitations to the assessment of potential effects on ecological features presented in this chapter.

16.4 Current State of the Environment

16.4.1 The study area for the environment is the airport complex, including the North Runway, and the ZoI defined in section 16.3.

European Sites

16.4.2 The Malahide Estuary SPA and SAC is located approximately 4 km north-east of North Runway and is the only 'European site' in the ZoI. The SPA and SAC encompasses the estuary, saltmarsh habitats and shallow subtidal areas at the mouth of the estuary. Following construction of a railway viaduct in the 19th century, the estuary became lagoonal in character and is only partly tidal. There are extensive intertidal flats which are exposed at low tide, with substantial stands of eelgrass (both *Zostera noltii* and *Zostera angustifolia*), and saltmarshes which provide important roost sites at high tide.

Landcover and Habitats

16.4.3 The landcover within the airport is industrial / commercial, comprising the terminals, hangers, piers and support facilities; the North Runway is currently under construction. Thus, no semi-natural habitats[4] are present within the airport boundary which may be affected by the proposed Relevant Action (as the site has been dug up and/or is under hard-standing). Habitat in the surrounding area is largely limited to improved grassland and other agricultural land, dissected by species poor hedgerows and ditches.

Watercourses

16.4.4 Dublin Airport lies within several watercourse catchments. The main surface water catchment within the airport complex is "the Cuckoo Stream", whose catchment is located in the vicinity of the terminal, south of the North Runway. The Cuckoo Stream is within the Mayne sub-catchment and flows from west-north-west to east-south-east, discharging to the centre of Baldoyle Estuary SPA and SAC, approximately 7 km east-south-east from the North Runway.

16.4.5 The North Runway is located across two surface water catchments: the Forest Little / Sluice and, to a lesser extent, the Ward. The majority of the North Runway is within the Forest Little / Sluice sub-basin (Sluice_010) of the Mayne sub-catchment, which also includes the Cuckoo Stream to the south. The Forest Little / Sluice flows from west-north-west to east-south-east, discharging to the north of Baldoyle Estuary SPA and SAC.

16.4.6 The western end of the North Runway is within the Ward sub-basin (Ward_030), which is a subdivision of the Broadmeadow sub-catchment that discharges to Malahide Estuary SPA and SAC, approximately

[4] A semi-natural habitat is defined as: "An ecosystem with most of its processes and biodiversity intact, though altered by human activity in strength or abundance relative to the natural state."

4 km north-east of the North Runway, however the drainage for the North Runway diverts runoff from the hardstanding to the Forest Little / Sluice sub-catchment to prevent degradation of this stream (see *Chapter 12: Water*).

Water Quality, Biotic Quality and WFD Status

16.4.7 The nearest downstream EPA surface water quality monitoring data within the Mayne sub-catchment is immediately downstream of the confluence of the Cuckoo and Mayne streams (station code RS09M030500) which is approximately 5.5 km east-south-east of the airport. At this monitoring point the surface water quality is classified as Poor WFD status with an EPA Q value of 2-3[5] in 2019. This is consistent with results of daa's water biannual biological sampling and water quality monitoring for the Cuckoo and Mayne streams upstream of their confluence which, in May 2019, reported Q values of 1-2 (Bad WFD status) for the Cuckoo Stream and 3 (Poor WFD Status) and for the Mayne.

16.4.8 The Cuckoo Stream is not known to have any important fisheries or invertebrate populations, due to its legacy of historically poor water quality.

16.4.9 There is no surface water quality monitoring point located on the Forest Little / Sluice stream for which data are reported by the EPA. However, daa conducts biannual biological sampling and water quality assessment of three monitoring points along the Forest Little / Sluice downstream of the airport. Available monitoring data (see *Chapter 12: Water*) report Q values of 3 (Poor WFD status) for each of the three monitoring points in May 2019, indicating a pollution status of Moderate. Over time at the two monitoring points closest to the airport, F4A/B and F5, Q values had improved from 1-2 (Bad WFD status) in 2006 and 2007 to 3 (Poor WFD status) from September 2017 onwards. The most downstream of the three monitoring points, F6, has been monitored since September 2013, and Q values of 3 (Poor WFD status) were predominantly reported up to May 2019.

16.4.10 The WFD status of the Forest Little / Sluice for the 2013 to 2018 period is Unclassified, while the risk status is to be reviewed. For other streams within the Mayne sub-catchment, the Mayne and the Cuckoo, their WFD status is classified as Poor for the period 2013-2018 and At Risk.

16.4.11 The nearest downstream EPA surface water quality monitoring point within the Ward sub-basin, is the bridge north of Killeek (station code RS08W010300), located 1.8 km north of the airport. At this monitoring point the surface water quality is classified as Moderate WFD status with an EPA Q value of 3-4 in 2020. The Ward water quality 4.6 km upstream of the confluence with the airport inflows was also classified as Moderate WFD status (Q value of 3-4) in 2020 at Coolatrath Bridge (station code RS08W010070), indicating that there is no deterioration in the biotic quality (Q value) of watercourses within the Ward sub-basin downstream of the airport. The Ward is considered a salmonid river[6] by Inland Fisheries Ireland (IFI).

16.4.12 Under the WFD, the WFD status of the Ward sub-basin for the period 2013 to 2018 between the North Runway and the monitoring station at the bridge north of Killeek is classified as Moderate, while downstream of that monitoring point it is classified as Poor for the same period. The risk status of the Ward is given as At Risk.

Drainage and De-icing

16.4.13 Details of the drainage network and treatment, including the application and treatment of de-icing chemicals, are discussed in *Chapter 12: Water*.

16.5 Future Receiving Environment

16.5.1 For the purposes of the assessment it is assumed that the Future Receiving Environment in the 2022, 2025 and 2035 will remain as described in the section on the Current State of the Environment.

[5] Q Values are an EPA biotic indices which reflect average water quality. A Q Value ranges between 5, which indicates unpolluted status with high WFD status, and 1, which indicates serious polluted status with bad WFD status. See online: https://epawebapp.epa.ie/qvalue/webusers/

[6] A salmonid river is defined as freshwaters capable of supporting Salmon (Salmo Salar), Trout (Salmo trutta), Char (Salelinus) and whitefish (Coregonus).

16.6 Environmental Design and Management

16.6.1 The assessment has taken into account the existing drainage network and the extant trade effluent licence, which includes the operation of the de-icing and pollution control system. This will be in place in both the Permitted Scenario and the Proposed Scenario in all three Assessment Years, more detail is provided in *Chapter 12: Water*.

16.7 Assessment of Effects and Significance

16.7.1 As the proposed Relevant Action will not result in changes to the design or construction of the North Runway, or any other part of Dublin Airport, the proposed Relevant Action will not have any construction related effects upon any of the aquatic habitats considered in this chapter.

Indirect Effects of Pollution

16.7.2 Operationally, the net effect of the proposed Relevant Action would be to facilitate recovery in the number of flights permitted to take off from, or land at, Dublin Airport at night in the Proposed Scenario compared with the Permitted Scenario. It also facilitates a faster recovery to the 32mppa Cap. Neither the change in the number of passengers, faster rate of recovery or the increase in the number of night time flights would have an significant effect on the water environment, as detailed in *Chapter 12: Water*, and thus the proposed Relevant Action will have no significant effects on aquatic habitats or ecology in any of the Assessment Years: 2022, 2025 or 2035.

16.8 Mitigation and Monitoring

16.8.1 As the proposed Relevant Action will not have any significant effects on aquatic ecological features, there is no requirement for mitigation to be implemented. No monitoring measures are proposed.

16.9 Residual Effects and Conclusions

16.9.1 There are no residual significant effects on ecological features from the proposed Relevant Action.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections, including minor removals from and additions to the earlier text, the chapter has been revised to:

- Address additional assessment years requested by the Council
- Set out more clearly the scenarios for assessment in the EIAR
- Respond to the latest passenger growth forecasts at Dublin Airport
- European sites are dealt with in the Appropriate Assessment Screening Report

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

17. Landscape and Visual

17.1 Introduction

17.1.1 This chapter of the EIAR reports the findings of an appraisal of the effects of the proposed Relevant Action on landscape and visual matters. It sets out the relevant aspects of the Current State of the Environment and the Future Receiving Environment and goes on to consider the impact of the proposed Relevant Action, which will be an operational change, to remove the numerical cap on the average number of flights permitted between the hours of 23:00 and 07:00 in the Permitted Scenario, replacing it with an annual night-time noise quota, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00.

17.1.2 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2027 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario. Around 7.1 million additional passengers will have used the airport in in the period 2022-2026 in the Proposed Scenario.

17.2 Legislation, Policy and Guidance

National Planning Policy

17.2.1 The following national planning policy is relevant to this chapter and has been considered in the assessment:

- The National Landscape Strategy (NLS) for Ireland 2015-2025.

Regional and Local Planning Policy

17.2.2 The following local planning policy is considered relevant to this assessment.

- Fingal Development Plan 2017-2023, Fingal County Council; and
- Dublin Airport Local Area Plan (2020), Fingal County Council.

International Policy, Standards and Guidance

17.2.3 The following international policies, standards and guidance documents are considered relevant to this assessment:

- The European Landscape Convention;
- Environmental Protection Agency “Guidelines on the information to be contained in Environmental Impact Assessment Reports”, Draft, August 2017;
- Guidelines for Landscape and Visual Impact Assessment (GLVIA), Landscape Institute UK/ Institute of Environmental Management and Assessment (IEMA), 2013, 3rd Edition;
- Photography and Photomontage in Landscape and Visual Impact Assessment, Landscape Institute Advice Note 01/2011; and
- ‘Visual Representation of Development Proposals’, Landscape Institute, Technical Guidance Note 06/19, 17 September 2019.

17.3 Assessment Methodology

Methodology for Determining Construction Effects

17.3.1 As the proposed Relevant Action proposes no changes to the design or construction of the North Runway, or any other part of Dublin Airport, there will be no physical changes in any part of the airport or its surroundings. As a result, the proposed Relevant Action will not result in any additional landscape or visual effects arising from construction, and further assessment is therefore not required.

Methodology for Determining Operational Effects

17.3.2 Potential operational impacts on the visual environment include:

- Potential visual effects arising from additional flights; and
- Potential visual effects from extended hours of lighting.

17.3.3 These potential effects are assessed below. Note that these potential effects are purely visual. As, there are no proposed changes to the landscape or additional new structures associated with the proposed Relevant Action, there will be no potential landscape effects on the landscape character arising from the proposed Relevant Action.

17.3.4 A report considering the effects on tranquillity in important designated landscapes prepared in response to ANCA RFI 12 is included as Appendix 17A.

Limitations and Assumptions

17.3.5 There are no significant limitations to the assessment of potential effects on landscape character and visual amenity presented in this chapter.

17.4 Current State of the Environment

Sensitive Landscapes

17.4.1 The Landscape Character Assessment included in section 9.4 – Landscape in Fingal County Development Plan 2017-2023 states that there are "Highly Sensitive Landscapes" located within 4 km of Dublin Airport, these are illustrated as per the figure taken from the Fingal Development Plan Viewer in Figure 17 1 (*EIAR Volume 3: Figures*). Some of which have a very high or high landscape value and high or very high landscape sensitivity, these are of county or national importance and are designated as Highly Sensitive Landscapes (HSL).

Historic Landscapes

17.4.2 Fingal Development Plan 2017 – 2023 also identifies "*Historic Landscape Characterisations*" areas (HLC). A segment of Swords designated HLC Area runs through the northern part of Dublin Airport as seen on Figure 17.2 (*EIAR Volume 3: Figures*).

17.4.3 Objective NH 42 within the Fingal Development Plan states: "*Ensure development reflects and reinforces the distinctiveness and sense of place of identified historic landscape character types*". It states further to retain "*important features or characteristics, taking into account the results of the historic landscape characterisations carried out in the County*".

Views and Prospects

17.4.4 The Fingal Development Plan states that "*The scenery and landscape of the County are of enormous amenity value to residents and tourists and constitute a valuable economic asset. The protection of this asset is therefore of primary importance in developing the potential of the County." and that "Given the high rates of economic and population growth, the challenge the County faces is to manage the landscape so that any change is positive in its effects, such that the landscapes we value are protected*".

Objective NH 40 within the Fingal Development Plan states: "*Protect views and prospects that contribute to the character of the landscape, particularly those identified in the Development Plan, from inappropriate development*".

17.5 Future Receiving Environment

17.5.1 Given the nature of the sensitive receptors, as identified above, it is considered that the Current State of the Environment will remain unchanged in all three Assessment Years.

17.5.2 In the absence of the proposed Relevant Action, with its predicted passenger and ATM forecasts, will come into effect once the North Runway becomes operational

17.6 Assessment of Effects and Significance

17.6.1 As the proposed Relevant Action will not result in changes to the design or construction of the North Runway or any other part of Dublin Airport, there will be no construction impacts. As a result, the proposed Relevant Action will not result in construction related landscape or visual effects.

Visual Effects resulting from Additional Flights

17.6.2 In the Permitted Scenario, night-time use of the runway system would be restricted to an average of 65 flights daily, with more flights occurring during the day than would be the case in the Proposed Scenario. The proposed Relevant Action would lift this restriction as described above and in *Chapter 2: Characteristics of the Project*, meaning that there would be comparatively fewer flights during the day and more at night in all Assessment Years, 2022, 2025 and 2035. Overall, the number of ATMs would be similar in both scenarios by 2027 and thereafter.

17.6.3 Aircraft flying at night-time is visible primarily because of the use of navigation lights, and it is arguable that a night-time flight in clear skies could be considered more visually intrusive than a corresponding flight in daylight hours. On the other hand, during the night or early in the morning, there would normally be many fewer observers experiencing visual effects, which would mean that the overall effect would be considerably less significant. There would be about 60% more flights at night in the Proposed Scenario than in the Permitted (see Table 1-1 in *Chapter 1: Introduction* for details), although fewer than 100 during the 23:00-07:00 period. Taking all of the above points into account, and also that there could be up to 65 flights on average in the Permitted Scenario during the same hours, it is considered that visual effects will not be significant.

Visual Impact from Extended Hours of Lighting

17.6.4 Lighting of the airport in the Permitted Scenario will be as consented in the North Runway Planning Permission. This included mitigation to manage the impact of lighting of the runway system at night. This mitigation has already been implemented and will therefore be present in the Proposed Scenario. The North Runway will be lit for the same time during the night in both scenarios, so there is no additional visual impact from the proposed Relevant Action.

17.6.5 Navigation lights are also positioned at the end of the runways for safety reasons, to assist planes landing during the hours of darkness or at times of low visibility. These are only visible from the direction of approach to the runways but can also be seen by people on the ground. In the Permitted Scenario the navigation lights on the South Runway would be on throughout the night, whereas those on the North Runway would only be used until 23:00 and again after 07:00, when aircraft are using this runway.

17.6.6 In the Proposed Scenario, the navigation lights on the North Runway would be used for an additional hour at night (23:00-00:00) and in the morning (06:00-07:00), although these lights would not normally be needed in the morning when it is light and visibility is good. Outside these times there would be no difference between the Permitted and Proposed Scenarios. Given that the North Runway navigation lights would be lit at night in both scenarios, the resulting additional visual effects are not significant due to the fact that the visual impact is not qualitatively different to the permitted scenario and that relatively few observers would experience these visual effects considering the location of the lights and the time of their additional operation.

17.7 Mitigation and Monitoring

17.7.1 As the proposed Relevant Action will have not any significant effects on the landscape character or the visual amenity, there is no requirement for mitigation to be implemented. No monitoring measures are proposed.

17.8 Residual Effects and Conclusions

17.8.1 There will be no significant landscape or visual effects as a result of the proposed Relevant Action in any of the Assessment Years.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections, including minor removals from and additions to the earlier text, the chapter has been revised to:

- Address additional assessment years requested by the Council
- Set out more clearly the scenarios for assessment in the EIAR

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

18. Land and Soils

18.1 Introduction

18.1.1 This chapter of the EIAR reports the findings of an appraisal of the effects of the proposed Relevant Action on land and soils. It sets out the relevant aspects of the Current State of the Environment and the Future Receiving Environment and goes on to consider the impact of the proposed Relevant Action, which will be an operational change, to remove the numerical cap on the average number of flights permitted between the hours of 23:00 and 07:00 in the Permitted Scenario, replacing it with an annual night-time noise quota, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00.

18.1.2 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2027 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario. Around 7.1 million additional passengers will have used the airport in in the period 2022-2026 in the Proposed Scenario.

18.2 Legislation, Policy and Guidance

18.2.1 The following guidance is relevant to this chapter and has been considered during its preparation:

- Institute of Geologists of Ireland (IGI), Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (2013); and
- EPA, Towards Setting Guideline Values for the Protection of Groundwater in Ireland (2003).

18.2.2 Other relevant legislation and guidance concerning EIA generally is given in *Chapter 1: Introduction*.

18.3 Assessment Methodology

Methodology for Determining Construction Effects

18.3.1 As the proposed Relevant Action propose no changes to the design or construction of North Runway, or any other part of Dublin Airport, there will be no physical changes in any part of the airport or tis surroundings. As a result, the proposed Relevant Action will not result in any new effects on land and soils arising from construction, and further assessment is therefore not required.

Methodology for Determining Operational Effects

18.3.2 The potential operational impacts on land and soils include:

- Potential for pollution arising from additional flights.

18.3.3 This potential impact is examined in more detail and their effects assessed below[1].

18.4 Current State of the Environment

18.4.1 Data and background information relating to Land were derived from resources including the online Geological Survey Ireland (GSI) 'Spatial Resources Viewer'[2].

[1] It is noted that the Aircraft Noise Competent Authority asked for an assessment of the impact of the proposed Relevant Action on the effectiveness of the noise zones set out in Figure 9.1 of the Dublin Airport Local Area Plan. For clarity, this analysis is presented in *Chapter 6: Planning and Development Context*.
[2] https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx

Bedrock Geology

18.4.2 The majority of the airport is underlain by the Tober Colleen Formation, a dark grey, calcareous shale and limestone conglomerate of Carboniferous age.

