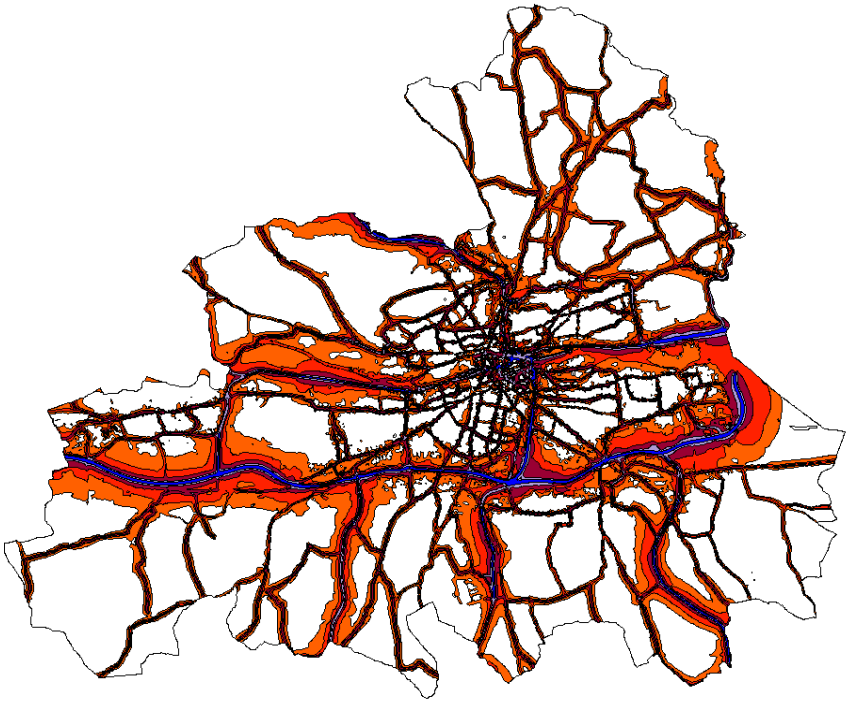
Comhairle Contae Chorcaí
Cork County Council

Comhairle Cathrach Chorcaí
Cork City Council

NOISE ACTION PLAN

2018 - 2023



CORK AGGLOMERATION AREA

CORK AGGLOMORATION AREA NOISE PROJECT

Cork NRDO Job No:

Project Phase: Noise Action Planning

Report Title: Noise Action Plan

Report Reference:

Date of Issue: February 2019

Issued For: Draft for Public Consultation

Revision: 01

Revision	*Issued for*	*Prepared By*	*Approved by*	*Approved by*
01	Public Consultation	KMc K/ NO'B _____ Date: Feb 2019	_____ Date: Xxxx 2019	_____ Date: Xxxxx 2019
02	Final Approved Document	_____ Date:	_____ Date:	_____ Date:

Report Distribution:

Copy No. 1: EPA/ Public Consultation

Internal Location:

T:\NOISE ACTION PLANS\2018 NOISE ACTION PLAN\DRAFT\CORK AGGLOMERATION NAP 2018-2023\2019 02 21 CORK AGGLOMERATION - NOISE_ACTION_PLAN 2018-2023_DRAFT.DOCX

EXECUTIVE SUMMARY

This Noise Action Plan has been prepared in accordance with EU directive 2002/49/EC commonly referred to as the 'END' Directive and the Environmental Noise Regulations 2006 (S.I. No. 140 of 2006), as revoked by European Communities(Environmental Noise) Regulations 2018.

The purpose of the Noise Action Plan (NAP) is to act as a means of managing environmental noise, and to meet the aim of the END Directive of preventing, and reducing where necessary, environmental noise through the adoption of the action plan.

Strategic noise maps produced in the strategic mapping stage is one of the key inputs into the Noise Action Planning stage. Strategic noise maps identify and prioritise cluster areas which require further assessment and which may require mitigation measures to be put in place.

In accordance with Environment Protection Agency (EPA) recommendations, the proposed onset levels for assessment of noise mitigation are as follows:

- 70 dB L_{den} (day evening night average sound level)
- 57 dB L_{night}(night time average sound level)

These levels are consistent and comparable with other Local Authorities who had adopted the EPA recommended onset levels. These levels provide for a concentration of efforts on those areas at the higher noise levels.

Appropriate Assessment (AA) and Strategic Environmental Assessment (SEA) screening will be carried out on the project, in relation to any potential impacts upon the Cork Harbour Special Protection Area [Site No. 004030] and the Great Island Channel Special Area of Conservation [Site No. 001058].