18.4.3 The remainder is underlain by the Malahide Formation, an argillaceous limestone / shale, and by Waulsortian Limestone, a massive unbedded lime / mudstone. A small portion of the airport is underlain by the Lucan Formation, also known as the Calp Formation, a dark limestone and shale. All of the above formations are of Carboniferous age.

18.4.4 The Tober Colleen Formation is generally considered a 'Poor Aquifer', bedrock which is generally classified as unproductive (capable of yielding only sufficient water from wells or springs to supply single houses, small farms or small group water schemes), except for local zones. The other bedrock units constitute a 'Locally Important Aquifer', which is moderately productive (capable of yielding enough water to boreholes or springs to supply villages, small towns or factories) only in local zones.

Overburden Geology

18.4.5 Quaternary deposits overlying bedrock comprise glacial till derived from limestones (boulder clay) while the soils have been mapped as made ground. There is no gravel aquifer underlying the airport.

18.4.6 Soils immediately surrounding the airport are mapped on the EPA website as the Elton series, fine loamy drift with limestone, which has moderate drainage.

Topography and Landslides

18.4.7 The airport is relatively flat, with an elevation of 80 m above Ordnance Datum (OD) to the west close to runway 10/28 and declining to 60 m OD in the south-east, with a gradient of 0.005. Land instability, landslide and earthquakes are not a high risk in the Dublin area.

Groundwater Usage

18.4.8 The airport's water supply is solely provided by mains services with a reservoir on site having a 14,500m^3 capacity.

Depth to Groundwater and Flow Direction

18.4.9 Depth to groundwater measurements are not reported in the licensed monitoring wells on site, however, given that the shallow monitoring wells are generally between 4.2 m and 6 m below ground level (bgl) it is assessed that the depth to groundwater in the overburden (glacial till and made ground) is approximately 3 m bgl.

Land Use

18.4.10 Available historic maps from 1837-1842 and 1888-1913 indicate that the airport site was primarily occupied by agricultural land during this period with a number of single dwellings within the airport boundary, which included:

- Corballis House;
- Collinstown House; and
- A ruined castle.

18.4.11 An airfield was first developed at Collinstown in 1917, during World War 1, with the commercial airport developed in the late 1930s.

18.4.12 As shown on the Corine 2018 land cover map[3], the majority of land surrounding North Runway and the airport is classified as a combination of industrial / commercial (artificial surfaces) and agricultural (arable or pasture). The airport itself is classified as artificial surface throughout for industrial / commercial / transport use, with this classification extending eastwards across the office and hotel developments and incorporating the long-term car parks west of the M1 motorway.

[3] https://land.copernicus.eu/pan-european/corine-land-cover/clc2018

18.4.13 The airport buildings, comprising the terminals, hangars, piers and support facilities for catering, cargo and fuel, are set out in a horseshoe configuration with airfield development to the west (aprons, taxiways and runways) and ground transportation infrastructure located centrally to the east.

18.4.14 Within the airfield, ground cover is predominantly concrete with some grassed areas adjacent to the taxiways, runways and around the airfield perimeter.

18.5 Future Receiving Environment

18.5.1 The it is assumed that land environment is not likely to change between now and the Assessment Years of 2022, 2025 and 2035. Thus, the Future Receiving Environment will be largely as described above. In the absence of the proposed Relevant Action, the Permitted Scenario, with its predicted passenger and ATM forecasts, will come into effect once the North Runway becomes operational.

18.6 Assessment of Effects and Significance

18.6.1 As explained in *Chapter 12: Water*, the proposed Relevant Action does not pose a significant risk of pollution. The increase in the number of night-time flights in the Proposed Scenario would have no effect on land or soils, since the number and the time of day at which flights operate has little bearing on the volume of pollution in runoff from the runway system. De-icing operations would not be significantly different; furthermore, the drainage system consented as part of the North Runway Planning Permission is sealed to prevent impacts to groundwater and thus indirectly to land and soils.

18.6.2 Therefore, the proposed Relevant Action would have no effect on land and soils in any of the Assessment Years since the consented drainage system will prevent any increase in pollution.

18.7 Mitigation and Monitoring

18.7.1 As the proposed Relevant Action will have not any significant effects on land and soils, there is no requirement for mitigation to be implemented. No monitoring measures are proposed.

18.8 Residual Effects and Conclusions

18.8.1 The proposed Relevant Action will not result in any significant effects upon land and soils.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections and additions, the chapter has been revised to:

- Address additional assessment years requested by the Council
- Set out more clearly the scenarios for assessment in the EIAR
- Respond to the latest passenger growth forecasts at Dublin Airport

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

19. Material Assets

19.1 Introduction

19.1.1 This chapter of the EIAR reports the findings of an appraisal of the potential impact of the proposed Relevant Action on material assets. It sets out the relevant aspects of the Current State of the Environment and the Future Receiving Environment and goes on to consider the impact of the proposed Relevant Action, which will be an operational change, to remove the numerical cap on the average number of flights permitted between the hours of 23:00 and 07:00 in the Permitted Scenario, replacing it with an annual night-time noise quota, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00.

19.1.2 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2027 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario. Around 7.1 million additional passengers will have used the airport in in the period 2022-2026 in the Proposed Scenario.

19.2 Legislation, Policy and Guidance

19.2.1 The following legislation, policy and guidance is relevant to this chapter and has been considered during the assessment presented within it. General legislation, policy and guidance has also been considered but is not listed as this has been covered in the introductory chapters.

Regional and Local Planning Policy

- Eastern Midlands Regional Waste Management Plan (2015 – 2021); and
- Dublin Airport Local Area Plan, Fingal County Council (2020).

International Policy, Standards and Guidance

- Waste Framework Directive 2018/851; and
- EC (Waste Directive) Regulations (2011).

19.3 Assessment Methodology

19.3.1 A qualitative assessment has been carried out following the below methodology, which follows the EPA Draft Guidance;

- Identification of the characteristics of the proposed Relevant Action;
- Identification and assessment of the receiving environment and receptor sensitivity;
- Identification of the potential impacts, and assessment of the magnitude of potential effects; and
- The consideration of whether mitigation measures or alternatives are required.

19.3.2 The EPA's draft guidance states the identification of potential likely significant impacts from different phases of a proposed development should be considered as far as reasonably possible. The environmental assessments for the proposed Relevant Action evaluated the construction and operational phases, in addition to the likelihood, extent, magnitude, duration, reversibility and significance of any likely potential impacts.

Methodology for Determining Construction Effects

19.3.3 As the proposed Relevant Action propose no changes to the design or construction of North Runway, or any other part of Dublin Airport, there will be no physical changes in any part of the airport or its surroundings and thus no impact material assets. As a result, the proposed Relevant Action will not result in any new effects on material assets arising from construction, and further assessment is therefore not required.

Methodology for Determining Operational Effects

19.3.4 The potential operational impacts on material include:

- Potential for increase in the use of gas and electricity by additional passengers;
- Potential for increased usage of water by additional passengers;
- Potential for increased generation of wastewater by additional passengers; and
- Potential for increase in waste generated by additional passengers.

19.3.5 These potential impacts are examined in more detail and their effects assessed below.

Limitations and Assumptions

19.3.6 There are no limitations to the assessment of potential effects on material assets presented in this chapter.

19.4 Current State of the Environment

19.4.1 Material assets are defined in the Environmental Protection Agency's draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports to include traffic & transport, waste and built services. Traffic & transport is covered in *Chapter 09: Traffic & Transport*, so this chapter addresses waste and built services only. Surface water and wastewater matters are addressed in *Chapter 12: Water*.

Gas

19.4.2 The Applicant has stated that Dublin Airport consumed some 39,053,010 kWh of gas in 2018 when the airport was operating close to the 32mppa Cap. By 2020, reflecting the impact of the Covid-19 pandemic, this consumption had declined to 30,663,819 kWh. It is notable that with far fewer passengers using the airport in 2020 than in 2018, gas consumption remained at about 75% of the 2018 figure. This is accounted for by the need to heat the terminal buildings irrespective of how many passengers are using them.

Electricity

19.4.3 In terms of electricity, the on-site power supply and distribution network was significantly upgraded as part of the development of Terminal 2 in 2011. The Applicant owns and operates a substation at Dardistown with dual supply 100kVA power lines to the airport was completed. This provides power to the airport directly. In 2018, the Applicant, in partnership with ESB, installed 268 solar panels on top of the airport's reservoir system which will provide more than half of the reservoir's annual energy requirements. The solar panels are connected directly to the airport's reservoir system.

19.4.4 According to data provided by the Applicant, electricity consumption at the airport in 2018 was 46,617,349 kWh and 34,019,557 in 2020. As with the figures for gas consumption, it is notable that the decline in consumption is not proportional to the decline in passenger throughput.

Potable Water

19.4.5 Dublin Airport straddles the Blanchardstown High Level Water Supply Area (Ballycoolin Reservoir Source, via elevated storage) and the Airport Water Supply Area (Ballycoolin Source via the 24" (600mm) diameter Forrest Little Main). A 36" (900mm) diameter trunk main supplies the area and delivers roughly

660 litres per second. Distribution pipework from the reservoir supplies cold water to the existing terminal, hangers, workshops, Aer Lingus offices and fire hydrants on the fire ring main across the airport.

19.4.6 In 2018 some 392,404 m^3 of water was used by Dublin Airport, according to data provided by the Applicant. This figured had fallen to 186,897 m^3 in 2020, a much bigger decline proportionally than seen in the gas and electricity consumption figures. This indicates that water consumption is more sensitive to the number of passengers using the airport than gas or electricity.

Waste

19.4.7 Dublin Airport is located within the Eastern and Midlands Waste Region and is managed by Dublin City Council, the Waste Enforcement Regional Lead Authority (WERLA). In terms of waste management, the WERLA are responsible for implementing the Eastern-Midlands Region Waste Management Plan 2015-2021 (EMRWMP), as well as setting priorities and common objectives for waste enforcement within the region.

19.4.8 The three key objectives of the EMRWMP are as follows:

- Prevent waste: a reduction of one per cent per annum in the amount of household waste generated over the period of the EMRWMP;
- More recycling: increase the recycle rate of domestic and commercial waste from 40 to 50 per cent by 2020; and
- Further reduce landfill: eliminate all unprocessed waste going to landfill from 2016.

19.4.9 Waste management in Dublin is largely governed by the requirements set out in the EMRWMP. The EMRWMP addresses all areas of waste management, from waste prevention and minimisation, to its collection treatment, recovery and final disposal. WERLA has set a target of 70% for the reuse, recycling and material recovery of man-made construction and demolition waste (excluding soil and stone) by December 2020.

19.4.10 Figures provided by the Applicant show that waste generated by Dublin Airport is growing (for example Municipal Managed Waste rose for 2,659 tonnes in 2017 to 3,104 tonnes in 2018), as would be expected as passenger numbers rise. However, Dublin Airport has a target of "Zero Waste to Landfill" which was first achieved in 2016 and is a key part of the Airport's waste management strategy, referenced in the latest Sustainability Report[1]. A recent target in respect of waste is to achieve 50% of waste recycled by 2020 (at the time of writing the Applicant had not yet published data on progress against this target). Recycling rates have improved from 11% in 2013 to 42% in 2019.

19.5 Future Receiving Environment

19.5.1 It is assumed for the purposes of this chapter that the Future Receiving Environment would evolve in line with the Applicant's sustainability targets. Environmental management is discussed further in the next section of this chapter. These point to a significant decline in the use of non-renewable sources of power such as gas by 2035, improvements in recycling rates and movement to a circular economy although exact timescales are unclear. In the absence of the proposed Relevant Action, the Permitted Scenario, with its predicted passenger and ATM forecasts, will come into effect once the North Runway becomes operational.

19.6 Environmental Design and Management

19.6.1 A draft Waste Minimisation Plan (see Appendix 19A) has been developed and recently submitted to Fingal County Council (FCC) as required by the Dublin Airport Local Area Plan policies WM01 and WM02. These cover waste management and the circular economy and are to "*support, where appropriate, the provision of proposals to aid the transition from a waste management economy to a green circular economy*" and "*promote a waste prevention and minimisation programme to target all*

[1] https://www.daa.ie/wp-content/uploads/2020/10/Dublin-Airport-Sustainability-Report-Final.pdf

aspects of waste in the LAP boundary area, focusing on all airport, commercial and domestic waste producers" respectively.

19.6.2 The Applicant has recent published a draft Carbon Reduction Strategy[2] which sets out how Dublin Airport will meet targets for the reduction of carbon emissions. To reach the long-term goal of net zero emissions by 2050, the Applicant is working towards reducing absolute Scope 1+2 carbon emissions by -30% below a 2019 baseline by 2030 (note; the draft CRS was prepared prior to the new carbon reduction target of 51% by 2030 published by the Government. The draft CRS is currently being reviewed to reflect this change in target). This would be achieved through the use of mature, affordable, and effective emission reduction measures. These measures include the use of 100% renewable electricity, electrification of vehicle fleets, fuel-switching and the eventual electrification of the onsite thermal energy plant, energy efficiency measures and circular economy practices.

19.7 Assessment of Effects and Significance

Use of Gas and Electricity

19.7.1 Use of gas and electricity is not likely to vary significantly between the Permitted and Proposed Scenarios because gas and electricity use is largely dictated by the needs of the terminal buildings to provide heat and light for passenger comfort. Although there will be more passengers using the airport in 2022-2026 in the Proposed Scenario, the airport will still need to be lit and heated irrespective of passenger numbers, as indicated by the comparison of 2018 and 2020 consumption figures given above. Thereafter, passenger numbers will be similar as the airport is forecast to be operating at the 32mppa Cap in both the Permitted and Proposed Scenarios, so there will be no difference at all in the 2035 Assessment Year.

19.7.2 Annual consumption of gas and electricity from non-sustainable sources in the Proposed Scenario (in 2025 and after) would likely be little higher than in 2018 (gas 39,053,010 kWh and electricity 46,617,349 kWh), when the airport operated at close to the 32mppa Cap without significant effects. However, it may well be lower in both the Proposed and Permitted Scenarios as the Applicant expects to reduce reliance on such sources as set out in the draft Carbon Reduction Strategy.

19.7.3 The proposed Relevant Action will, therefore, have no significant effects on gas or electricity consumption.

Usage of Water and Generation of Wastewater

19.7.4 The increase in the number of passengers in the Proposed Scenario, compared with the Permitted Scenario, would likely lead to a proportional increase in the volume of water usage and wastewater generation in the Assessment Years of 2022 and 2025. However, the total volumes in the Proposed Scenario would be comparable to those experienced in 2018 (392,404 m^3) when the airport was operating at close to the consented 32mppa Cap, without causing significant effects on the supply of potable water or generation of wastewater.

19.7.5 The difference between the Permitted and Proposed Scenarios is forecast to narrow to nothing by 2027 and thus there is no difference between the two scenarios in the 2035 Assessment Year. The impact on water usage and wastewater generation is therefore assessed as imperceptible.

Generation of Waste

19.7.6 Whilst it is expected that waste generated at Dublin Airport will be higher in the Proposed Scenario in the Assessment Years of 2022 and 2025, the total volume of waste generated at the airport would be no higher than in 2018 when the airport was operating at close to the consented 32mppa Cap without significant environmental effects. Measures set out in the Applicant's Waste Minimisation Plan would be expected to reduce waste and increase recycling similarly in both the Permitted and Proposed Scenarios. Once passenger numbers are forecast to have returned to the 32mppa Cap in the Permitted Scenario in 2027 there would be no difference between the Permitted and Proposed Scenarios, thus no

[2] https://www.dublinairport.com/corporate/corporate-social-responsibility/sustainability

difference in the 2035 Assessment Year. The impact on waste generation is therefore assessed as imperceptible.

Summary of Effects

19.7.7 The proposed Relevant Action will have no significant effects on material assets in any of the Assessment Years: 2022, 2025 or 2035.

19.8 Mitigation and Monitoring

19.8.1 As the proposed Relevant Action will have not any significant effects on material assets, there is no requirement for mitigation to be implemented. No monitoring measures are proposed.

19.9 Residual Effects and Conclusions

19.9.1 There will be no significant effects on material assets as a result of the proposed Relevant Action in any of the Assessment Years.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections, including minor removals from and additions to the earlier text, the chapter has been revised to:

- Address additional assessment years requested by the Council
- Set out more clearly the scenarios for assessment in the EIAR

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

20. Cultural Heritage

20.1 Introduction

20.1.1 This chapter of the EIAR reports the findings of an appraisal of the effects of the proposed Relevant Action on cultural heritage. It sets out the relevant aspects of the Current State of the Environment and the Future Receiving Environment and goes on to consider the impact of the proposed Relevant Action, which will be an operational change, to remove the numerical cap on the average number of flights permitted between the hours of 23:00 and 07:00 in the Permitted Scenario, replacing it with an annual night-time noise quota, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00.

20.1.2 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2027 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario. Around 7.1 million additional passengers will have used the airport in in the period 2022-2026 in the Proposed Scenario.

20.1.3 A Request for Further Information from the Aircraft Noise Competent Authority (ANCA) asked whether on the effect of additional overflying of Dunsink Observatory and other sensitive cultural heritage receptors was considered in the EIAR submitted in December. A report confirming that there would be no significant effects is included as Appendix 20A of this EIAR and discussed in Section 20.6 of this chapter.

20.2 Legislation, Policy and Guidance

20.2.1 The following legislation, policy and guidance is relevant to this chapter and has been considered during the assessment presented within it. General legislation, policy and guidance has also been considered but is not listed as this has been covered in the introductory chapters.

Legislation

- National Monuments Act 1930 as amended.