Road traffic noise is the predominant noise source within the Cork Agglomeration Area. The results of the noise mapping indicate that approximately **1%** of the population within the Cork Agglomeration area are being exposed to noise levels due to road traffic sources above the proposed onset levels for assessment of noise mitigation of 70dB L_{den}.

The onset levels for **rail noise** for the assessment of noise mitigation measures of 68dB L_{den} were not exceeded. A population of approximately 400 persons experience rail noise levels of between 55 and 65 dB L_{den} from railway traffic. The remainder of the population, approximately 190,500, experience levels of less than 55 dB L_{den}.

The onset levels for **air noise** for the assessment of noise mitigation measures of 63 dB $L_{Aeq,16hr}$ were not exceeded. A population of approximately 8,700 persons experience air noise levels of 55 and 65 dB L_{den}. The remaining population of 182,200 experience levels of less than 55 dB L_{den}.

High priority areas can be investigated by the Noise Action Planning Authorities of Cork County Council and Cork City Council and where appropriate implement noise mitigation measures, subject to budgetary constraints. Preservation of noise in areas can be facilitated through a combination of policy and planning in a sustainable manner.

This document will provide a basis for actions for the Noise Action Planning Authorities over a five year period from 2018, with the intention to reduce and protect the existing and future noise environment within the Cork Agglomeration area.

TABLE OF CONTENTS

1. BACKGROUND / INTRODUCTION

1.1 Purpose and Scope of the END Directive

In 2004 the European Community adopted Directive 2002/49/EC, which relates to the assessment and management of environmental noise. This directive is commonly referred to as the Environmental Noise Directive or END.

The aim of the Directive 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" [1]

The underlying principles of the Directive are similar to those underpinning other overarching environment policies (such as air or waste), i.e.:

- **Monitoring the environmental problem** by requiring competent authorities in Member States to draw up "strategic noise maps" for major roads, railways, airports and agglomerations, using harmonised noise indicators L_{den} (day-evening-night equivalent level) and L_{night} (night equivalent level). These maps will be used to assess the number of people annoyed and sleep-disturbed respectively throughout Europe

- **Informing and consulting the public** about noise exposure, its effects, and the measures considered to address noise, in line with the principles of the Aarhus Convention[1]

- **Addressing local noise issues** by requiring competent authorities to draw up action plans to reduce noise where necessary and maintain environmental noise quality where it is good. The directive does not set any limit value, nor does it prescribe the measures to be used in the action plans, which remain at the discretion of the competent authorities

- **Developing a long-term EU strategy**, which includes objectives to reduce the number of people affected by noise in the longer term, and provides a framework for developing existing Community policy on noise reduction from source. With this respect, the Commission has made a declaration concerning the provisions laid down in article 1.2 with regard to the preparation of legislation relating to sources of noise

[1] The Aarhus Convention establishes a number of rights of the public (individuals and their associations) with regard to the environment - access to environmental information, public participation in environmental decision-making, review procedures

1.2 Purpose and Scope of the Regulations

The Environmental Noise Regulations 2006 (S.I. No. 140 of 2006), as revoked by European Communities (Environmental Noise) Regulations 2018, which transposed the Environmental Noise Directive 2002/49/EC into Irish legislation were produced to:

"Provide an implementation in Ireland of a common approach within the European Community intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise" [2]

A two-stage approach to the assessment and management of environmental noise is provided for in the Regulations. Firstly, the preparation of strategic noise maps for areas and infrastructure falling within defined criteria, e.g. large agglomerations, major roads, railways and airports. Secondly, based on the results of the mapping process, the Regulations require the preparation of noise action plans for each area concerned. The fundamental objective of action plans is the prevention and reduction of environmental noise.

The Regulations do not apply to noise caused by an exposed person, noise from domestic activities, noise created by neighbours, noise at work places, noise inside means of transport, or noise due to military activities in military areas.

The Regulations provide for strategic noise maps and action plans to be made available to the general public. They also provide for public consultation on proposed action plans, and for the results of public consultation to be taken into account in finalising action plans or reviews of action plans.

For the third round of noise mapping in 2017 the strategic noise mapping was undertaken for:

- Agglomerations with more than 100,000 inhabitants within their territories
    1. Agglomeration of Cork as defined in the Regulations
    2. Agglomeration of Dublin as defined in the Regulations

- "major roads"
    1. Sections of road with a flow above a threshold of 3,000,000 vehicle passages per year (or 8,220 AADT)

- "major railways"
    1. Sections of rail route above a flow threshold of 30,000 train passages per year

- "major airports"
    1. Airports which have more than 50,000 movements per year (a movement being a take-off or a landing),

excluding those purely for training purposes on light aircraft.

Note 1: The definition of “major roads” has been clarified to consist of all roads classified as “National” roads or “Regional” roads with a total flow above 3,000,000 (or 8,220 AADT) vehicle passages per year.

1.3 Purpose and Scope of the Action Plan

The aims and objectives of END/Noise Regulations are that the adoption of action plans should be concerned with:

“*Preventing and reducing environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where it is good*.” [1]

This implies two scenarios which are addressed by the action plan:

- Reduction of the existing noise climate where necessary
- Protection of the future noise climate

The Directive does not apply to noise that is caused by the exposed person himself\herself, noise from domestic activities, neighbourhood noise, noise at work places or noise inside means of transport or due to military activities in military areas. Noise maps are strategic tools and should not be used for the assessment of local noise nuisances.

1.4 Noise and Effects of Noise

Noise is typically defined as “unwanted sound”, sound being the human sensation of pressure fluctuations in the air. Environmentally noise can have a significant impact on people both physically and mentally. Noise causes a wide range of health effects, including:

- Sleep disturbance
- Cardiovascular effects
- Damage to work and school performance
- Hearing impairment including tinnitus

Excessive noise seriously harms human health and interferes with people’s daily activities at school, at work, at home and during leisure time. It can disturb sleep, cause cardiovascular and psychophysical effects, reduce performance and provoke annoyance responses and changes in social behaviour.

Traffic noise alone is harming the health of almost every third person in the WHO (World Health Organisation) European Region. One in five Europeans is regularly exposed to sound levels at night that could significantly damage health. The World Health Organisation, in *Night Noise Guidelines for Europe* 2009 recommends a 40dB $L_{night,outside}$ as being the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. $L_{night,outside}$ of 55dB is recommended as an interim target where the NNG cannot be achieved in the short term for various reasons (For more information in relation to dB, refer to Appendix A).

There is no statutory noise limit for environmental noise in place at an EU level or at a national level.

1.5 Roles and Responsibilities of Designated Bodies

National Overseeing Authority

Environmental Protection Agency (EPA)

The EPA is designated the national authority for the purposes of the 2006 Environmental Noise Regulations, as revoked by European Communities (Environmental Noise) Regulations 2018. In this regard the EPA has the following functions

i. Exercise general supervision over the functions and actions of noise-mapping bodies and action planning authorities and provide guidance or advice to such bodies and authorities, where necessary.
ii. Submit to the Commission the information required in accordance with Article 10(2) of the Directive.

The EPA is required to submit summaries of the third round of Action Plans, prepared by the relevant action planning authority, to the European Commission.

Noise Mapping Bodies (NMB)

Transport Infrastructure Ireland (TII)

Transport Infrastructure Ireland (TII) is designated as the NMB for major roads, in the Environmental Noise Regulations 2006, as revoked by European Communities(Environmental Noise) Regulations 2018, where such roads are classified as national roads in accordance with Section 10 of the Roads Act 1993 (No. 14 of 1993).

TII provided the relevant data for National Roads within the Cork Agglomeration boundary, which was used in the formulation of the Cork Agglomeration noise maps.

In the production of the finalised Noise Action Plan consultation will take place with the TII.

Irish Rail

Iarnród Éireann (Irish Rail) /Railway Procurement Agency are designated as the NMB for the purpose of making and approving strategic noise maps for major rail.

As defined by the regulations, there is no major rail within the Cork Agglomeration i.e. no railway line exceeding 30,000 train passages per year. There is however, active railway lines entering and leaving Kent railway station. Irish Rail carried out the noise modeling for the section of railway line which runs through the Cork Agglomeration Area using the Cork Agglomeration Area base model for contour, buildings, green areas etc.

As part of the consultation process a copy of the Noise Action Plan will be forwarded to Irish Rail for observations and comments.

Cork Airport (Part of the DAA (Dublin Airport Authority) Group)

The relevant airport authority is designated the NMB for the purpose of making and approving strategic noise mapping for major airports.

As defined by the regulations, there is no major airport within the Cork Agglomeration i.e. no civil airport which has more than 50,000 movements per year, excluding those movements purely for training purposes on light aircraft, where a movement means a single take-off or landing of an aircraft.
Cork Airport personnel provided assistance in producing strategic noise mapping for the airport.

The production of the finalised Noise Action Plan will involve consultation with Cork Airport Authority.

Cork County Council & Cork City Council

Cork County Council & Cork City Council, as the relevant road authorities are deemed to be the NMB for major roads (other than National Roads) within the Cork Agglomeration area.