Regional and Local Planning Policy

- Fingal Development Plan, 2017 – 2023, Appendix 2 (Record of Protected Structures), Fingal County Council;
- Fingal Development Plan, 2017 – 2023, Appendix 3 (Recorded Monuments), Fingal County Council;
- Fingal Heritage Plan, 2018 – 2023, Fingal County Council, 2018 (includes the Record of Protected Structures for Fingal County); and
- Dublin Airport Local Area Plan, Fingal County Council (2020).

Policy, Standards and Guidance

- Department of Arts, Heritage, and the Gaeltacht, 1999, Frameworks and Principles for the Protection of the Archaeological Heritage;
- Department of Arts, Heritage and the Gaeltacht, 2011, Architectural Heritage Protection, Guidelines for Planning Authorities;

- Demesnes, Estates and their Settings, An Action of the County Cork Heritage Plan 2005/2010. Cork County Council, Cork;
- Institute of Archaeologists of Ireland ("IAI") (2006a) Code of Conduct for Archaeological Assessment Excavation;
- IAI (2006b) Code of Conduct for the Treatment of Archaeological Objects in the context of an archaeological excavation. Institute of Archaeologists of Ireland; and
- IAI (2007) Environmental Sampling: Guidelines for Archaeologists. Institute of Archaeologists of Ireland.

20.3 Assessment Methodology

Methodology for Determining Construction Effects

20.3.1 As the proposed Relevant Action propose no changes to the design or construction of North Runway, or any other part of Dublin Airport, there will be no physical changes in any part of the airport or its surroundings. As a result, the proposed Relevant Action will not result in any new effects on cultural heritage arising from construction, and further assessment is therefore not required.

Methodology for Determining Operational Effects

20.3.2 The potential operational impacts on cultural heritage include:

- Potential for physical impacts on heritage receptors owing to changes in the number of passengers using the airport; and
- Potential for impacts on the setting of heritage receptors from additional night flights.

20.3.3 These potential impacts are examined in more detail and their effects assessed in Section 20.6.

Limitations and Assumptions

20.3.4 There are no limitations to the assessment of potential effects on cultural heritage presented in this chapter.

20.4 Current State of the Environment

20.4.1 Recorded heritage assets gleaned from the records of the National Monuments Service, Fingal County Council and the Heritage Council have been used to determine the Current State of the Environment in the study area (Figure 20.1, *EIAR Volume 3: Figures*). This study area incorporates the boundaries of the airport lands and an area extending beyond these boundaries. Archaeological sites, and architectural heritage (Protected Structures and National Inventory of Architectural Heritage) were identified within this study area.

National Monuments

20.4.2 There are no National Monuments within the study area. The closest is HA2 Dunsoghly Castle (NM 230) which was associated with the Plunkett Family and is located within a farmyard 1460m west of the site. Dunsoghly Castle is a 15th century tower house consisting of four storeys with four large corner towers built with coursed limestone blocks with dressed stone quoins and a base batter. It is recorded as DU014-005001 on the Record of Monuments and Places.

Record of Monuments and Places

20.4.3 There are four assets recorded on the Record of Monuments and Places (RMP) within the boundaries Dublin Airport with a further three assets in close proximity outside the airport boundaries.

20.4.4 The assets within the grounds of Dublin Airport are HA6 Corballis Castle (DU014-011), an enclosure (DU014-008), HA8 a house (DU014-040) dating to the 16th or 17th centuries and a HA5 ring fort (DU011-046). The former location of HA6 Corballis Castle (DU014-011) is under airport buildings 93 m southeast of Terminal 2. This asset was a medieval tower house which is marked on the 1837 OS map as 'Corballis Castle, in ruins'.

20.4.5 The HA5 enclosure (DU014-008) and HA8 house (DU014-040) are located in close proximity to one another at the west end of the South Runway. The HA5 enclosure (DU014-008) is not marked on OS map sheets. It appeared as a circular single ditched enclosure with a diameter of 35m in an area of low-lying pasture on an aerial photograph taken in 1971. This asset may be a levelled ringfort dating to the Early Medieval period. The location is now under the runway and the asset has been destroyed.

20.4.6 The HA8 house (DU014-040) was located 190 m southwest of the HA5 enclosure (DU014-008). This building is shown on the Down Survey map (1655-6) as a dwelling near where Harristown House was located. The Civil Survey (1654-6) described the house as being a ruined stone building and it is now under the runway. This asset has been destroyed.

20.4.7 The former location of the HA29 ring fort (DU011-046) is located at the north boundary of the airport with the Naul Road. It was labelled 'fort' on the 1837 OS map. It was partly demolished in 1822 and cleared away in 1873. The location was occupied by a halting site but the area has now been incorporated into an extension to the recently constructed runway at Dublin Airport. The ring fort was included on the Record of Protected Structures as RPS 610.

20.4.8 A HA7 holy well (DU014-023) consists of an unenclosed pool located behind Toberbunny Lodge close to the Cuckoo Stream. It was said to be a station well but it is no longer venerated and has been incorporated into a golf course.

20.4.9 The presence of the holy well suggests religious activity within the area dating prior to the medieval period. This is reinforced by the surrounding townland name- Toberbunny which translates as the Milk Well. The establishment of townlands pre-dates the Anglo-Norman invasion during the 12th century so Toberbunny suggests that the well was in existence prior to this. The holy well is also recorded as a Protected Structure (RPS 602).

20.4.10 Another HA26 holy well (DU014-010) is located in a field east of the R132. Known locally as the Lady Well, this site was visited in 1958 when it was shown that the well had dried up and its location consisted of a hollow marked by a whitethorn bush (O'Danachair, 1958). The well is no longer venerated. The Holy Well is also recorded as a Protected Structure (RPS 607).

20.4.11 A HA25 church (DU014-009001) is located in a graveyard (DU014-009-002). The HA25 church (DU014-009001) dates to the medieval period and is said to have been erected by Ryryd, son of Owain, Prince of Wales. It was reported as still in good condition in 1630 though, now, consists of foundational remains located within the north east of the graveyard. An early 18th century parish church was erected in the centre of the graveyard. There are no upstanding remains associated with this 18th century church although its former location can be discerned as a low grassed over platform.

20.4.12 The surrounding graveyard (DU014-009002) is roughly rectangular and built on a rock outcrop. The rock has been quarried along the exterior of the graveyard wall to create a steep precipice around the north and east sides. The graveyard contains 18th to 20th century gravestones, undecorated markers and two vaults. The church and graveyard are also recorded as Protected Structures (RPS No.609).

20.4.13 One further asset recorded on the RMP is located on the boundaries of Dublin Airport. This is the HA9 Boot Inn (DU014-090) which is a located to the immediate west of the airport at Pickardstown. It consists of a two-storey, four bay building dating to post 1700.

20.4.14 One asset to the south of the airport was uncovered through archaeological fieldwork associated with the proposed Metro West rail scheme from 2008 to 2009. It was initially detected through geophysical survey then verified through excavation. It consisted of an enclosure (DU014-121).

20.4.15 The HA13 enclosure (DU014-121) was located 212m south of the airport at Merryfalls. It consisted of an area 30 m in diameter enclosed by a ditch between 1.1 m and 2.2 m wide and 0.45 m deep. No dating evidence was recovered during the excavation although the form, size and shape of the enclosure were consistent with a ringfort dating to the early medieval period (Frazer, 2009).

20.4.16 The remaining assets recorded on the RMP within the study area generally represent site types already noted within Dublin Airport and immediately adjacent. Many of these assets have no visible upstanding remains but have been included on the Fingal County Council Record of Protected Structures. This ensures protection for any subsurface archaeological remains that may exist. Details of the assets are listed in Table 20-1 below.

Table 20-1 Remaining RMP Assets within the Study Area

Label	NMS Ref	RPS	Type / Name	Date	Description	Condition
HA28	DU011-044	631	House	16th / 17th century	The Civil survey (1654-6) mentions a fair stone house at the Great Forrest held by Lord Ranelagh.	No visible remains
HA21	DU014-002001	626	Church	Medieval	The remains of the medieval parish church lie in the W end of a graveyard N of St. Margaret's village. This site has been described as the 'old church' in the Civil survey (1654-6).	Some remains
HA21	DU014-002002	626	Grave yard	Medieval	The graveyard surrounded by a stone wall is sub-rectangular in plan. The ground slopes steeply down from south to north. An 18th century mausoleum which is dedicated to the Morgan family is located at the southern boundary of the graveyard.	Substantial remains
HA21	DU014-002003	626	Grave yard	Late Medieval	A chantry chapel, apparently built by the Plunkett family (Tutty 1979, 155-157) in the sixteenth century lies southeast of the St. Margaret's medieval parish church (DU014-002002-). It is rectangular in plan (L 9m, WNW-ESE, W 4.9m, wall T 0.9m) and is entered through an elaborately decorated, pointed arched doorway which incorporates roll and hood moulding that terminates in a carved head.	Substantial remains
HA17	DU014-003	624	Holy Well	Early Medieval	Dedicated to St. Brigid, access is via laneway from rear of the Parochial Hall. This is an enclosed spring well. The well 'bath' area delineated by stone wall, iron railings and a gate. To south are steps down to a stone lined base. Lower course of bath red brick. According to a plaque attached to the west end of the tank, the well was enclosed by Sir. John Plunkett of Dunsoghly (d. 1582) although the present structure looks much later.	Substantial remains
HA4	DU014-007	620	Enclosure	Uncertain	Situated on a slight rise in a large open field of tillage. An oval-shaped, single-ditched enclosure (max. dims. L 33m; W. 30m) appears as a cropmark on an aerial photograph.	No visible remains
HA41	DU014-108		Enclosure	Uncertain / Early Medieval	Circular enclosure visible as a crop mark on an aerial photograph (SMR file; pers. comm. T. Condit). Located at low point within field in Sandyhill with quite stark undulations. Arable.	No visible remains
HA37	DU014-109		Enclosure	Uncertain / Early Medieval	A sub-circular enclosure visible as a crop mark on an aerial photograph (SMR file; pers. comm. T. Condit). Located within relatively flat open field, in Sandyhill.	No visible remains
HA33	DU014-099		Ringfort	Early Medieval	Aerial photograph (GB89. AF.01) shows cropmark of a curvilinear enclosure defined by a fosse. This is probably a ploughed-out ringfort. Within rough pasture. No visible remains.	No visible remains
HA34	DU011-113		Enclosure	Uncertain	A sub-circular enclosure visible as a crop mark on an aerial photograph together with other features (SMR file; pers. comm. T. Condit). The site is located on low-lying land that rises steeply to the south. No visible remains at ground level.	No visible remains

Label	NMS Ref	RPS	Type / Name	Date	Description	Condition
HA36	DU011-118		Enclosure	Uncertain	An irregular shaped enclosure visible as a crop mark on an aerial photograph together with other features. A circular enclosure (DU011-116----) and field system (DU011-117----) are located close to the north (SMR file; pers. comm. T. Condit). This site was subject to geophysical survey (08R117) and test excavation (09E 0466) as part of the proposed Metro North development. A possible D-shaped enclosure (30m diam.) was identified. An additional enclosure was identified 20 m to the northeast, possibly enclosing an area measuring 50 m in diameter. A figure-of-eight shaped corn drying kiln was identified directly north of a ditch feature which may have had a relationship with either enclosure (Hession 2009, 36).	Excavated
HA37	DU014-109		Enclosure	Uncertain/Early Medieval	A sub-circular enclosure visible as a crop mark on an aerial photograph (SMR file; pers. comm. T. Condit). Located within relatively flat open field, in Sandyhill.	No visible remains
HA38	DU014-111		Enclosure	Uncertain	An irregular shaped enclosure visible as a crop mark on an aerial photograph together with other features that could indicate a possible field system (DU014-112----) (SMR file; pers. comm. T. Condit). Located within flat open land.	No visible remains
HA40	DU014-123		Enclosure	Uncertain/Early Medieval	This monument was identified from geophysical survey (Licence no. 09R195) and confirmed by test excavation (Licence no. 10E0459) as part of the proposed Metro West development. It is a circular enclosure (30m diam.) characterised by a U-shaped ditch (1.1m-2.2m wide by 0.45m deep). Although undated its form, size and shape are consistent with that of a severely truncated early medieval ringfort (O'Donovan 2010, 16).	Excavated
HA42	DU011-041		Enclosure	Uncertain	Situated in an elevated position enjoying extensive views. There is a tradition of a 'fort' at this site (Healy 1975, 24). Had been in use for poly tunnels, now abandoned. Not visible at ground level.	No visible remains
HA43	DU011-42		Church	Uncertain/Early Medieval	An elevated position under tillage. Human bones have been exposed (Healy 1975, 24). There are no visible surface remains. There is a tradition of a chapel at this site (DU011-042001-). The area was subject to geophysical survey (Licence no. 12R0059) undertaken in advance of a proposed development. Anomalies suggestive of an archaeological complex measuring 100 m north south were identified. These are characterised by a circular enclosure (c.55 m diam.) within which are numerous responses indicative of pit features. Associated rectilinear responses extend from the enclosure some of which may be contemporary (Leigh 2012, 8).	No visible remains
HA44		RPS 608	Holy Well	Uncertain/Early Medieval	Enclosed stone well at base of steps under tree in field off Stockhole Lane.	Some remains

Record of Protected Structures

20.4.17 A number of the assets recorded on the RMP have also been recorded as Protected Structures and these have been discussed in the RMP section above.

20.4.18 There are four Protected Structures located within the airport boundary. The HA14 Old Central Terminal Building consists of the 1937 terminal building (RPS 612) which is a detached multiple-bay four-storey terminal building built in the International Modern style in 1937. It is also recorded on the National Inventory of Architectural Heritage (NIAH) where it is noted as (NIAH 11349006).

20.4.19 HA16 the Church of our Lady Queen of Heaven (RPS 864) which is located within the main airport complex to the north of Terminal 1. It consists of a detached multiple-bay Roman Catholic church which was built in 1964 with a concrete bell tower and landscaped entrance courtyard to the west. It is one of the first modernist churches in Dublin and is also recorded as NIAH 11349001.

20.4.20 HA24 is Castlemoate House (RPS 611) which is a five bay, two-storey house without-offices and gates. Enlarged in 1877 to plans by the architect William Stirling, it is currently used as offices by the airport. The last Protected Structure within the airport boundaries is HA27 the former Cloghran Stud Farm (RPS 606) is located 400m to the east of the proposed staff car park. It consists of the former Glebe House and entrance gates although the Protected Structure designation excludes the stable complex.

20.4.21 HA22 a thatched dwelling (RPS 604) is an architectural structure which is also recorded on the NIAH as NIAH 11349003 is located on the Swords Road 135 m south of Dublin Airport. It consists of a detached three-bay, single-storey house with a central projecting entrance porch dating to around 1800. The cottage is post-medieval in date.

20.4.22 HA20 Kilreesk Bridge (RPS 627) is located 367 m northwest of the airport boundary on the R122. It consists of a double-arch rubble stone bridge carrying the road over a river. The bridge dates to 1750 and is recorded on the NIAH as NIAH 11342008.

20.4.23 The remaining assets recorded on the RPS within the study area are not noted on either the RMP or NIAH. Three are located within the vicinity of the proposed staff car park adjacent to the R132. The closer of these is HA24 Castlemoate House (RPS 611) which is a five bay, two-storey house without offices and gates located 8m to the north of the location of the West Staff car park. Enlarged in 1877 to plans by the architect William Stirling (Dictionary of Irish Architects 1720-1940).

20.4.24 HA26 the Holy Well (RPS 607) is located off Stockhole Lane. It consists of an enclosed stone well at the base of steps under a tree in the field while HA27 the former Cloghran Stud Farm (RPS 606) is located 400 m to the east of the proposed staff car park. It consists of the former Glebe House and entrance gates although the Protected Structure designation excludes the stable complex.

20.4.25 The last assets recorded as Protected Structures within the study area are a HA19 windmill (RPS 628) which is located at Millhead and HA18 St Margrets RC Church (RPS 625) located on Main Street in St Margrets. The HA19 windmill (RPS 628) now consists of a circular ruin within a field to the northeast of St Margrets. HA18 St Margrets Church (RPS 625) is a 19th century Roman Catholic church.

National Inventory of Architectural Heritage

20.4.26 A number of the assets recorded on the NIAH have also been recorded as Protected Structures and these have been discussed in the previous section. Four further assets recorded on the NIAH are located within the study area.

20.4.27 HA15 Corballis House (NIAH 11349002) was located within the airport boundary but was lost to construction of Terminal 2. It consisted of a detached seven-bay, two-storey house on an irregular plan with three canted bays to the left side and a two-storey return to the rear.

20.4.28 HA23 a detached three-bay single-storey thatched house (NIAH 113490040) is located on the Swords Road 150 m southeast of Dublin Airport. The house dates to 1800 and has an L-shaped plan with a gable-fronted projecting entrance porch. It has a double pitched thatch roof with decorative thatched ridging with two nap rendered chimney stacks. The protected structure, HA22 a thatched dwelling (RPS 604), is located to the west across the Swords Road.

20.5 Future Receiving Environment

20.5.1 It may be that in future new cultural heritage assets are designated or discovered but this is not possible to predict, so it is assumed for the purposes of the assessment that the Future Receiving Environment would not be substantively different than at present.

20.5.2 In the absence of the proposed Relevant Action, the Permitted Scenario, with its predicted passenger and ATM forecasts, will come into effect once the North Runway becomes operational.

20.6 Assessment of Effects and Significance

20.6.1 As the proposed Relevant Action will not result in changes to the design or construction of the North Runway, or any other part of Dublin Airport, there will be no construction impacts. As a result, the proposed Relevant Action will not result in construction related cultural heritage effects.

Changes in Passenger Numbers

20.6.2 Operationally, the increase in the number of passengers using the airport in the Proposed Scenario, compared with the Permitted Scenario, would not have any impact on cultural heritage receptors outside the airport boundary.

20.6.3 Within the boundary there would be a higher number of passengers using the airport in the 2022 and 2025 Assessment Years under the Proposed Scenario, but this difference is only temporary. By 2027 passenger throughput will be the same in both the Permitted and Proposed Scenarios, so there is no difference in the 2035 Assessment Year. This temporary difference is unlikely to have a material effect on heritage receptors within the airport boundary, particularly as in both scenarios only a very small proportion of passengers ever interact with heritage receptors at the airport.

Setting of Heritage Receptors

20.6.4 The impact of the increase in the number of night flights under the Proposed Scenario would have little if any effect on the setting of cultural heritage receptors. There will be no new flight paths in the Proposed Scenarios, so any potential setting impact would continue to affect the same receptors. The only variable would be the time of day in which such overflights would occur. In the Proposed Scenario there would be more flights at night-time but less during the day, which arguably might have a lesser impact on the setting of cultural heritage receptors than the Permitted Scenario, but the beneficial effect would be imperceptible.

20.6.5 As explained in Appendix 20A, there will be no overflights of Dunsink Observatory in the Proposed Scenario and therefore no impact. With regard to other sensitive cultural heritage receptors the overall setting effect was imperceptible.

Summary

20.6.6 Thus, the proposed Relevant Action will have no significant effects on cultural heritage in any of the Assessment Years: 2022, 2025 or 2035.

20.7 Mitigation and Monitoring

20.7.1 As the proposed Relevant Action will not have any significant effects on cultural heritage, there is no requirement for mitigation to be implemented. No monitoring measures are proposed.

20.8 Residual Effects and Conclusions

20.8.1 There will be no significant cultural heritage effects as a result of the proposed Relevant Action in any of the Assessment Years.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections, including minor removals from and additions to the earlier text, the chapter has been revised to:

- Include details of the archaeological and architectural baseline
- Address additional assessment years requested by the Council
- Set out more clearly the scenarios for assessment in the EIAR

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

21. Interactions and Cumulative Effects

21.1. Introduction

21.1.1 The EIA Directive[1] states an Environmental Impact Assessment Report (EIAR) should contain:

'*A description of the likely significant effects of the project on the environment resulting from…the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources*.'

21.1.2 The Directive makes clear that the description of the likely significant effects should cover cumulative effects. The Environmental Protection Agency's draft 'Guidelines on the information to be contained in Environmental Impact Assessment Reports'[2] (hereafter referred to as 'the EPA Draft Guidelines') explains that cumulative effects are '*the addition of many minor or significant effects, including the effects of other projects, to create larger, more significant effects*.

21.1.3 Cumulative effects may occur as a result of the addition of effects from more than one project development. They may also occur when a single receptor or group of receptors experience more than one type of impact, for example a single receptor may be affected by noise, air quality and visual impacts from a proposed development at the same time. To distinguish the latter 'intra-project' cumulative effects from 'inter-project' cumulative effects, such 'intra-project' effects are referred to in this EIAR as 'interactions'. This chapter assesses both the interactions and cumulative effects of the proposed Relevant Action.

21.1.4 The two types of cumulative effects assessed in this EIAR are:

- Interactions of several impacts arising from the proposed Relevant Action: these are effects resulting from the interaction of several different impacts (e.g. noise, air quality etc.) arising from the proposed Relevant Action that may collectively cause an effect / effects of greater magnitude, on any single environmental receptor. Individually the effects resulting from these impacts may not be significant, but the accumulation of effects may collectively cause an overall significant effect; and
- Cumulative effects of proposed Relevant Action with other existing or permitted projects: these occur when the environmental impacts and effects of the proposed Relevant Action interact with those associated with other planned projects and developments located within a realistic geographical scope where environmental impacts could act together to result in a greater significance of effect on environmental receptors.

21.1.5 Other developments that already exist or will be constructed and/ in operation by the time the proposed Relevant Action would be implemented in 2022 are already accounted for in the Current State of the Environment established for the technical assessments in Chapters 7 to 20. Therefore, with the exception of traffic-related assessments the cumulative effects assessment considers other developments which have potential for cumulative effects with the proposed Relevant Action and which have planning permission and/ or which are in the planning system and considered reasonably likely to proceed but would not be constructed/ in operation by the time the proposed relevant Action is implemented in 2022. The traffic related assessments take into account other developments which would be in operation in the future years, 2025 and 2035, as part of the Future Receiving Environment; therefore, those assessments are inherently cumulative and are not assessed further in this chapter.

21.1.6 Details on the process used to identify other developments relevant to the assessment of cumulative effects are provided in Section 21.3.

The assessments of interactions and cumulative effects presented in this chapter draw on the assessments of impacts provided in Chapters 7 to 20, information available in the public domain relating

[1] *Directive 2011/92/EU of the European Parliament and of the Council of 13th December 2011 on the assessment of the effects of certain public and private projects on the environment* (as amended by Directive 2014/52/EU)
[2] *Guidelines on the information to be contained in Environmental Impact Assessment Reports*, Environmental Protection Agency (2017)

to other known developments within the study area (refer to Section 21.3 below) and professional judgement.

21.2. Legislative Context and Guidance

21.2.1 The EIA Directive was transposed into domestic law on the 1st September 2018 in the form of the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018[3].

21.2.2 In addition to the EPA Draft Guidelines, further guidance is available from the European Commission which has published 'Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions'[4]

21.3. Assessment Methodology

21.3.1 The assessments of interactions and cumulative effects consider the residual effects identified by the individual technical assessments (Chapters 7 to 20), excluding those which are classified as 'imperceptible' (refer to *Chapter 1: Introduction*, Plate 1-2, *Determination of the Significance of an Effects (EPA, 2017)*). For the purposes of this assessment, the Assessment Year 2025 has been chosen as it is the 'worst-case' year of the three Assessment Years, the first year of maximum use of the runway system in the Proposed Scenario (i.e. when 32 million passengers per annum throughput is first expected to be reached but not exceeded) and it is also the first year of predicted maximum environmental effects in the Proposed Scenario.

Interactions Assessment - Methodology

21.3.2 The assessment of interactions due to the interaction of different types of impact from the proposed Relevant Action on particular receptors considers each of the environmental topics addressed within the EIAR and reported in Chapters 7 to 20 of this EIAR. As the proposed Relevant Action relates to the operating conditions of the runway system at night and does not involve construction works or changes to the consented physical infrastructure of North Runway, the interactions' assessment focusses on the operational phase only.

21.3.3 This assessment considers all residual effects which have been identified, excluding those which are classified as 'imperceptible' (refer to *Chapter 1: Introduction*). It thereby includes residual effects which, whilst not significant individually, may, in combination with other residual effects, result in a significant interaction. As only residual effects are considered, the assessment of interactions takes into account any mitigation measures identified in each technical assessment (Chapters 7 to 20).

21.3.4 The assessment considers the residual effects for each topic, the significance of each individual identified effect and the duration over which these effects would be experienced by an individual receptors/ group of receptors, where interactions are identified.

21.3.5 Only those receptors identified in multiple assessments and which would therefore be subject to multiple types of residual effect are considered.

21.2.3 The environmental receptors / receptor groups that have been identified and considered in relation to potential interactions are:

- Human receptors (residents and local community, including those using schools, healthcare facilities and places of worship).

21.3.6 The types of residual effects associated with the proposed Relevant Action considered to have potential to result in interactions are outlined below:

- Effects on noise sensitive receptors caused by noise impacts from aircraft as a result of changes in aircraft noise patterns (refer to *Chapter 13: Air Noise and Vibration and Chapter 7: Population and Human Health*); and

[3] European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.
[4] European Commission: Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, May 1999. https://ec.europa.eu/environment/archives/eia/eia-studies-and-reports/pdf/guidel.pdf

- Effects on noise sensitive receptors due to ground noise as a result in changes to operation (refer to *Chapter 14: Ground Noise and Vibration and Chapter 7: Population and Human Health*).

21.3.7 No other types of effect have been classified as having greater than 'imperceptible' effects, i.e. they would not be perceptible or would not occur and are excluded from the assessment of interactions. For example, as the residual air quality effects described in *Chapter 10: Air Quality* are imperceptible, there is no potential for receptors to be subject to significant effects due to interactions between the residual noise effects of the proposed Relevant Action and the air quality effects.

Cumulative Effects Assessment - Methodology

21.3.8 Cumulative effects consider the impacts of other projects which have potential for cumulative effects with the proposed Relevant Action. As explained above, this chapter focusses on developments which have planning permission and/ or which are in the planning system and considered reasonably likely to proceed, pending a planning decision but which do not form part of the Current Receiving Environment or, in the case of traffic-related assessments, the Future Receiving Environment. The potential for other developments to result in cumulative effects with the proposed Relevant Action is dependent upon the location, type and scale of development and associated activities, and the type and duration of any likely environmental effects of the other developments. This includes any known permitted or planned projects by third parties. The following section details the process followed to identify those projects with the potential to result in significant cumulative effects when considered in combination with the proposed Relevant Action.

21.3.9 The Assessment Year of 2025 has been chosen for the cumulative effects assessment as this is the first year of highest use of the runway system in the Proposed Scenario (i.e. when 32 million passengers per annum is expected to be reached but not exceeded) and is also the year of predicted maximum environmental effects in the Proposed Scenario.

Identification of Long List of Projects

Study Area

21.3.10 Potential adverse cumulative effects may occur where the technical assessments for the proposed Relevant Action indicate that there would be more than negligible effects as a result of the proposed Relevant Action. Using the terminology defined in *Chapter 1: Introduction*, Section 1.5, for the purposes of the cumulative effects assessment this has been taken to equate to effects which are classified as 'slight to profound'. Table 21-1 below considers each of the assessments in Chapter 7 to 20 of the EIAR and identifies which types of effects are considered to have potential for cumulative effects.

Table 21-1 Environmental Effects of Proposed Relevant Action with Potential for Cumulative Effects

EIAR Chapter	Residual Effects Due to Proposed Relevant Action	Potential for Cumulative Effects?
7. Population and Human Health	Moderate adverse effects on amenity and community and on human health and wellbeing as a result of adverse impacts due to air noise and ground noise.	Yes – potential for cumulative effects due to air noise and ground noise impacts.
8. Major Accidents and Disasters	The assessment of major accidents and disasters considers the risks from specific types of hazards, including aircraft crashes, bird strike, wake vortex and fuel dumping. These are all specific to aircraft operation. There would be a slight increase in the residual risks to third parties as a result of the proposed Relevant Action.	No - whilst residual risk would increase, no other developments have been identified which could give rise to these types of hazard, hence there would not be cumulative effects.
9. Traffic and Transport	On an hour-by-hour basis, the proposed Relevant Action would result in an increase in two-way traffic flows on some adjacent road links, and a decrease on others. For the majority of the 24-hour period, increases in traffic flows caused by the proposed Relevant Action are estimated to be less than 5%. This is considered to have a slight effect.	No – the traffic and transport assessment is based upon a Local Area Model which factors in traffic growth on the network and is therefore inherently cumulative. Any environmental effects associated with changes in traffic flows due to the proposed Relevant Action are reflected in the assessment of road traffic noise – refer to comment under *14. Ground Noise and Vibration* below in this table. There would be no other cumulative traffic and transport effects as a result of the proposed Relevant Action.
10. Air Quality	The magnitude of impacts for all pollutants (NO_2, PM_{10}, $PM_{2.5}$) and odour would be imperceptible for all receptors.	No - there would be no cumulative effects associated with air quality as a result of the proposed Relevant Action.
11. Climate and carbon	The proposed Relevant Action would give rise to minor impacts as a result of unavoidable Greenhouse Gas (GHG) emissions. These do not represent a significant effect in terms of the proposed Relevant Action.	No - whilst the proposed Relevant Action would add to overall GHG emissions from other developments globally and will therefore give rise to cumulative effects, the contribution of the proposed Relevant Action would be inconsequential.
12. Water	There would be no change to impacts on the water environment as a result of the proposed Relevant Action.	No – as there would be no impacts on the water environment as a result of the proposed Relevant Action, there would be no cumulative effects on water environment receptors.
13. Air Noise and Vibration	In the likely worst-case future year, 2025, there would be an increase of 24% in the number of people highly annoyed and an increase of 65% in the number of people who would be highly sleep disturbed as a result of the proposed Relevant Action. In 2025, the number of people experiencing greater than imperceptible air noise effects as a result of the proposed Relevant Action would be 72,67034,318 as determined by the L_{den} metric. Of these, 34,251 would experience slight or moderate effects with 67 being subject to	Yes - potential for cumulative noise impacts as a result of noise from aircraft.

EIAR Chapter	Residual Effects Due to Proposed Relevant Action	Potential for Cumulative Effects?
	significant effects. In general noise level increase would be around 1dB (A) although increases of up to 5 dB (A) would be experienced by receptors near Malahide Castle. At night-time in 2025, the number of people experiencing greater than imperceptible air noise effects as a result of the proposed Relevant Action would be 69,957 as determined by the L_{night} metric. 11,494 of these would be subject to a significant very significant or profound effect. The majority of receptors would experience increases in noise levels of around 2 dB (A), however receptors closer to flight paths form the North Runway, for example at Swords, Malahide and Ridgewood would experience larger increases of between 5 and 8 dB (A). With the implementation of sound insulation measures proposed as part of the proposed Relevant Action there would be a slight reduction in the number of people exposed to high or very high noise levels at night in 2025, from 64 people to 56 people. *Chapter 13: Aircraft Noise & Vibration* shows the overall net significant effects with sound insulation measures in place and includes all people in existing residential receptors who are exposed to at least 45 dB L_{den} or 40 dB $L_{night.}$ In 2025, the proposed Relevant Action would result in a net significant adverse effect on up to 10,560 people (L_{night}) with up to 86 people experiencing a net significant beneficial effect. With regards to vibration due to airborne aircraft, there would be negligible impacts as a result of the proposed Relevant Action.	
14. Ground Noise and Vibration	The assessment of ground noise effects (refer to *Chapter 14: Ground Noise and Vibration*) as a result of the proposed Relevant Action includes consideration of the cumulative impacts of the proposed Relevant Action together with the separate Apron 5H application, which seeks to develop Apron 5H in the north-east of the airport site (planning reference number: F20A/0550). That application, if successful, would not result in any change to the number of aircraft operations, but would re-distribute some of them to the Apron 5H stands. In general, this would result in a small increase in noise levels for receptors to the north of the airport, and a small decrease for receptors to the south. *Chapter 14: Ground Noise and Vibration* also includes an assessment of road traffic noise effects from the proposed Relevant Action. In the 'worst-case' year, 2025, the number of people exposed to at least 45 dB (A) who would experience more than imperceptible adverse effects as determined by the L_{den} metric as a result of the proposed Relevant Action is 15,551. Of these, 678 would experience slight effects. All predicted increases in noise levels at selected representative receptors would be +1 dB.(A). The proposed Relevant Action together with the Apron 5H development would result in 760 people experiencing slight adverse effects in 2025. In 2025, at night-time, the number exposed to more than imperceptible adverse noise effects, as determined by the L_{night} metric would be: 37,330, of which 14,721 would experience slight effects, 3,529 moderate effects and 62 significant effects. The maximum predicted noise increase at selected receptors would be +4 dB (A) (at GR01, Ridgewood).	Yes – potential for cumulative ground noise effects associated with developments other than Apron 5H and excluding road traffic noise. Any potential cumulative effects associated with road traffic noise due to the proposed Relevant Action are already inherently assessed within the Ground Noise Road Traffic Noise assessment and are therefore not considered again under cumulative effects. As road traffic noise effects would be imperceptible, there would be no cumulative road traffic noise effects as a result of the proposed Relevant Action.

EIAR Chapter	Residual Effects Due to Proposed Relevant Action	Potential for Cumulative Effects?
	The application of residential sound insulation measures would reduce the number of people experiencing significant residual ground noise effects. In the 'worst-case' year, 2025, the proposed Relevant Action together with the Apron 5H development would result in a total of 9 people experiencing a significant adverse effect.. During daytime, (L_{den} metric) there would be no significant effects. The assessment of road traffic noise effects for the proposed Relevant Action is inherently cumulative as it is based on traffic modelling which includes traffic that would be generated by other proposed developments. The increases in road traffic noise would be less than 1 dB (A), which is considered to be negligible. Vibration due to aircraft ground operations was not assessed the Ground Noise and Vibration assessment as aircraft operations do not typically produce any significant receptors outside the airport site.	
15. Terrestrial Biodiversity	The impact of the proposed Relevant Action on terrestrial biodiversity would be negligible. Note that potential effects of the proposed Relevant Action on European sites are considered in detail in the separate Appropriate Assessment (AA) Screening Report. The AA concludes that there would be no likely significant effects on any European site from the proposed Relevant Action.	No – there would be no residual effects on terrestrial biodiversity as a result of the proposed Relevant Action, therefore no possibility of cumulative effects.
16. Aquatic Biodiversity	There would be no impacts on aquatic ecology as a result of the proposed Relevant Action.	No – there would be no residual effects on aquatic biodiversity as a result of the proposed Relevant Action, therefore no possibility of cumulative effects.
17. Landscape and Visual	The proposed Relevant Action would result in a small variation in the times at which flights can depart and arrive into Dublin Airport at night-time and would have negligible impacts on landscape or visual amenity.	No – there is no residual effects to occur on landscape or visual amenity as a result of the proposed Relevant Action, therefore no possibility of cumulative effects.
18. Land and Soils	There would be no impacts on land and soils as a result of the proposed Relevant Action.	No – as there would be no residual effects on land and soils as a result of the proposed Relevant Action, therefore no possibility of cumulative effects.
19. Material Assets	Although the proposed Relevant Action may result in a small variation in the consumption of material assets when compared to the Permitted Scenario, the combined capacity of Terminal 1 and Terminal 2 shall not exceed 32 mppa on both the Permitted and Proposed Scenarios and the effect of the proposed Relevant Action on material assets would be negligible.	No – as the effect on material assets would be negligible, there is no potential for cumulative effects on material assets as a result of the proposed Relevant Action.
20. Cultural Heritage	The proposed Relevant Action would result in a small variation in the times at which flights can depart and arrive into Dublin Airport at night-time but would have negligible impacts on cultural heritage.	No – there would be no residual effects on cultural heritage as a result of the proposed Relevant Action, therefore no possibility of cumulative effects.