Cork County Council & Cork City Council engaged AWN Consulting Ltd to undertake the strategic noise mapping exercise for the Cork Agglomeration on their behalf.

Action Planning Authorities

Cork County Council/Cork City Council

Under the 2006 Environmental Noise Regulations as revoked by European Communities(Environmental Noise) Regulations 2018, Cork County Council and Cork City Council are designated the action planning authorities for the Cork Agglomeration area. The main purpose of the action planning authorities is making and approving action plans, in consultation with the EPA, the Noise Mapping Bodies (NMB's) and the general public.

1.6 Key Phases / Dates

Table 1.1 below sets out the key phases as outlined in the END 2002/49/EC and the 2006 Environmental Noise Regulations (S.I. 140 of 2006), as revoked by European Communities(Environmental Noise) Regulations 2018, in relation to the strategic noise mapping and the noise action plan processes:

Table 1.1- Key Phases- END 2002/49/EC

Key Phase	Date
Round 3 Centralised Contract supporting mapping of roads in Cork	April 2017
Round 3 strategic noise maps to be reported by Noise Mapping Bodies to EPA (for review)	July 2017
Results of strategic noise maps to be reported to European Environment Agency (EEA) by the EPA	28 December 2017
Draft Noise Action Plan to be submitted to the EPA for review;	February 2019
Public consultation (6 – 8 weeks) on Draft Noise Action Plan;	February 2019 – April 2019
Draft Noise Action Plan to be updated following EPA comments;	March-April 2019
Summary Draft Noise Action Plan to be reported to EEA by the EPA;	April 2019
Final Noise Action Plan (3rd round) to be submitted to the EPA for final review	April 2019
Final Noise Action Plan (3rd round) to be reported to the EC by the EPA	April/May 2019
Final Noise Action Plan in consultation with relevant stakeholders to be published by the competent authorities	Q2 2019

Strategic noise maps and noise action plans are to be revisited every 5 years or sooner where a material change in environmental noise in the area occurs.

2 EXISTING NOISE MANAGEMENT LEGISLATION AND GUIDANCE

This chapter provides an overview of existing noise management legislation, regulations and guidance in Ireland and regional scale.

2.1 National Legislation and Guidance

2.1.1 National Planning Framework 2040

The finalised 'National Planning Framework 2040' was published in 2018 and is to be used as the guideline for current planning policy. Specific reference to noise is made under Objective 65:
"*Promote the pro-active management of noise where it is likely to have significant adverse impacts on health and quality of life and support the aims of the Environmental Noise Regulations through national planning guidance and Noise Action Plans*."
The National Planning Framework will support:

- noise management and action planning measures through strategic noise mapping, noise action plans and suitable planning conditions;
- good acoustic design in new developments, in particular residential development, through a variety of measures;
- the further enjoyment of natural resources through the preservation of low sound levels or a reduction of undesirably high sound levels. Extra value is placed on areas with low sound levels, coined Quiet Areas, because they are deemed to be of environmental quality and to have a positive impact on quality of life and health.

2.1.2 Planning and Development (Strategic Housing Development) Regulations 2017

Planning applications for housing developments of more than 100 residential units and 200 plus student bed spaces can now be made directly to An Bord Pleanála. New legislation which allows for this type of application was enacted on 19th December 2016 and the associated regulations came in to effect on 3rd July 2017. This new type of application has been introduced as part of Rebuilding Ireland to speed up the planning application process and accelerate delivery of larger housing and student accommodation proposals.
The types of housing applications which can be made direct to An Bord Pleanála are referred to as Strategic Housing Development (SHD) and are defined as follows:

(a) the development of 100 or more houses on land zoned for residential use or for a mixture of residential and other uses;

(b) the development of student accommodation units which, when combined, contain 200 or more bed spaces, on land the zoning of which facilitates the provision of student accommodation or a mixture of student accommodation and other uses thereon;

(c) development that includes developments of the type referred to in paragraph (a) and of the type referred to in paragraph (b), or containing a mix of houses and student accommodation;

(d) the alteration of an existing planning permission granted under section 34 (other than under subsection (3A)) where the proposed alteration relates to development specified in paragraph (a), (b), or (c).

This legislation has the effect that An Bord Pleanála will be the authority responsible for considering the impact of noise for those types of proposed developments in Cork City and County and not the relevant local authority.

2.1.3 Professional Planning Guidance (ProPG) on Planning & Noise: New Residential Development - 2017

The ProPG for new residential developments was published in May 2017 by the Acoustics and Noise Consultants (ANC), Chartered Institute of Environmental Health and UK Institute of Acoustics. The primary goal of Pro PG is to provide assistance in planning to deliver sustainable development by promoting good health and well-being in relation to noise. It encourages the use of good acoustic design process in and around proposed new residential development, having regard to national policy.