21.3.11 The following types of effect resulting from the proposed Relevant Action have potential to give rise to cumulative effects with other developments, as identified in Table 21-1:

- Air and ground noise effects on human health and well-being;
- Air noise effects on noise-sensitive receptors; and
- Ground noise effects on noise-sensitive receptors.

21.3.12 Noise sensitive receptors include both residential and non-residential receptors, where the former would be occupied during the night-time hours affected by the proposed Relevant Action. As effects on human health are an indirect effect of noise impacts, potential cumulative effects on human health and well-being are considered to be addressed by the potential for air and ground noise effects on noise sensitive receptors.

21.3.13 The proposed Relevant Action is not considered likely to result in any other types of cumulative effects, for the reasons stated in Table 21-1.

21.3.14 Given that noise, with its indirect effect on human health, is the only effect for which there are potential cumulative effects, the study area for the cumulative effects assessment, which has been used to identify other third-party developments which could result in cumulative effects in conjunction with the proposed Relevant Action, is therefore defined by the area which could be affected by perceptible air and /or ground noise effects due to the proposed Relevant Action. This has been taken as the area within the 40 dB (A) L_{night} noise level contour for 2025. Any noise level increases within the 40 dB (A) L_{night} noise contour have potential to give rise to annoyance or sleep disturbance due to noise, on the basis that, at noise levels below 40 dB (A), night-time disturbance due to noise is not likely. The reason for selecting 40dB L_{night} as the study area is that WHO Guidelines 2018 state that night-time aircraft noise above this level is associated with adverse effects on sleep and it is the lowest level of night-time noise modelled in the EIAR.

Third party developments

21.3.15 Having determined the types of effect and defined the 40dB L_{night} Study Area for the cumulative effects assessment, a search was undertaken for planning applications granted within the 40 dB Study Area from June 2011 to June 2021, as available on the All-Ireland digital planning register maintained by the Department of Housing, Planning and Local Government. For the purposes of this assessment, planning applications identified included development within the 40 dB Study Area of a commercial, industrial, agricultural or residential nature (10+ no. units or more[5]). Given the numbers of applications identified, two refinement reviews (P1 and P2) were completed to focus the assessment on those applications which have potential to result in cumulative effects by virtue of the type, scale and timescales for development. This is summarised in Table 21-2. The list of planning applications remaining on the Long-List after completion of the P2 refinement was then further refined to produce a short-list of other third-party developments (P3). Further explanation of the short-listing process is provided in the section '*Defining the Short-List'*.

Apron 5H

21.3.16 The Applicant has a planning application for development of Apron 5H lodged with Fingal County Council (planning reference number: F20A/055). This application would, if consented, result in replacement of 12 aircraft stands on the apron in the north-east of the airport. This application does not form part of the cumulative effects' assessment, instead a detailed modelled assessment of the cumulative noise impact with the proposed Relevant Action is given in *Chapter 14: Ground Noise and Vibration*. Details of cumulative air and ground noise (including road traffic noise) is also provided in *Chapter 14: Ground Noise and Vibration*.

[5] 25 or 50 units could equally well have been chosen as the threshold at which residential development could be considered to have a theoretical impact but the choice of 10 units as a threshold is considered a conservative approach.

Table 21-2 Number of Planning Applications and Criteria Used to Refine the Long-List

Review No.[1]	No. of Planning Applications identified	Planning Applications Not Considered to Have Any Potential for Cumulative Effects
P1	548 planning applications and SID[2]	Minor works excluded from the cumulative assessment by virtue of the small scale of development and negligible potential for generation of noise impacts: • ESB infrastructure (i.e., substations, switchrooms, and towers) • Surface car parking; • Signage and lighting installations; • Surface car parking; • Works to trees; • Extensions to existing buildings; • Cosmetic alterations to existing property/buildings • Roof mounted solar PV panels; • Ground mounted solar PV panels with less than 50kW output • Renewal of planning permission for retention of existing operational use; and • Variation to planning permissions.
P2	268 planning applications and SID	As above, and excluding: • Planning Applications granted prior to June 2016 with a 5-year permission for development and not subsequently extended, as these works were considered likely to have been developed, or otherwise lapsed without development; and • Residential development (including mixed-use residential and Strategic Housing Developments), as well as predominantly residential uses such as nursing or care homes). With regards the types of effect which have potential to result in cumulative effects (refer to Table 21-1 above), potential cumulative noise effects, noise impacts from residential development would be primarily due to traffic-related noise. Operational traffic likely to be generated by any developments that are reasonably likely to go ahead will have been included in the traffic modelling used in the assessment of road traffic noise in *Chapter 14: Ground Noise and Vibration*. Any potential for

Review No.[1]	No. of Planning Applications identified	Planning Applications Not Considered to Have Any Potential for Cumulative Effects
		cumulative impacts is therefore already considered within the assessment of ground noise for future assessment years. With regards effects associated with major accidents and disasters, residential developments would be receptors only and would not be expected to generate any risks associated with potential hazards.
P3	186 planning applications and SID	As above and excluding: • Any developments outside the 3 dB(A) noise difference contour for 2025: refer to main text '*Defining the short-list*'.

[1] Other development were screened using a phased approach. P1 to P3 are the sequential stages. Appendix 21A provides further details of all the developments identified following P2.

[2] SID: Strategic Infrastructure development (SID): applications for planning permission made directly to An Bord Pleanála for major infrastructure developments by local authorities and others. Examples include motorways, railway lines, pipelines, airports, ports or major facilities like hospitals.

Defining the Short-List

21.3.17 The Long-List was reviewed to produce a Short-List of projects for consideration in the cumulative effects assessment. The criteria used to define the short-list are described below.

21.3.18 The locations of the 186 third-party developments identified by the P2 long-list refinement process are shown on the *Phase 2 Exclusion Summary Map*, a copy of which is provided in Appendix 21B. These were overlain onto a noise difference contour plan for 2025 (refer to *Figure 3: Proposed versus Permitted Scenario Difference in Forecast Contours (Lden)* – also provided in Appendix 21B).

21.3.19 For the purposes of Short-Listing third-party developments, those developments which are in a location where there would be an increase in noise levels of 3 dB (A) L_{den} or more in the Proposed Scenario compared with the Permitted Scenario have been given further consideration for inclusion in the Short-List. A noise level increase of 3 dB (A) L_{den} represents a medium increase in noise levels and would result in an effect that is slight or greater where absolute noise levels are in the very low range (i.e. 45 – 49.9_{Lden} or 40 – 44.9_{Lnight}) as represented *Chapter 13: Air Noise and Vibration,* Tables 13-1 to 13-3 and to *Chapter 14: Ground Noise and Vibration*, Tables 14-1 to 14-3.

21.3.20 Of the 186 developments on the Long-List, seven are within the area where the proposed Relevant Action would result in noise level increases of 3 dB (A) L_{den} or more (refer to Figure 21-1 (*EIAR Volume 3: Figures)* and Figure 3 in Appendix 21B). These seven third party developments were therefore included within the Short-List for the cumulative effects' assessment (refer to Section 21.6). One additional (SID) application (Yao6F,309907) also falls within the Short-List defined by noise level increases of 3 dB (A) L_{den} or greater. No other SIDs (Section 5 & Class 32) are within the area where there would be noise increases of 3 dB (A) or greater.

21.3.21 Tables 1 and 2 in Appendix 21A provide summary details of the 186 third party developments and identifies those included and excluded from further consideration of cumulative effects. Summary details of the seven Short-Listed developments are provided in Table 21-4 in Section 21.6 – *Cumulative Effects Assessment*, which presents the results of the assessment.

Impact Assessment and Significance Criteria

21.3.22 The significance of interactions and cumulative effects upon environmental receptors and resources has been determined using professional judgment, assisted by the views and opinions of the competent experts responsible for undertaking the technical assessments.

21.3.23 As discussed in Section 21.3.1, cumulative effects are only considered to be possible where receptors would experience residual effects that are greater than 'imperceptible' as a result of the proposed Relevant Action.

21.3.24 In determining the possible significance of cumulative effects in conjunction with each of the other developments, the type of development, location of the development and timing of activities associated with the other relevant developments and their associated impacts/ effects have been taken into account wherever possible.

21.4. Limitations and Assumptions

21.4.1 The identification of third-party developments for inclusion in the cumulative effects assessment has been based on information available at the time of writing (July 2021). It is only possible to consider those developments currently in the planning system.

21.5. Assessment of Interactions

21.5.1 The following section reports the likelihood of receptors experiencing significant effects due to interactions as a result of the proposed Relevant Action. The receptors included within this assessment are reported within the *Chapter 7: Population and Human Health, Chapter 13: Air Noise and Vibration and Chapter 14: Ground Noise and Vibration* of this EIAR.

21.5.2 The receptor groups identified as likely to experience interactions as a result of the proposed Relevant Action are:

- Human receptors (residents, local community, including those using schools and community facilities).

21.5.3 Table 21-3 shows the likely residual effects on the receptors and provides a description of the likely interactions experienced.

Table 21-3 Assessment of interactions

Receptor	Receptor Value/ Sensitivity	Summary of potential residual effects		Interactions
		Air Noise	**Ground Noise**	
Human receptors – residential property (dwellings)	High	Greater than imperceptible effects on up to 69,952 residents in worst case year 2025 due to noise from airborne aircraft resulting in increased annoyance and sleep disturbance. Up to 58,463 of these would experience effects which are not classified as significant, very significant or profound. The greatest increases in noise levels are towards the north, east and east-north-east of the airport (example receptor locations AR02 Ridgewood; AR03 Swords; AR04 Malahide Castle; AR07 Malahide S) and during night-time hours, represented by the L_{night} metric. Medium to high noise level increases at night at these locations (refer to *Chapter 13: Air Noise and Vibration*).	Increase in ground noise as a result of the proposed Relevant Action alone would be very low during daytime hours in 2025. Noise increase during night-time hours (represented by L_{night}) would be around 2 to 3 dB (A) for most receptors (a low magnitude of impact) with the greatest increases predicted at representative receptor location GR01 – Ridgewood, to the north of the airport. The increase at this location is predicted to be +4 dB (A), a medium magnitude of impact. Absolute ground noise levels at Ridgewood due to aircraft ground noise would be 47dB (A). The effect would be moderate adverse (not significant).	*Chapter 14-Ground Noise and Vibration* has considered the potential contribution of air noise and ground noise from aircraft and road traffic to overall noise levels and the effect that the proposed Relevant Action, in conjunction with Apron 5H, would have on the overall noise levels at sensitive receptors. At Ridgewood (GR01), considering the total noise, the increase due to the proposed Relevant Action is predicted to be 5 dB(A) in 2022 and reduces to 3 dB(A) in 2035. This represents a medium overall impact and would result in a moderate effect (not significant).
Human receptors – community facilities including schools, residential healthcare facilities and places of worship	High	In 2025, increases in noise levels during both day and night-time hours (as represented by the L_{den} and L_{night} metrics) for individual receptors are all low (less than 3 dB (A)). Air noise impacts would therefore not contribute to interactions on these receptors.	No schools, residential healthcare facilities or places of worship would experience noise levels above the thresholds of approx. L_{den} 55dB (A) or approx. L_{night} 45 dB (A). Effects on these receptors would therefore be non-significant and would not contribute to interactions.	No interaction would affect human receptors in community facilities.

21.6. Assessment of Cumulative Effects

21.6.1 Details of all of the long-list 186 third party developments are provided in Appendix 21A, which also indicates which developments have been included and excluded from the cumulative effects assessment. The locations of the 186 third party developments are shown on the *Phase 2 Exclusion Summary Map* and *Figure 3: Proposed versus Permitted Scenario Difference in Forecast Contours (L_{den})* – provided in Appendix 21B.

21.6.2 Figure 21-1 (*EIAR Volume 3: Figures)* shows the locations and Table 21-4 details the Short-Listed developments considered in the cumulative effects' assessment.

Table 21-4 List of Third-Party Developments Included in the Cumulative Effects Assessment

ID[1]	Planning Ref. No./ Applicant	Status	Development Description	Assessment of Cumulative Effects	Significance of Cumulative Effect
R47	F19A/0493 / daa	Granted 11/6/2020	Proposed landside facility and snow base. The demolition of 3 no. existing single storey sheds, the removal of the surface of the existing yard, and the construction of (1) a part single (double height), part two-storey machinery/salt storage building, consisting of a machinery storage facility with 2 no. roller shutter doors, 3 no. separate salt stores with open front, and ancillary facilities over the two floors (2) new single-storey (double height) vehicle wash bay, (3) A new vehicular and pedestrian access of the existing Castlemoate Road, (4) new concrete yard, (5) staff parking facilities, (6) 2 no. concrete mulch storage bins, (7) 2.4 m high paladin boundary fence, (8) internal concrete path, (9) 2 no. rainwater harvesting tanks, (10) an underground tank, and (11) all associated site development, drainage, landscaping and ancillary works. The proposed development is located within the curtilage of Castlemoate House, A Protected Structure. (Fingal County Council Protected Structure Reference: 0601).	Existing site is an established location for ancillary airport maintenance services, plant and materials and is not a noise sensitive use. The development will be carried out within the footprint of the existing snow facility within the landside portion of the existing Dublin Airport campus. The EIA screening report for this development states that noise levels during construction will not exceed the indicative levels of acceptability for construction noise in an urban environment and construction contractors will be required to comply with the requirements of the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations ,1988, as amended and the Safety, Health and Welfare at Work (Control of Noise at Work) Regulations 2006. With appropriate measures to mitigate noise in place and given the short-term nature of construction noise impacts, the development is not likely to give rise to noise impacts which would result in significant cumulative effects on noise sensitive receptors in conjunction with the Proposed Scenario under the proposed Relevant Action when compared to the Permitted Scenario.	Not significant
R51	F16A/0471 / Roadstone Ltd	Granted 4/12/2017	The development will consist of decommissioning of the existing concrete crushing and screening plant and erection and operation of a proposed concrete plant consisting of concrete mixer plant, conveyors, 4 no. aggregate silos, 8 no. cement silos, tip in bin, 2 no. water storage tanks and a control cabin (c. 849.2m²) (with a maximum height of 23.0m), a truck wash out (c. 187.0m²), aggregate storage bays (152.0m²) and ancillary facilities (connections to existing water discharge system, electricity supplies and proposed downward lights) on a hardstanding area with a reduced floor level to 23 mOD over c. 0.94 ha of the site and a proposed overburden storage area within the quarry site (c. 0.58ha), with an overall application area of c. 2.25 ha. at	The site is an existing quarry site. Plant will be operational 2am to 10pm and, on up to 20 occasions per calendar year, outside these hours. There is therefore an overlap between the hours of working with the one additional hour proposed under the Proposed Scenario of the proposed Relevant Action when compared to the permitted development, i.e. 06.00 to 07.00. The proposed Relevant Action would also have some effect on daytime activity at the airport and therefore on daytime noise levels. Planning conditions no. 5, 8 and 9 of this development requires noise levels within the boundary of the site not to exceed 45 dBA at night-time (20:00 to 0:00 hours) or 55 dBA during day-time hours (08:00 to	Not significant

ID[1]	Planning Ref. No./ Applicant	Status	Development Description	Assessment of Cumulative Effects	Significance of Cumulative Effect
			the existing quarry landholding (Q/05/005). It is proposed to operate the concrete plant between the hours of 2 a.m. to 10 p.m. Monday to Saturday and on 20 occasions per year outside these hours with prior agreement from Fingal County Council.	20:00), and for a requirement for noise monitoring and mitigation measures to be imposed should the noise levels within the boundary of the site exceed these levels. The conditions are in the interest of residential amenity and proper planning and sustainable development of the area. The quarry lies to the south-east of Swords. Noise level changes as a result of the proposed Relevant Action at this location would be around 4 to 5 dB (A) L_{den} in 2025. Noise level changes on the outskirts of Swords would be 3 to 4 dB (A) L_{den} (refer to Figure 21-1, *EIAR Volume 3: Figures*). Provided that the mitigation required by the conditions of planning permission F16A/0471 is applied, there should be no significant cumulative noise effects as a result of the proposed Relevant Action in conjunction with this development.	
R61	F16A/0049 / Roadstone Ltd	Granted 10/10/2016	A Concrete plant (604 sq.m.) with a maximum height of 18m., replacing existing concrete plant, along with aggregate storage bays (152 sq. m), truck wash out (187 sq.m) and ancillary facilities on a hard standing area with in a 0.18 hectare site at the existing quarry landholding (Q/05/005).	This development is in a similar location to development ID 51 above. In this case, concrete manufacturing on site would take place between 07:00 and 18:00 hours Monday to Friday, and 07:00 and 14:00 hours Saturday. The usual operating hours would therefore not overlap with the additional operational hours proposed under the proposed Relevant Action although the proposed Relevant Action would also have some effect on daytime activity at the airport and therefore on daytime noise levels. There is a condition in place for 3 weeks' notice and written agreement to be in place if any extension to these hours is required. Limits on noise levels are as for development ID 51. The potential for cumulative noise effects as a result of the proposed Relevant Action in conjunction with this development would be less than for development ID 51. With conditions and mitigation in place for both development ID 61 and development ID 51, there should be no significant cumulative noise effects as a result of the proposed Relevant Action in conjunction with development ID61, or development ID 61 together with development ID 51.	Not significant

ID[1]	Planning Ref. No./ Applicant	Status	Development Description	Assessment of Cumulative Effects	Significance of Cumulative Effect
R84	F20A/0023 / Port Side Investments Ltd	Granted 8/12 2020; Appeal submission 12/1/2021 currently under consideration	Proposed motor sales and service centre. The construction of Building 'A', a single storey 6.6 m high 1,060 sq.m motor vehicle service and sales facility building; Building 'B' a single 6.6 m high 895 sq.m. motor vehicle service and sales facility building; annexe building to the west of Building 'A & B', a single storey 605 sq.m. ancillary valeting and wash building; Building 'C' a single storey 55 sq.m. ancillary building providing an ESB substation, bin storage and security office; associated site-works including on-grade car parking/display spaces, attached and freestanding signage, flagpoles, proposed new vehicular site entrance of Holywell Dale extension, associated boundary treatments, landscaping and drainage.	This development has limited potential to generate noise other than associated traffic-related noise. Potential traffic associated with new developments has been included in the traffic modelling used for the road traffic noise assessment of the proposed Relevant Action (refer to *Chapter 14: Ground Noise and Vibration*).	Not significant
R85	F16A/0303 / Irish Water	Granted 13/12/2016	The development will include construction of a reservoir adjacent to an existing reservoir including the construction of associated valve chambers and installation of disinfection kiosk and equipment. The access road to the existing reservoir will be extended to the proposed reservoir. Security fencing will be installed at the proposed reservoir, and the fencing at the existing reservoir will be modified and repaired, with a new main entrance gate being installed.	Limited potential for this development to generate noise other than during construction. Hours of operation of construction sites would be 08:00 to 19:00 Monday to Friday and 08:00 to 14:00 on Saturdays and therefore outside the additional hours of operation proposed by the proposed Relevant Action, although the proposed Relevant Action would also have some effect on daytime activity at the airport and therefore on daytime noise levels. Construction works would, however, be temporary, hence there is limited potential for cumulative noise effects.	Not significant
R141	F17A/0031 / daa	Granted 19/04/2017 Now operational.	The erection of a solar photovoltaic (PV) array over the existing reservoir, within a site of 0.79 ha. The array will consist of ca. 650 sq.m. of PV modules and associated development including inverters, cables and all associated site development works. The proposed PV array will have a maximum generating capacity of 109.88 kW.	Very limited potential for generation of noise.	Not significant
SID 8	YA06F.304624	Granted 19/05/2020	Greenway between Malahide Demesne and Newbridge Demesne to be known as 'Broadmeadow Way'.	Application is for a greenway which would not be expected to generate noise and therefore has no potential for cumulative noise impacts.	Not significant

[1] R denotes Regular planning application; SID denotes Strategic Infrastructure Development application; ID numbers relate to Tables 1 and 2 in Appendix 21A; locations are shown on Figure 21-1, *EIAR Volume 3: Figures*.

21.7. Summary

21.7.1 The assessments of interactions and cumulative effects have considered the residual effects identified by the individual technical assessments (Chapters 7 to 20), excluding those which are classified as ‘imperceptible’. For the purposes of this assessment, the Assessment Year of 2025 has been used as it is the ‘worst-case’ year, i.e. the year in which maximum environmental effects would occur.

21.7.2 The only residual effects of the proposed Relevant Action which are classified as greater than ’imperceptible’ are those relating to air noise and ground noise. Cumulative effects on population and human health are an indirect effect of air and ground noise impacts and are therefore addressed by consideration of air and ground noise effects.

21.7.3 The proposed Relevant Action would result in a moderate, but not significant effect on human receptors in residential property as a result of impacts on the overall noise environment due to increases in air noise and ground noise at noise sensitive receptors.

21.7.4 The proposed Relevant Action would not result in any significant cumulative effects. Other developments within the daa 40dB L_{night} (A) Study Area and within the area where noise increase of 3dB L_{den} (A) or more would occur as a result of the proposed Relevant Action either have limited potential to generate noise impacts, or would be operational only outside the additional hours of operation proposed under the proposed Relevant Action, or are subject to planning conditions which will mitigate and control any potential noise impacts from those developments. There is therefore limited potential for cumulative noise effects and there will be no significant cumulative noise effects.

What has changed since the EIAR was submitted in December 2020?

This EIAR chapter has been updated in response to a Request for Further Information (RFI) from Fingal County Council dated 19/02/2021. As well as several minor corrections, including minor removals from and additions to the earlier text, the chapter has been revised to:

- Address additional assessment years requested by the Council; and
- Set out more clearly the scenarios for assessment in the EIAR.

In a change to the modelled runway usage, the revised EIAR assumes that in 2025 and 2035 both parallel runways are used for departures in the 06:00 to 08:00 i.e. semi-mixed mode. For 2022, it is assumed that segregated mode is in use 06:00 to 08:00 (no change from December EIAR).

The EIAR has been updated to account for this change and all modelling and assessment are revised accordingly. The above does not change the description of the Relevant Action.

22. Future Development Plans

22.1 Introduction

22.1.1 The growth of Dublin Airport is mandated by government policy, as well as national, regional and local planning policy, as set out in *Chapter 6: Planning & Development Context*. The proposed Relevant Action seeks to amend and replace planning conditions associated with the operation of the runway system and does not seek to lift the 32 mppa Cap on the number of passengers passing through the airport terminals. Nevertheless, if consented, the proposed Relevant Action will influence the way the runway system operates into the future, and this, in turn, will become the framework in which future applications associated with expansion of Dublin Airport will fall to be assessed.

22.1.2 Accordingly, in circumstances where there is a long-term policy to expand Dublin Airport as a whole, it is considered appropriate that the competent authority assessing the proposed Relevant Action would have an overview of those longer term plans, so that the proposed Relevant Action can be viewed and assessed in that wider context, with account being taken of planned future development at Dublin Airport as appropriate and as far as practically possible at this stage.

22.1.3 There are development proposals currently being prepared which will seek planning permission for future airport growth to 40 mppa. These will include proposals for airport infrastructure required to accommodate this growth. These future development proposals will require a grant of planning permission in order to be realised, which in itself will entail planning and environmental impact assessment. The proposed Relevant Action is a standalone proposal and is not reliant on future airport growth in order to be realised. Equally, future airport growth can occur (subject to planning being granted) in the absence of the proposed Relevant Action. Notwithstanding the independence of the proposed Relevant Action, an awareness of future airport plans is relevant in considering the proposed Relevant Action given the potential for interaction in the future. In this respect, this chapter is intended to give an overview of future development plans so that, consistent with the purpose of the EIA Directive and case law, account be taken of those future plans in the context of the assessment of the environmental effects of the proposed Relevant Action.

22.1.4 The future development plans discussed in this chapter do not form part of the proposed Relevant Action, nor is this chapter intended to undertake an EIA of these future development plans. Such an EIA is neither possible nor required at this stage; the environmental implications of such future projects will be fully assessed in future when consent is sought for them; they will be the subject of planning application(s) with any relevant supporting environmental information.

22.1.5 Importantly, future proposals for Dublin Airport, which include a planning application to grow to 40mppa, are still under development. While the Applicant can anticipate the required airport infrastructure to a reasonable degree, final proposals are likely to change in scale, scope and/or nature from those presented below. Proposals are currently at feasibility or early-design stage and have not yet been the subject of formal preplanning consultations or other stakeholder engagement which will affect the final designs. Other influencing factors include budgetary constraints, safety and security reviews, and the need to ensure proposals meet the constantly evolving needs of passengers and airlines. The current Covid-19 pandemic demonstrates that circumstances—and hence plans—can change unexpectedly and significantly. The pace of the aviation sector's recovery from the pandemic is still uncertain. Overall, development of large airports tends to be ongoing and organic. With these influencing factors in mind, it is likely that the plans for infrastructure discussed below will change over time.

22.1.6 While change is likely, what is set out below represents the best currently available information on which to form a view as to what an airport of 40mppa might comprise.

22.2 Methodology

22.2.1 The Current State of the Environment has been discussed in preceding chapters. Desk studies and surveys have informed the understanding of current environmental conditions and, insofar as possible, this has been projected forward in those chapters to determine the Future Receiving Environment.

22.2.2 The general approach to the assessment in this chapter is to describe the Future Receiving Environment as it appears from the vantage point of 2021. The Applicant's own planned development is then described, setting out the main aspirations for Dublin Airport and what these would entail.

22.2.3 The chapter also provides aviation noise predictions for 2030 when the airport is operating at 40mppa (on the assumption that same is permitted in the future) as Figure 22.1 (*EIAR Volume 3: Figures*), which address a Request for Information (RFIs) on that year for which aviation forecasts and aircraft noise predictions were requested by the Aircraft Noise Competent Authority (ANCA) in their RFI, dated 24th February 2021[1].

22.2.4 This chapter only considers expansion of Dublin Airport to 40mppa. While 'DA' Dublin Airport zoned land (as provided for in the Fingal Development Plan 2017, Map Sheet 11) could potentially cater for airport expansion beyond 40mppa to 55mppa, this degree of future growth is not provided for in government policy and has not been the subject of forward planning policies with appropriate public consultation and environmental review. Further, there is no certainty as to what a 55mppa airport would comprise, with only high-level exercises undertaken to ensure the ability to grow in future is not compromised by infrastructure delivered in the short and medium term. Lastly, given the considerable timeframe required to grow the airport to 55mppa, it is neither practically possible nor feasible to forecast the Future Receiving Environment with any degree of accuracy whatsoever. Therefore, the scope of this chapter has been confined to what is reasonable and practical with the information currently available.

22.3 Future Receiving Environment

22.3.1 The Future Receiving Environment will be shaped by several key drivers. Firstly, population growth: population in the Dublin area is projected to rise significantly over the period addressed in this chapter. Secondly, climate change and the response to it, both in terms of emissions and adaptation, with ambitious plans to reduce emissions. Thirdly, technology is likely to affect society and the environment in ways which are difficult to predict but may be profound.

22.3.2 The Future Receiving Environment in 2025 is likely to be broadly similar to the Current State of the Environment discussed elsewhere in the EIAR. The North Runway will be operational in the Permitted Scenario, with restrictions on night-time flights as outlined in *Chapter 1: Introduction*. Passenger forecasts suggest that the airport will have a passenger throughput of 30.4mppa in the Permitted Scenario[2] but will have reached the 32 mppa Cap in the Proposed Scenario, as the economy and aviation recover from the Covid-19 pandemic.

22.3.3 Projections in the Environmental Protection Agency's (EPA's) Greenhouse Gas Emissions Projections Report 2019-2040[3], indicate that a strong surge in demand for electricity, at a rate faster than the introduction of renewables, will mean Ireland's Emissions Trading Scheme (ETS) sector emissions will continue to increase up to 2025, after which policies contributing to fuel switching in power generation will contribute towards stronger emissions reduction to the end of the decade.

22.3.4 By 2030 it is probable that there will have been some important changes in the Future Receiving Environment should the future development plans be consented and implemented. As in 2025, the airport is assumed to be operating at the 32mppa level in both the Permitted and Proposed Scenarios, however the external environment will likely have evolved.

22.3.5 There will likely be a substantial increase in population in the Dublin area. The Metropolitan Area Strategic Plan (MASP) of the Regional Spatial and Economic Strategy[4] for the Eastern and Midland Region envisages a population of 1.65 million in the metropolitan area by 2031, an increase of 250,000 people or 18% from 2016. Strategic development along key transport such as the DART (Clongriffin, Baldoyle) and the proposed Metrolink will see increased populations in these parts of Dublin City and Fingal.

[1] The Applicant provided noise exposure numbers specifically to respond to the ANCA RFI asking what the noise impacts would look like at 40mppa. These should not be read as a robust assessment of effects as would be required for an EIA, which is not practicable at present. They do not form a prediction of the impacts of the proposed Relevant Action as they show the airport operating at beyond the 32mppa Cap. ANCA did not request details of impacts on other environmental factors, thus these have not been modelled for a 40mppa airport and nor would it be practicable to do so at present.
[2] In the Permitted Scenario, the 32mppa Cap is reached in 2027.
[3] Environmental Protection Agency, Ireland's Greenhouse Gas Emissions Projections 2019-2040 https://euagenda.eu/publications/ireland-s-greenhouse-gas-emissions-projections-2019-2040.
[4] Eastern and Midland Regional Assembly RSES https://emra.ie/final-rses/.

22.3.6 According to the MASP, the proposed Metrolink to Lissenhall via Dublin Airport and Swords was to be delivered by 2027, however construction work has been delayed because of the Covid-19 pandemic and it is now expected be completed post 2027. Therefore, it is assumed Metrolink is likely to become operational sometime around 2030. BusConnects is expected to be operational by 2027 and so will be in place in 2030.

22.3.7 Carbon dioxide emissions from Agriculture, Transport and Energy Industries, which are key sectors with the largest share of emissions, are projected to decrease by 12.4%, 37.8% and 34.0% respectively over the period 2019 to 2030, according to the most optimistic of the EPA's projections. However, the transport sector emission forecast requires the implementation of 'additional measures to achieve this reduction'. 'With Additional Measures', transport emissions are projected to decrease to 7.6 Mt CO_2 eq. 'With Existing Measures', transport emissions are projected to decrease to 11.2 Mt CO_2 eq. Ireland will need to reduce its non-ETS sector greenhouse gas emissions consistent with a 30% reduction by 2030, relative to 2005 levels, in order to reach the statutory target for 2030.

22.3.8 In 2035 it is assumed that the airport will still be operating at the 32mppa cap on the number of passengers passing through the airport. Projected population for the year 2035 for Dublin (county) is estimated at being approximately 1.70 million, which is a 26% increase on the 2016 Census population data.

22.3.9 Identifying how the Future Receiving Environment may evolve becomes more difficult after 2030 because development planning horizons do not extend this far and thus there are no programmes or strategies to guide development and inform this summary.

22.3.10 Projected population for the year 2035 for Dublin metropolitan area is estimated at being approximately 1.83 million, an increase of 30% on the 2016 Census population for Dublin, and a 7.6% increase on the 2031 estimate.

22.4 Future Development Overview

Context

22.4.1 There are a number of emerging documents and studies being prepared by the Applicant, which will shape the future development of Dublin Airport. Some of these are in the public domain already, but those which are not are appended to this EIAR where available. These are discussed in this section.

Capital Investment Programme 2020+

22.4.2 Since 2011, Dublin Airport has been a regulated entity, required periodically to submit its proposals for capital investment to the Commission for Aviation Regulation (CAR). In February 2019, the plans for investment to commence the next stage of Dublin Airport's development were submitted to CAR as the Capital Investment Programme (CIP 2020+)[5], with the objective of transforming the airport into a major European airport, welcoming 40 mppa. Following a Dublin Airport led consultation, CAR made a determination for the next price control period, which was published in October 2019. This determination is used as the basis for the identification of future infrastructure investment at the airport, although the timescales for growth set out in the CIP have clearly been impacted by the Covid-19 pandemic.

Drainage Master Plan

22.4.3 In 2018, the Applicant embarked on the Dublin Airport Drainage Masterplan (DMP) as part of its Sustainability Strategy. The DMP is a holistic long-term masterplan for drainage infrastructure at Dublin Airport. It is intended to examine existing and future drainage infrastructure requirements and develop a long-term phased and coherent approach to improvements in drainage infrastructure, including a long-term development horizon.

22.4.4 The overarching objectives of the DMP are:

[5] https://www.dublinairport.com/corporate/airport-development/cip-2020

1. Establish a detailed understanding of the existing airport drainage system, its effect on the surrounding environment and the legislative requirements Dublin Airport must comply with in this context.

2. Monitor and assess the existing drainage network and receiving watercourses on an ongoing basis to enable improvements in systems and practices and ensure compliance.

3. Provide drainage design guidelines and policies for Dublin Airport to ensure consistency of approach to both the development and operation of infrastructure across Dublin Airport, in line with the Applicant's Sustainability Policy.

4. Provide a holistic long-term drainage infrastructure investment plan to guide future development consistent with planning and environmental requirements, which, through a series of incremental improvements phased to align with the Applicant's cyclical funding structure, will deliver the flexibility, resilience and responsiveness required to enhance capacity of the airport's surface water management system and respond appropriately to extreme weather events.

5. Through stakeholder engagement, ensure the DMP is aligned with national, regional and local legislation, development plans and policies.

22.4.5 Work on the DMP is currently ongoing and it is expected to be completed by December 2021.

Draft Drainage Management Plan

22.4.6 As part of the DMP, the Applicant has prepared a Draft Drainage Management Plan (DMaP) for Dublin Airport. The DMaP is a best-practice model that involves an inter-agency Technical Working Group setting objectives and targets and monitoring water quality trends on an ongoing basis. The framework proposed in the DMaP represents the Applicant's commitment, through a series of incremental actions in implementing the DMP, to making a positive contribution to achieving the objectives of the Water Framework Directive for each catchment surrounding the airport. A copy of the Draft DMaP document was previously provided to officials of Fingal County Council's Water Pollution Section of the Department of Environment, Climate Action and Water Services in March 2021, and to officers of FCC's Planning Department in June 2021. As part of consultation programme, it has been circulated (July 2021) to other key stakeholders including Inland Fisheries Ireland (IFI), Local Authority Waters Programme (LAWPRO), and the EPA.

Draft Carbon Reduction Strategy

22.4.7 In 2021, the Applicant prepared a draft Carbon Reduction Strategy (CRS) for Dublin Airport[6] with a view to setting a roadmap to reach a long-term Net Zero Carbon goal. It proposes reducing absolute Scope 1+2 emissions by 30% below a 2019 baseline by 2030, aligned with the government's 2019 Climate Action Plan target to reduce Greenhouse Gas emissions by 30%.

22.4.8 The draft CRS identifies a range of carbon reduction actions, including integration of energy efficiency measures, use of 100% renewable electricity, electrification of Dublin Airport vehicle fleets, fuel-switching and electrification of onsite thermal energy plant, and circular economy practices.

22.4.9 Since the preparation of the draft CRS however, the Climate Action and Low Carbon Development Bill 2021 revisited governmental targets, prescribing a new interim target of 51% reduction in GHG emissions by 2030 relative to a baseline of 2018. Achieving the revised target, if enacted, will require a revision of the draft CRS to incorporate additional measures to ensure any future growth proposals for Dublin Airport go far enough in terms of effective and affordable emission reduction measures to achieve the ambitious targets. The Draft CRS is currently under review and the final document will accompany future planning applications to grow Dublin Airport to 40mppa.