Any issues related to noise should be given consideration at the earliest stages of the development process in order to facilitate streamlined decision making in planning. The ProPG follows a systematic, proportionate, risk based, two-stage, approach.

Stage One is an Initial Site Noise Risk Assessment which should be conducted to establish the level of risk from noise, not including any mitigation measures. There are four noise risk categories (negligible, low, medium and high). The outcome of this assessment should not directly inform a decision, rather to allow for the consideration of good acoustic design.
Stage Two is a full noise assessment including four recommended key elements:

- Element 1 - demonstrating a “Good Acoustic Design Process” avoiding “unreasonable” and preventing “unacceptable” acoustic conditions;
- Element 2 - observing “Internal Noise Level Guidelines”;
- Element 3 - undertaking an “External Amenity Area Noise Assessment”;
- Element 4 - consideration of “Other Relevant Issues”.

To support proposals for a development an Acoustic Design Statements should be produced which will aid recommendations formulated by the decision maker. Further detail in relation to this guidance is provided in Section 7.

2.1.3 Spatial Planning and National Roads; Guidelines for planning Authorities - January 2012

The Department of the Environment, Community and Local Government (DoECLG) has prepared these guidelines in the context of the delivery of the National Spatial Strategy and actions identified in Smarter Travel, A Sustainable Transport Future, A New Transport Policy for Ireland 2009-2020.

The guidelines set out planning policy considerations relating to development affecting national roads (including motorways, national primary and national secondary roads) outside the 50/60 km/h speed limit zones for cities, towns and villages.

The guidelines provide a checklist of items to be incorporated into local authority development plans such as environmentally sensitive issues including noise, air pollution, greenhouse gases, congestion, etc. Mitigation measures are also highlighted and the need for these to be examined in relation to the developments.

2.1.4 World Health Organisation (WHO) Guidelines

WHO guidelines make numerous recommendations for noise levels in specific environments in order to minimise the health impact of environmental noise.

In the context of the WHO definition of health as, "...*a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity*", these guideline values can be seen as aspirational targets based on the precautionary principle. The guidelines set out a number of external and internal values for daytime and night time noise levels which aim to minimise all identified adverse health effects, including annoyance, for residential properties and other noise sensitive premises. Examples of the WHO 'Guideline values for Community Noise' in specific environments' are:

- LAeq, day ≤ 55dB outdoor living area, to avoid serious annoyance;
- LAeq, day ≤ 50dB outdoor living area, to avoid moderate annoyance;
- LAeq, day≤ 35dB dwelling indoors, to avoid moderate annoyance;
- LAeq, night ≤ 30dB inside bedrooms, to avoid sleep disturbance;
- LAeq, night ≤40dB outside bedrooms with open window, sleep disturbance;

- LAFmax, night≤ 45dB noise maxima inside bedrooms, to avoid sleep disturbance.

The Night Noise Guidelines for Europe (2009) were subsequently developed to provide expertise and scientific advice in developing future standards in the area of night noise exposure control. The document presents guidelines values with the intention of preventing the harmful effects of noise. These are grouped into biological effects, sleep quality, well-being and medical conditions. It is recommended that the population should not be exposed to night noise levels greater than 40 dB of Lnight, outside (a long-term eight hour average between 23:00 and 07:00 hrs). The level can be considered a health-based limit value necessary to protect the public, including most of vulnerable groups such as children, the chronically ill and the elderly, from the adverse health effects of night noise. Adverse health effects are observed among the exposed population between the range of 40 and 55 dB Lnight, outside and those among vulnerable groups will be more severely affected. The effect of noise levels above 55 dB Lnight,outside are is increasingly hazardous to public health. An interim target of 55 dB Lnight, outside is recommended in the situations where the achievement of the guideline level of 40 dB Lnight, outside is not feasible in the short-term for various reasons. However, it is not a health-based limit.

2.1.5 Building Regulations 1997 – 2007

Part E of the Building Regulations 1997 (S.I. no. 497 of 1997) relates to the mitigation of sound transfer between dwellings and rooms within a building. This document, updated in 1998, gives some guidance in relation to the achievement of reasonable sound insulation insofar as it relates to non-complex buildings of normal design and construction.

2.1.6 Transport Infrastructure Ireland (TII) Guidelines 2004

In light of the lack of standardised methods for the assessment of road traffic noise the National Roads Authority, now TII, published the "***Guidelines for the Treatment of Noise and Vibration in National Road Schemes***", in October 2004. These guidelines propose design goals for noise related to both the construction and operational stages of new roads schemes. Following a review of similar guidelines in the UK and adapting methodologies in line with the requirements of the END, the Authority proposed an operational design goal of L_{den} ≤ 60dB (free field residential facade criterion).

Essentially what this means is that for any new road scheme the Environmental Impact Statement must take this target into account with regard to any existing sensitive residential property likely to be affected by the

road scheme. The guidelines present an approach to mitigating the adverse effects of road construction in so far as possible through the use of measures such as alignment changes, barrier construction e.g. earth mounds, and the use of low noise road surfaces. The responsibility for noise mitigation policy relating to any proposed new sensitive properties in the vicinity of the road scheme lies with the relevant Planning Authority.

2.1.7 Roads Act 1993

Section 77 of the Roads Act 1993 allows the minister "….*make regulations requiring road authorities or the Authority to carry out works or take such other measures as are necessary to mitigate the effects of road traffic noise in respect of such types of public road constructed or improved after the commencement of this section as are specified in the regulations*" [4].

It also outlines powers of the Minister to make regulations in respect of noise limits, measurement and mitigation. No specific guidance in respect of noise or noise limits is contained within the Road Act.

2.1.8 Environmental Protection Agency Act 1992

In Ireland, the principal law relating to noise is Sections 106, 107, and 108 of Part VI of the Environmental Protection Agency (EPA) Act 1992.

Part six *Miscellaneous* of the Act contains Section 106 to 108 [3].

- Section 106 relates to *Regulations for control of noise* - the minister may make regulations for the purpose of the prevention or limitation of any noise which may give rise to a nuisance or disamenity, constitute a danger to health, or damage property.

- Power of local authority or Agency to require measures to be taken to prevent or limit noise is contained in section 107 i.e. serve notices on the person in charge.

- Section 108 sets out the steps for individuals to take in bringing noise complaints to the District Court and also what steps the accused should take in forming a defence.

Noise such as that coming from other homes, workshops or local businesses, that is continuous, repeated, loud and occurring at such times and of such duration that it affects the quality of life of the person, is covered by this law.

Under the legislation local authorities or the EPA are empowered to serve a Notice requiring measures to be taken to limit or prevent noise. A Notice can be served by a local authority on any person in charge of any premises,

processes or works, other than an activity controlled by the EPA. The Notice must indicate the measures to be taken to prevent or limit the noise and may specify a period within which such measures are to be taken. Failure to comply with a Notice is an offence and allows the relevant local authority to take steps to ensure compliance.

A noise laboratory is located in Inniscarra Waterworks, Inniscarra, Co. Cork which implements the provisions of the EPA Acts. Key activities carried out by the laboratory include

- The laboratory investigates complaints under the above legislation;
- monitors and enforces planning/licence conditions and industrial operations.

Within the EPA Act there is no legal noise limit specified.

2.1.9 Guidance Note for Noise (NG4) EPA

The Guidance Note for Noise document produced by the EPA is intended to assist licensed sites with the assessment of their potential and actual noise impact on the local environment. It provides the relevant knowledge and guidance to licensees together with their consultants, regulators and interested third parties [6].

Values from the licensed facility should not generally exceed the values given below

- Daytime (07:00 to 19:00 hrs) – 55dB $_{LAr,T}$
- Evening (19:00 to 23:00 hrs) - 50 dB $_{LAr,T}$
- Night-time (23:00 to 07:00 hrs) – 45 dB $_{LAeq,T}$

2.2 Regional & Local Legislation and Guidance

Currently there is no regional or local legislation relating to noise.

There are however ongoing local sustainability programs driven by Cork County and City Council, which aim to reduce long term traffic congestion levels in the Cork Agglomeration Area. These include initiatives such as provision of Park & Ride facilities, Green Routes, new cycling infrastructure, Intelligent Transport Systems (ITS) etc. whose aim is to facilitate the use of more non-car sustainable forms of travel which will also contribute to the reduction in overall traffic noise generation.