[6] https://www.dublinairport.com/corporate/corporate-social-responsibility/sustainability

Reasonably Foreseeable Future Development Plans

22.4.10 In addition to a rolling programme of infrastructure rehabilitation, maintenance and upgrades of existing facilities, much of which is outlined in the CIP 2020+, there are three reasonably foreseeable major projects planned at Dublin Airport.

Western Vehicle Underpass

22.4.11 The Western Vehicle Underpass is a critical safety project that will provide for a vehicle underpass of the existing Crosswind Runway 16/34. The underpass will be served by portals on each end and entail enabling works to Pier 3 and the West Apron to integrate with existing airport infrastructure. It will be used by service vehicles and airfield operatives to provide safe and efficient access to the West Apron and maintain efficient movement between the east and west of the airport campus.

22.4.12 Currently the airport makes use of the 'west apron crossing' for these purposes. However, when the North Runway comes into operation, this crossing will no longer be available.

22.4.13 The key potential environmental impact of the Western Vehicle Underpass appears likely to be the generation of significant volumes of spoil during construction. This, in turn, would involve additional HGV traffic on the major roads around the airport to remove this spoil during the construction period. It is unclear whether this would lead to significant but temporary air or noise effects in the vicinity of the airport during the construction period but an EIA is likely to be undertaken as part of the planning application, and a Construction Environmental Management Plan (CEMP) and Construction Traffic Management Plan will be developed to mitigate impacts from construction work.

Airport Drainage Projects Arising from the DMP

22.4.14 As outlined above, the DMP will result in a series of recommendations for incremental improvements in the drainage system at Dublin Airport. These improvements will ensure the flexibility, resilience, and responsiveness required to enhance the capacity of the airport's surface water management system to achieve environmental improvements in response to extreme weather.

22.4.15 The developments likely to be complete by 2030 comprise:

- A central pollution control facility to collect and manage contaminated surface water from the airfield as a whole to mitigate additional demand and improve environmental baseline conditions;
- Segregation of clean and contaminated flows through implementation of a contamination detection and response system across the existing and proposed surface water network;
- Additional hydraulic capacity through the construction of additional network pipelines for the separate conveyance of clean and contaminated surface water flows, as well as foul flows;
- Greater operational flexibility in the network; and
- Clean surface water attenuation.

22.4.16 Post-2030 further development would include:

- Additional pollution control infrastructure;
- Additional hydraulic capacity; and
- Further clean surface water attenuation.

22.4.17 The key environmental impact of the DMP would be a permanent improvement in the water environment, in particular of the watercourses leaving the airport campus. During construction, which it appears likely would occur in phases over an extended timeframe, there would be spoil generated from excavations, leading to additional HGV traffic on the major roads around the airport to remove this spoil. However, this impact is thought unlikely to lead to significant noise or air quality impacts given that additional HGV movements would be minimal for much of the construction programme with occasional short-term peaks.

Infrastructure Application

22.4.18 The Infrastructure Application (IA) is a project to increase the passenger capacity of the airport to 40mppa and the infrastructure required to facilitate that growth, whilst maintaining service levels at the airport. No single item of infrastructure will provide a capacity increase in isolation, rather the combined effect of new infrastructure will provide overall airport capacity.

22.4.19 Currently at the feasibility or early design stage , in broad terms the IA would:

- Provide for a new passenger pier to the east of Terminal 2 - Pier 5;
- Expand the existing South Apron with new remote stands, taxiways and apron space;
- Extend Pier 1 on the North Apron;
- Create a new Apron 7 on the western side of the airport;
- Increase space internally inside Terminal 1;
- Enable Pier 3 for pre-cleared US-bound passengers;
- Consolidate existing car hire facilities;
- Expand long-term car parking in an area of the airport known as Eastlands;
- Expand the existing Terminal 1 and Terminal 2 multi-storey car parks; and
- Re-locate the staff car park.

22.4.20 Importantly, the IA would also seek permission to raise the annual passenger cap, currently 32mppa, to 40mppa. However, it is unlikely that the IA would seek to change the runway operations protocols described in *Chapter 2: Characteristics of the Project* under the proposed Relevant Action, if these are consented. The environmental impact assessment of the IA has not yet reached the scoping stage and, whilst extensive environmental baseline surveys were undertaken in 2019-2020, a great deal of work remains to be done on the assessment of effects, so the assessment presented below has been undertaken as far as reasonably practicable at this stage and with the information available.

22.4.21 The principal operational environmental impact of the IA appears likely to be the increase in air and ground traffic movements from Dublin Airport, with associated aircraft / ground noise and greenhouse gas emissions. During construction, there will be construction wastes generated and this would involve additional HGV traffic on the major roads around the airport. It is unclear whether this would lead to significant but temporary air or noise effects in the vicinity of the airport during the construction period but mitigation of any such impacts is a key focus for the environmental assessment work to be undertaken for the IA, with phasing of the likely 10 - 15 year construction programme offering opportunities to manage the timing of potential impacts to limit their cumulative effects.

Other Projects

22.4.22 Other ‘business as usual’ projects are planned by the Applicant to ensure that Dublin Airport remains a safe and efficient airport. These include many projects set out in the CIP 2020+, concerning maintenance of runways and taxiways, ongoing upgrade and replacement of aging infrastructure in the airfield, the terminals, and other parts of the airport.

22.5 Assessment of Future Development Plans

Western Vehicle Underpass

22.5.1 Currently it is thought that a planning application to permit development of the Western Vehicle Underpass might be made in the next twelve months. If this development were consented, it is probable that construction of the Western Vehicle Underpass would take place between 2024 and 2026. Construction would take place within the airport campus and this would limit noise, air quality and other impacts on the surrounding environment arising from the construction work. However, it would require the removal of a significant amount of spoil from the construction site and this would add construction traffic impacts, including noise and air quality, on the surrounding road network. The extent of these is not clear but receptors close to the major roads around the airport might experience a temporary impact to noise and air quality duing this period. The effect is likely to be marginal given the amount of traffic likely to be using these roads in future, but this is not certain at this time. An assessment of construction traffic impacts, and the resulting noise and air quality effects, would be provided with any future planning application.

22.5.2 The operation of the Western Vehicle Underpass will not affect the assessment of impacts from the proposed Relevant Action in this EIAR. The reason in this case is that the operational environmental impacts of the Western Vehicle Underpass will be very limited and restricted to the airport campus itself.

Airport Drainage Projects Arising from the DMP

22.5.3 Not enough detail is known about the drainage projects arising from the DMP to enable an assessment at this stage. However, it can be said that the purpose of these projects is to improve the surface water management system to achieve environmental improvement in response to extreme weather and so the operational effect on water and biodiversity is likely to be beneficial.

Infrastructure Application

22.5.4 Potential passenger demand is forecast by Mott MacDonald to reach 40mppa around 2030-31. Thus, it is probably reasonable to assume that the Applicant would seek to have permission for and have aimed to complete construction of the IA, providing the infrastructure necessary to allow the airport to operate at 40mppa whilst maintaining service levels, by 2030. Indicative air noise contours, and residential receptors within these indicative contours, are shown in Figure 22.1 (*EIAR Volume 3: Figures*).

22.5.5 A full environmental impact assessment of the likely significant environmental effects of an airport operating at 40mppa, including any interactions with the proposed Relevant Action, and appropriate mitigation, will be presented if and when a planning application for the IA is made to FCC.

22.5.6 Table 22-1 summarises how the above future airport development, might inform the environmental effects assessed in this EIAR.

Other Projects

22.5.7 It is unlikely that any of the ‘business as usual’ projects will lead to significant environmental effects, although they may generate noise and some traffic on the surrounding roads during construction. However, as these projects are ‘business as usual’, it is reasonable to conclude that the effects arising from their construction would not differ markedly from those arising from similar ongoing upgrade and maintenance projects being undertaken at present. In other words, their effects on noise and traffic are already part of the Current State of the Environment.

22.5.8 Table 22-2 lists these projects and gives a brief description of what they comprise, highlighting any potential environmental effects beyond those discussed below in the comments section

Table 22-1 Potential Environmental Effects of the Infrastructure Application

Environmental Factor	Potential Demolition Effect	Potential Construction Effect	Potential Operational Effect	Comments
Population and Human Health	Not known	Likely to be beneficial employment effects	Not known	There is the potential for the future airport developments including the IA to have beneficial effects from airport operations, construction and supply chain jobs created due to increased spending in the local area by employees. There is also potential for loss of amenity associated with traffic, noise, dust and vibration during construction, however this would be minimised through the introduction of construction environmental management and construction traffic management measures. Effects upon the actual and perceived physical and mental health and well-being of local residents are possible, owing to additional air traffic movements associated with an increase to 40mppa. This is not easy to quantify at this stage; although the number of passengers passing through the airport would be 25% higher than in 2018 this would not necessarily translate into 25% more flights, and aircraft in future are likely to be quieter than at present. Noise impact predictions for the proposed Relevant Action show that in general the overall noise exposure numbers reduce in 2035 compared to 2025 due to this modernisation effect. A full assessment of the noise impacts and those on population and human health will be undertaken as part of any future planning application.
Traffic and Transport	Not known	Likely to be adverse effects from construction traffic	Not known	Traffic around the airport is likely to increase as a result of construction traffic and operation of a 40mppa airport, however the extent is not known and could be offset / reduced by the introduction of more sustainable transport options such as BusConnects and Metrolink and implementation of the forthcoming campus Mobility Management Plan. A modelling exercise would need to be undertaken to determine the effect. This will be prepared for the IA itself but is not available currently.
Major Accidents and Disasters	Probably none	Probably none	Not known	A modelling exercise would need to be undertaken to determine the effect of changes to the number of operational air traffic movements. This will be prepared for the IA but is not available currently.
Air Quality	Not known	Not known	Not known	There is potential for increase in public exposure to short-term concentrations of small particles and pollutants most commonly associated with road traffic emissions during construction, although construction impacts would be managed by a CEMP. There is potential for increase in public exposure to pollutants most commonly associated with combustion during operation of the IA, but the likelihood is that there would be little change in assessed air quality if the airport was operating at 40mppa. However, the data to undertake the modelling is not currently available. An air quality model will be prepared for the IA in due course.
Noise	Not known	Not known	Adverse	Noise from the airport operating at 40mppa would be expected to increase given the growth in air traffic movements and changes in aircraft movements on the ground, taxiing and engine testing. Overall noise effects are likely to reduce over time as the fleet is modernised. Indicative air noise contours, and residential receptors within these indicative contours, are shown in Figure 22.1 (*EIAR Volume 3: Figures*). A full noise impact assessment will be undertaken for the IA in due course.
Climate and Carbon	Probably none	Not known	Not known	Scope 1+2 carbon emissions from the airport operating at 40mppa would tend to increase, however this would be offset by measures in the Applicant's CRS and incorporated in the IA. The exact balance between these effects is not clear at present but could be expected to represent an improvement overall in the medium term, in line with the CRS and government policy. Emissions will be modelled for the IA in due course.
Landscape and Visual	None	None	None	Unlikely that there would be significant landscape or visual effects as development would be primarily confined to the airport campus.
Cultural Heritage	Not known	Not known	Not known	There is potential for physical and setting impacts on known cultural heritage assets, and possible physical impacts on unknown archaeological assets. However, it is unlikely that there would be significant cultural heritage effects as development would be primarily confined to the airport campus.

Environmental Factor	Potential Demolition Effect	Potential Construction Effect	Potential Operational Effect	Comments
Land and Soils	None	None	None	There is potential for the mobilisation of contaminants via numerous pathways to subsurface during construction, but such impacts are capable of mitigation through the application of a CEMP. Also potential for loss of soil cover, soil erosion and compaction during construction, but again this can be mitigated through application of a CEMP.
Biodiversity, Flora and Fauna	Not known	Not known	Not known	There is potential for increased disturbance of wintering birds using functional land at the airport by increased noise / visual disturbance from increased aircraft flights and possible increase in bird strikes. Effects on European Sites are also possible with an increase in flights over such locations. An Appropriate Assessment will be undertaken for the IA in due course to determine whether such effects might occur.
Water	None	None	None	There is potential for the mobilisation of contaminants via numerous pathways to surface waters and groundwater during construction, but such impacts are likely to be capable of mitigation through the application of a CEMP.
Material Assets	Not known	Not known	Not known	There is potential for additional waste to be generated during construction and operation, as well as the use of materials during the construction process. Details to assess the extent of such impacts are not yet known.

Table 22-2 Other Projects

Project	Description	Comments
Apron Rehabilitation Programme	Annual apron rehabilitation programme that addresses aprons with a remaining life of between 1 & 5 years. The apron areas included in this category are primarily the South Apron, stands associated with Pier 2 & Pier 3, and Apron Taxiway 1 and Apron Taxiway 3 & Apron Taxiway 6.	none
Airfield Maintenance Base Improvement Programme	Upgrade facility to improve the efficiency scope also includes moving the potassium acetate tanks into a new purpose build bunded area that is not congested and allows for the larger delivery and distribution equipment.	none
Cross Wind Runway (Runway 16/34) Lighting for Low Visibility Procedures (LVP)	This project proposes to install LVP taxiing guidance lighting on Cross Wind Runway (16/34) to allow it to be used as a formal LVP Taxiway route.	none
Airport Water and Foul Sewer Upgrade	This project entails the replacement, upgrade and refurbishment of critical airport campus utility mains and foul water service. Installation of underground pipework to complete the mains water Ring Main. Installation of a reservoir mains bypass to allow mains direct feeding of the mains water Ring Main and installation of a mains water interconnection from the T2 domestic water storage to the T1 domestic water storage tanks to increase the T1 water storage capacity and replacement of end of life and defective sluice valves, fire hydrants and sections of underground water mains.	Likely to lead to an improvement in water efficiency at the airport however the effect is unlikely to be significant.
Hydrant enablement - Pier 2 & 3	The project proposes the installation of a fuel hydrant system to service aircraft parked on Pier 2 and Pier 3. This proposed Pier 2 & 3 fuel hydrant system consists of a network of underground piping that transports fuel from tanks in the fuel farm to aircraft while managing fuel intake.	Likely to marginally reduce the risk of accidents in fuel deliveries to aircraft. Unlikely to be significant as the current procedure is governed by strict safety protocols.

Project	Description	Comments
South Runway (R10R/28L) delethalisation programme	This project proposes to plan and execute the residual works of the South Runway (Runway 10/28) delethalisation programme.	none
Airfield Taxiway Rehabilitation Programme	Annual airfield taxiway rehabilitation programme and address taxiways with a remaining life of between 1 and 5 years. The main focus of this project will be Taxiway F1, Taxiway F-Outer, Taxiway B1, Taxiway E1 and Taxiway M2.	none
De-icing pad at South Runway (Runway 10R)	It is proposed to build a purpose-built de-icing facility as an enhancement to the previously approved PACE South Runway Line Up Points (LUP) project. This pad will allow the de-icing of a single code E or code C aircraft. The optimised layout of the pad allows for full circulation of de-icing trucks around the aircraft. The design includes a reserved area for de-icing trucks and ancillary equipment.	none
Airfield southern perimeter road upgrade programme	This project proposes to rehabilitate and upgrade the southern perimeter maintenance road. This will involve upgrade and partial widening of the perimeter & access roadways associated with the South Runway to make them suitable for their current use and the increased traffic on them (minor airfield security fence improvements are also captured as part of this project).	none
Advance visual docking guidance system (5G, Pier 1 & Pier 2) - CIP	This project entails the installation of Advanced Visual Docking Guidance System (A-VDGS) technology to aircraft parking stands on Apron 5H and stands 102-104.	none
AGL fibre optic communication network improvement programme	This project proposes to provide a ring configuration for the airfield fibre optic network (complete ring around South Runway). Scope includes pit and duct system, installation of fibre network and reconfiguring of fibre network.	none
Second Medium Voltage (MV) connection point	This project proposes that a second electrical supply point be provided at Dublin Airport to protect the entire airport campus from the risk of a single-point failure at the current electrical connection point at Dardistown Substation.	none
Critical taxiways	Several the airfield taxiways are in a relatively poor condition and will need to be rehabilitated within the next few years as part of ongoing maintenance.	none
South Apron taxiway widening	Widening of a portion of the South Runway (Runway 10/28) Taxiway.	none
Runway 10 Line-up Points (LUP)	Comprises an additional South Runway (Runway 10/28) line-up point, bypass taxiway and associated infrastructure.	none
Terminal 1 façade, roof and spirals	A full refurbishment of Terminal 1 Facade. Re-life existing Façade including: 8-bay Terminal 1 Façade, Terminal 1 Roof upgrade, Phase 3b(8-Baysection), rectify balcony drainage issues, repair of spiral ramps and relocation of Antenna Mounting Facility.	May have non-significant, temporary adverse effects in terms of noise and air quality in the area of the Ground Transportation Centre.
Office consolidation and refurbishment	This project will fund the refurbishment of levels 4 and 5 located in Terminal 1. It will increase the capacity allowance for staff in that location by 100%, which will allow the Applicant to vacate staff from Cloghran House and Cargo 6 buildings.	none
Skybridge rehabilitation	Full structural survey and assessment of the current condition of the structural cables and floor joints, remedial works to all identified structural defects in suspension cables, replace/upgrade joints and replace Terrazzo flooring where defective.	none

Project	Description	Comments
Campus buildings critical maintenance	This project entails delivery of several essential improvement works to the structure and roofs of existing campus properties and supplementary safety works.	none
Airport roads critical maintenance - Phase 1 gate 11 corner	6km of pavement have been identified as having very low skid resistance which will need immediate re-surfacing. A further 3km of pavement require re-strengthening works.	none
Staff car parks critical maintenance	Essential improvement and rehabilitation and upgrade works to staff car park spine roads at Dublin Airport.	none
Public carpark critical maintenance	Essential upgrade and improvement works to public car park spine roads at Dublin Airport. Project will also implement structural and waterproofing improvement works required at both multi-storey carparks.	none
Electric charger network facilities	This project proposes to install publicly accessible electrical vehicle charging facilities. Works include: feasibility study, provision of underground ducting network and futureproofing, associated civil works and electric charger network facilities	Will have beneficial effects on carbon emissions but these will be negligible in the context of global emissions.
Small energy projects	This project proposes using new energy efficient and sustainable equipment and control systems for the purposes of improving energy consumption, reducing energy cost, reducing carbon emissions, improving air quality and reducing noise	Will have beneficial effects on carbon emissions but these will be negligible in the context of global emissions.
Terminal 1 kerbs	This project proposes to build the following components as a first phase to developing the Ground Transportation Centre to become the new gateway to the airport: Relocation and increase in the Terminal kerbs drop off to the other side of the multi-storey carpark where bussing services are currently located; Refurbished multi-storey carpark atrium space with passenger segregation to become the new entrance to Terminal1; and Reconfiguration of vehicle access and pedestrian routes to and from the Ground Transportation Centre and the main road network around the airport.	May have non-significant, temporary adverse effects in terms of noise and air quality in the area of the Ground Transportation Centre.
Large energy project - photovoltaic (PV) farm	This project entails developing and integrating a solar PV Farm to generate electricity at Dublin Airport. The installation will provide operating cost reduction, facilitate long term price certainty, secure revenue generation capacity and help obtain compliance with regulatory energy and carbon emissions targets.	Will have a significant effect in assisting the Applicant achieve the airport-wide carbon reduction targets. Will also have beneficial effects on carbon emissions but these will be negligible in the context of global emissions.
Early bag store	The proposed project will construct an early bag store on the mezzanine of Terminal 2. The lane-based system will have the capacity of 950 bags.	none

22.6 Summary

22.6.1 An overview and broad assessment of the possible environmental impacts of reasonably foreseeable future development plans has been provided, insofar as this is practically possible at this stage given the information available on these plans at time of writing. It was noted that these proposals are likely to change as they have not yet been the subject of preplanning consultations or other stakeholder engagement which will affect the final designs. Other influencing factors include budgetary constraints, safety and security reviews, and the need to ensure proposals meet the constantly evolving needs of passengers and airlines.