2.2.1 Cork County Council

The Cork County Council Development Plan 2014 highlights committed noise objectives. These include the key objectives detailed in **Table 2.1**:

Table 1.1: Noise related Key Objectives - Cork County Council Development Plan 2014

Objective	Description
EE 12·3: Impacts of Mineral Extraction	With new quarries and mines and extensions to existing quarries and mines regard should be had to visual impacts, methods of extraction, noise levels, dust prevention, protection of rivers, lakes, European sites and other water sources, impacts on residential and other amenities, impacts on the road network: (particularly with regard to making good any damage to roads), road safety, phasing., re-instatement and landscaping of worked sites.
ED 3-4: Acceptable In Principle	Commercial wind energy development is normally encouraged in these areas subject to protection of residential amenity particularly in respect of noise, shadow flicker, visual impact and the requirements of the Habitats, Birds, Water Framework, Floods and EIA Directives.'
ED 3·5: Open to Consideration	Commercial wind energy development is open to consideration in these areas where proposals can avoid adverse impacts on: • Residential amenity particularly In respect of noise, shadow flicker and visual impact;
ED 3-7: Other Wind Energy Development	The Council will consider proposals where it can be shown that significant Impacts on; • Residential amenity particularly in respect of noise, shadow flicker and visual Impact;
ED 4-3: Bioenergy	Visual, noise and odour impacts on adjacent residential property will be key considerations when assessing any such proposals.
TM 3-1: National Road Network	**h)** Ensure that in the design of new development adjoining or near National Roads, account is taken of the need to include measures that will serve to protect the development from the adverse effects of traffic noise for the design life of the development.
TM 3-2: Regional & Local Roads	e) Ensure that in the design of new development adjoining or near Regional & Local Roads, account is taken of the need to include measures that will serve to protect the development from the adverse effects of traffic noise for the design life of the development.
GI 13-1: Noise Emissions	**a)** Seek the minimisation and control of noise pollution associated with activities or development, having regard to relevant standards, published guidance and the receiving environment. **b)** Support the implementation of Noise Action Plans prepared for the Cork County area.

In addition the following clauses in **Table 2.2** in the Cork County Council Development Plan 2014 also relate to noise:

Table 2.2: Noise related clauses - Cork County Council Development Plan 2014

Clause	**Description**
6.4.7	**'Industrial Areas'** are concerned with medium/large scale process-orientated employment and production including manufacturing, repairs, warehousing, distribution, open-storage and transport operating centres and can include activities that cause localised noise, vibrations, smells, fumes, smoke, etc.
9.4.4	Larger scale schemes, whilst delivering significant benefits, may have environmental impacts which may include; … • Noise during construction and operation.
9.4.7	*(geothermal energy)* The principal impacts can concern ground excavation, which may be inappropriate in/near nature conservation/archaeological areas, and noise/visual Impact from pumps and effect on groundwater.
10.2.2	Walking, Cycling and Public Transport Benefits accruing for both the environment and the citizen, include reducing air and noise pollution and traffic congestion as well as contributing to healthy more active lifestyles and social communities.
12.2.13	Trees and Woodlands Trees make a valuable contribution to the landscape and to local visual amenity across County Cork. They can provide shelter from wind, and act as a barrier providing privacy or helping screen out otherwise intrusive sights, movement, dust and noise. They are also important for their production of oxygen and absorption of carbon dioxide.
13.13.1	Cork County Council has produced two finalised Noise Action Plans, in accordance with the European Noise Directive 2002/49/EC, which impacts the Cork County functional area. These Noise Action Plans are 5 year strategic plans covering the period 2013 to 2018: − Cork Agglomeration Noise Action Plan 2013-2018 (in conjunction with Cork City Council). − Major Roads Cork County Noise Action Plan 2013-2018.
13.13.2	The purpose of these Noise Action Plans is to act as a means of managing environmental noise, and to meet the aims of the European Noise Directive (END) of preventing, and reducing where necessary, environmental noise through the adoption of the Plans. The planning authority will have regard to the Noise maps in the Action Plans, when assessing planning applications. The planning authority will also give careful consideration to the location of noise sensitive developments so as to ensure they are protected from major noise sources where practical. See Chapter 10 Transport and Mobility.

2.2.2 Cork City Council

Table 2.3 lists noise related objectives detailed in the Cork City Council Development Plan 2015-2021.