22.6.2 The future development plans discussed in this chapter do not form part of the proposed Relevant Action and would all require further consents (and environmental assessments as required) before they can be implemented.

22.6.3 The overview above does not give rise to any concern about the likely environmental effects of the proposed Relevant Action when viewed in the context of policy and plans for the future expansion of Dublin Airport.

What has changed since the EIAR was submitted in December 2020?

This is a new EIAR chapter and did not feature in the EIAR submitted in 2020.

23. Summary of Impacts and Mitigation

23.1 Introduction

23.1.1 This chapter of the EIAR contains a summary of the impacts, mitigation and residual impacts as a result of the proposed Relevant Action.

23.2 Summary Tables

23.2.1 Summary tables for 2022, 2025 and 2035 are presented in Table 23.1, 23.2 and 23.3 respectively.

23.2.2 Mitigation measures listed include those measures that form part of the proposed Relevant Action (inherent mitigation) and airport-wide mitigation measures (denoted by an asterisk). The latter would provide mitigation in both the Permitted Scenario and Proposed Scenario but are not mitigation provided specifically to address the impacts of the proposed Relevant Action.

23.2.3 Mitigation provided as part of the North Runway Planning Permission is not included here as it will be implemented in both the Permitted Scenario and the Proposed Scenario. It is not mitigation for the proposed Relevant Action specifically.

Table 23.1 Summary of Assessed Effects, Mitigation and Residual Impacts: 2022 Assessment Year

Chapter	Assessed Effects	Mitigation	Residual Effects	Timescale for Implementation of Mitigation
Chapter 7: Population and Human Health	Amenity and Local Communities: Moderate Adverse (Significant) Human Health: Negative	None Proposed (but see noise mitigation below)	Moderate Adverse (Significant) Negative	Not applicable (n/a) n/a
Chapter 8: Major Accidents and Disasters	Individual aviation accident risk: Slight to Moderate Adverse (Not Significant) Other environmental receptors: Slight to Moderate Adverse (Not Significant) Bird strike: Not Significant Wake vortex: Not Significant Emergency fuel dumping: Not Significant	Airport-wide operational safety procedures *	Slight to Moderate Adverse (Not Significant) Slight to Moderate adverse (Not Significant) Not Significant Not Significant Not Significant	Implemented / ongoing
Chapter 9: Traffic and Transport	Vehicle trip impacts on the local road network: Not Significant	None Proposed	Not Significant	n/a
Chapter 10: Air Quality	Changes in annual mean nitrogen dioxide (NO_2) concentrations: Negligible (Not Significant) Changes in annual mean Particulate Matter (PM_{10}) concentrations: Negligible (Not Significant) Changes in annual mean Particulate Matter ($PM_{2.5}$) concentrations: Negligible (Not Significant) Changes in 98th percentile of 1-hour mean odour concentrations: below the point of detection (Not Significant)	None Proposed	Negligible (Not Significant) Negligible (Not Significant) Negligible (Not Significant) Below the point of detection (Not Significant)	n/a
Chapter 11: Climate and Carbon	Greenhouse Gas Emissions: Minor Adverse (Not Significant)	Airport-wide draft Carbon Reduction Strategy *	Minor Adverse (Not Significant)	n/a
Chapter 12: Water	Pollution of Surface Water: No Effect (Not Significant)	None Proposed	No Effect (Not Significant)	n/a

Chapter	Assessed Effects	Mitigation	Residual Effects	Timescale for Implementation of Mitigation
	Pollution of Groundwater: No Effect (Not Significant) Increased use of water and generation of wastewater: Imperceptible (Not Significant)		No Effect (Not Significant) Imperceptible (Not Significant)	
Chapter 13: Aircraft Noise and Vibration	Vibration: Not Significant Air noise effects L_{den} and L_{night} (residential): Significant Beneficial to Significant Adverse (Significant) Air noise effects (non-residential): Not Significant	3 Runway preferential runway use Residential Noise Insulation Grant Scheme Noise Monitoring Framework	Not Significant Significant Beneficial to Significant Adverse (Significant) Not Significant	Implemented once the proposed Relevant Action application is determined Annual updates will be included in the Annual Compliance Report
Chapter 14: Ground Noise and Vibration	Ground noise effects L_{den}: Not Significant to Slight Adverse (Not Significant) Ground noise effects L_{night}: Not Significant to Significant Adverse (Significant)	3 Runway preferential runway use Residential Noise Insulation Grant Scheme Noise Monitoring Framework	Not Significant to Slight Adverse (Not Significant) Not Significant to Significant Adverse (Significant)	Implemented once the proposed Relevant Action application is determined Annual updates will be included in the Annual Compliance Report
Chapter 15: Terrestrial Biodiversity	Noise Disturbance to Important Fauna Species: Imperceptible (Not Significant) Killing of or Injury to Important Fauna Species: No Impact (Not Significant)	None proposed	Imperceptible (Not Significant) No Impact (Not Significant)	n/a
Chapter 16: Aquatic Biodiversity	Indirect impacts of Pollution: Not Significant	None Proposed	Not Significant	n/a
Chapter 17: Landscape and Visual	Visual effects from additional flights: Not Significant Visual impact from extended hours of lighting: Not Significant	None Proposed	Not Significant Not Significant	n/a
Chapter 18: Land and Soils	Indirect pollution to land and soils: No Effect (Not Significant)	None Proposed	No Effect (Not Significant)	n/a
Chapter 19: Material Assets	Use of gas and electricity: Not Significant Usage of water and generation of wastewater: Not Significant Generation of Waste: Not Significant	None Proposed	Not Significant Not Significant Not Significant	n/a

Chapter	Assessed Effects	Mitigation	Residual Effects	Timescale for Implementation of Mitigation
Chapter 20: Cultural Heritage	Changes in passenger numbers: No material effect (Not Significant)	None Proposed	No material effect (Not Significant)	n/a
	Setting of heritage receptors: Imperceptible Beneficial (Not Significant)		Imperceptible Beneficial (Not Significant)	

Table 23.2 Summary of Assessed Effects, Mitigation and Residual Impacts: 2025 Assessment Year

Chapter	Assessed Effects	Mitigation	Residual Effects	Timescale for Implementation of Mitigation
Chapter 7: Population and Human Health	Amenity and Local Communities: Moderate Adverse (Significant)	None Proposed (but see noise mitigation below)	Moderate Adverse (Significant)	n/a
	Human Health: Negative		Negative	n/a
Chapter 8: Major Accidents and Disasters	Individual aviation accident risk: Slight to Moderate Adverse (Not Significant)	Airport-wide operational safety procedures *	Slight to Moderate Adverse (Not Significant)	Implemented / ongoing
	Other environmental receptors: Slight to Moderate Adverse (Not Significant)		Slight to Moderate adverse (Not Significant)	
	Bird strike: Not Significant		Not Significant	
	Wake vortex: Not Significant		Not Significant	
	Emergency fuel dumping: Not Significant		Not Significant	
Chapter 9: Traffic and Transport	Vehicle trip impacts on the local road network: Not Significant	None Proposed	Not Significant	n/a
Chapter 10: Air Quality	Changes in annual mean nitrogen dioxide (NO_2) concentrations: Negligible (Not Significant)	None Proposed	Negligible (Not Significant)	n/a
	Changes in annual mean Particulate Matter (PM_{10}) concentrations: Negligible (Not Significant)		Negligible (Not Significant)	
	Changes in annual mean Particulate Matter ($PM_{2.5}$) concentrations: Negligible (Not Significant)		Negligible (Not Significant)	
	Changes in 98th percentile of 1-hour mean odour concentrations: below the point of detection (Not Significant)		Below the point of detection (Not Significant)	
Chapter 11: Climate and Carbon	Greenhouse Gas Emissions: Minor Adverse (Not Significant)	Airport-wide draft Carbon Reduction Strategy *	Minor Adverse (Not Significant)	n/a
Chapter 12: Water	Pollution of Surface Water: No Effect (Not Significant)	None Proposed	No Effect (Not Significant)	n/a

Chapter	Assessed Effects	Mitigation	Residual Effects	Timescale for Implementation of Mitigation
	Pollution of Groundwater: No Effect (Not Significant) Increased use of water and generation of wastewater: Imperceptible (Not Significant)		No Effect (Not Significant) Imperceptible (Not Significant)	
Chapter 13: Aircraft Noise and Vibration	Vibration: Not Significant Air noise effects L_{den} (residential): Not Significant to Significant Adverse (Significant) Air noise effects L_{night} (residential): Not Significant to Profound Adverse (Significant) Air noise effects (non-residential): Not Significant	3 Runway preferential runway use Residential Noise Insulation Grant Scheme Noise Monitoring Framework	Not Significant Not Significant to Significant Adverse (Significant) Not Significant to Profound Adverse (Significant) Not Significant	Implemented once the proposed Relevant Action application is decided. Annual updates will be included in the Annual Compliance Report.
Chapter 14: Ground Noise and Vibration	Ground noise effects L_{den}: Not Significant to Slight Adverse (Not Significant) Ground noise effects L_{night}: Not Significant to Significant Adverse (Significant)	3 Runway preferential runway use Residential Noise Insulation Grant Scheme Noise Monitoring Framework	Not Significant to Slight Adverse (Not Significant) Not Significant to Significant Adverse (Significant)	Implemented once the proposed Relevant Action application is decided. Annual updates will be included in the Annual Compliance Report.
Chapter 15: Terrestrial Biodiversity	Noise Disturbance to Important Fauna Species: Imperceptible (Not Significant) Killing of or Injury to Important Fauna Species: No Impact (Not Significant)	None proposed	Imperceptible (Not Significant) No Impact (Not Significant)	n/a
Chapter 16: Aquatic Biodiversity	Indirect impacts of Pollution: Not Significant	None Proposed	Not Significant	n/a
Chapter 17: Landscape and Visual	Visual effects from additional flights: Not Significant Visual impact from extended hours of lighting: Not Significant	None Proposed	Not Significant Not Significant	n/a
Chapter 18: Land and Soils	Indirect pollution to land and soils: No Effect (Not Significant)	None Proposed	No Effect (Not Significant)	n/a
Chapter 19: Material Assets	Use of gas and electricity: Not Significant Usage of water and generation of wastewater: Not Significant	None Proposed	Not Significant Not Significant	n/a

Chapter	Assessed Effects	Mitigation	Residual Effects	Timescale for Implementation of Mitigation
	Generation of Waste: Not Significant		Not Significant	
Chapter 20: Cultural Heritage	Changes in passenger numbers: No material effect (Not Significant)	None Proposed	No material effect (Not Significant)	n/a
	Setting of heritage receptors: Imperceptible Beneficial (Not Significant)		Imperceptible Beneficial (Not Significant)	

Table 23.3 Summary of Assessed Effects, Mitigation and Residual Impacts: 2035 Assessment Year

Chapter	Assessed Effects	Mitigation	Residual Effects	Timescale for Implementation of Mitigation
Chapter 7: Population and Human Health	Amenity and Local Communities: Moderate Adverse (Significant)	None Proposed (but see noise mitigation below)	Moderate Adverse (Significant)	n/a
	Human Health: Negative		Negative	n/a
Chapter 8: Major Accidents and Disasters	Individual aviation accident risk: Slight to Moderate Adverse (Not Significant)	Airport-wide operational safety procedures *	Slight to Moderate Adverse (Not Significant)	Implemented / ongoing
	Other environmental receptors: Slight to Moderate Adverse (Not Significant)		Slight to Moderate adverse (Not Significant)	
	Bird strike: Not Significant		Not Significant	
	Wake vortex: Not Significant		Not Significant	
	Emergency fuel dumping: Not Significant		Not Significant	
Chapter 9: Traffic and Transport	Vehicle trip impacts on the local road network: Not Significant	None Proposed	Not Significant	n/a
Chapter 10: Air Quality	Changes in annual mean nitrogen dioxide (NO_2) concentrations: Negligible (Not Significant)	None Proposed	Negligible (Not Significant)	n/a
	Changes in annual mean Particulate Matter (PM_{10}) concentrations: Negligible (Not Significant)		Negligible (Not Significant)	
	Changes in annual mean Particulate Matter ($PM_{2.5}$) concentrations: Negligible (Not Significant)		Negligible (Not Significant)	
	Changes in 98th percentile of 1-hour mean odour concentrations: below the point of detection (Not Significant)		Below the point of detection (Not Significant)	
Chapter 11: Climate and Carbon	Greenhouse Gas Emissions: Minor Beneficial (Not Significant)	Airport-wide draft Carbon Reduction Strategy *	Minor Beneficial (Not Significant)	n/a
Chapter 12: Water	Pollution of Surface Water: No Effect (Not Significant)	None Proposed	No Effect (Not Significant)	n/a
	Pollution of Groundwater: No Effect (Not Significant)		No Effect (Not Significant)	

Chapter	Assessed Effects	Mitigation	Residual Effects	Timescale for Implementation of Mitigation
	Increased use of water and generation of wastewater: Imperceptible (Not Significant)		Imperceptible (Not Significant)	
Chapter 13: Aircraft Noise and Vibration	Vibration: Not Significant	3 Runway preferential runway use Residential Noise Insulation Grant Scheme Noise Monitoring Framework	Not Significant	Implemented once the proposed Relevant Action application is decided. Annual updates will be included in the Annual Compliance Report.
	Air noise effects L_{den} (residential): Not Significant to Significant Adverse (Significant)		Not Significant to Significant Adverse (Significant)	
	Air noise effects L_{night} (residential): Not Significant to Profound Adverse (Significant)		Not Significant to Profound Adverse (Significant)	
	Air noise effects (non-residential): Not Significant		Not Significant	
Chapter 14: Ground Noise and Vibration	Ground noise effects L_{den}: Not Significant to Slight Adverse (Not Significant)	3 Runway preferential runway use Residential Noise Insulation Grant Scheme Noise Monitoring Framework	Not Significant to Slight Adverse (Not Significant)	Implemented once the proposed Relevant Action application is decided. Annual updates will be included in the Annual Compliance Report.
	Ground noise effects L_{night}: Not Significant to Significant (Significant)		Not Significant to Significant Adverse (Significant)	
Chapter 15: Terrestrial Biodiversity	Noise Disturbance to Important Fauna Species: Imperceptible (Not Significant)	None proposed	Imperceptible (Not Significant)	n/a
	Killing of or Injury to Important Fauna Species: No Impact (Not Significant)		No Impact (Not Significant)	
Chapter 16: Aquatic Biodiversity	Indirect impacts of Pollution: Not Significant	None Proposed	Not Significant	n/a
Chapter 17: Landscape and Visual	Visual effects from additional flights: Not Significant	None Proposed	Not Significant	n/a
	Visual impact from extended hours of lighting: Not Significant		Not Significant	
Chapter 18: Land and Soils	Indirect pollution to land and soils: No Effect (Not Significant)	None Proposed	No Effect (Not Significant)	n/a
Chapter 19: Material Assets	Use of gas and electricity: Not Significant	None Proposed	Not Significant	n/a
	Usage of water and generation of wastewater: Not Significant		Not Significant	

Chapter	Assessed Effects	Mitigation	Residual Effects	Timescale for Implementation of Mitigation
	Generation of Waste: No Effect (Not Significant)		No Effect (Not Significant)	
Chapter 20: Cultural Heritage	Changes in passenger numbers: No material effect (Not Significant)	None Proposed	No material effect (Not Significant)	n/a
	Setting of heritage receptors: Imperceptible Beneficial (Not Significant)		Imperceptible Beneficial (Not Significant)	

What has changed since the EIAR was submitted in December 2020?

This is a new EIAR chapter and did not feature in the EIAR submitted in 2020.