Table 2.3: Extracts - Cork City Council Development Plan 2015-2021

Objective	Description
	Alternative Fuels, Fuel Efficiency and electric Vehicles
5.37	During the lifetime of the Development Plan, particular emphasis will be placed on electric vehicles ("EVs"), as there is a national target for 10% of all road vehicles to be powered by electricity by 2020. Biofuels and EVs improve air quality (fuel combustion for transport is a primary source or air pollution in the city (paragraphs 12.57 – 12.60)); EVs also reduce noise levels (road traffic noise is a predominant noise source in Cork City; Objective 12.20 Joint Action Noise Plan.)
	Strategic Environmental Infrastructure Objectives
12.1j	Improve air quality and maintain acceptable levels of light and ***noise pollution*** in the city in accordance with requirements set out in European Union, National and Regional Policy
	Joint Cork Noise Action Plan
12.20	To implement the recommendations of the Cork Agglomeration Noise Action Plan 2013-2018 upon its adoption, in order to prevent and reduce environmental noise
	Noise Levels in Developments
12.21	To require all developments to be designed and operated in a manner that will minimize and contain noise levels. Where appropriate, the City Council shall apply conditions on new developments / uses that restrict noise emissions and hours of operation, in particular, night time uses such as public houses, private members clubs, casinos, fast food take-aways, restaurants and nightclubs; or conditions on noise sensitive developments / uses to mitigate the effects of existing noise levels.
	Noise Pollution
12.65-12.67	The Environmental Noise Regulations 2006 give effect in Ireland to the EU Environmental Noise Directive (END) 2002/49/EC. In accordance with the Directive, the National Roads Office on behalf of Cork City Council and Cork County Council has produced a Joint Noise Action Plan 2013 – 2018 covering infrastructure such as major roads, rail lines and the airport.

	The purpose of the Plan is to manage environmental noise, and to prevent and reduce noise where necessary. Strategic noise maps identify and prioritise cluster areas that require further assessment and may require mitigation measures to be put in place. Road traffic noise is the predominant noise source in Cork City and to a lesser extent commuter trains, and aircraft using Cork Airport.
	The City Council through the planning system can minimise the adverse impacts of noise by controlling and segregating noise intensive developments (day-time and night-time uses) from noise sensitive areas such as residential areas. Where this is not possible, the City Council shall impose conditions on development such as limiting the hours of operation of proposed development where it is likely to create disturbance due to noise.

3 DESCRIPTION OF THE ACTION PLANNING AREA

3.2 Extent of the Area

This Noise Action Plan relates to the Agglomeration of Cork which is defined in the Environmental Noise Regulations as:

"*The restricted area of Cork as specified in the First Schedule to the Air Pollution Act 1987 (Marketing, Sale and Distribution of Fuels) Regulations 1998 (S.I. No. 118 of 1998)"* [2]

The restricted area of Cork under the Air pollution Act 1987 (Marketing, Sale and Distribution of Fuels) Regulations 1998 is defined as:

- The county borough of Cork;

- The included areas of the administrative county of Cork as follows:

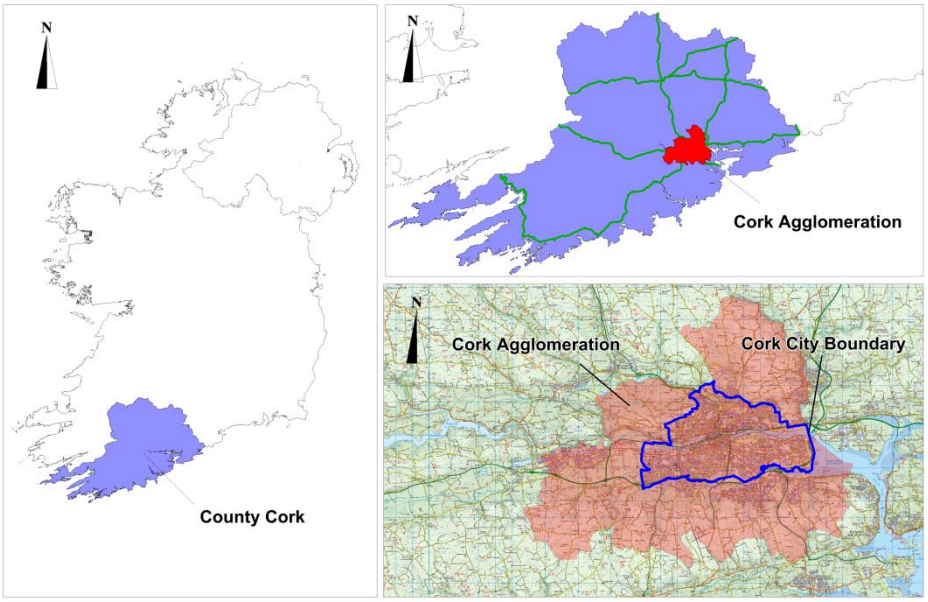
  - The district Electoral Divisions of:

    - Ballincollig;
    - Douglas;
    - Iniskenny;
    - Lehenagh;
    - Rathcooney;

  - That part of the District Electoral Divisions of Bishopstown and St. Mary's not within the county borough of Cork

This area and geographical location is represented graphically in **Figure 3.1** below.

Figure 3.1: Cork Agglomeration Area- Geographical Location



The total area of the Cork Agglomeration action planning area is approx 186km ^{2} contained within the jurisdiction of Cork County and City Council as detailed in **Table 3.1** below.

Table 3.1 - Agglomeration Area Statistics

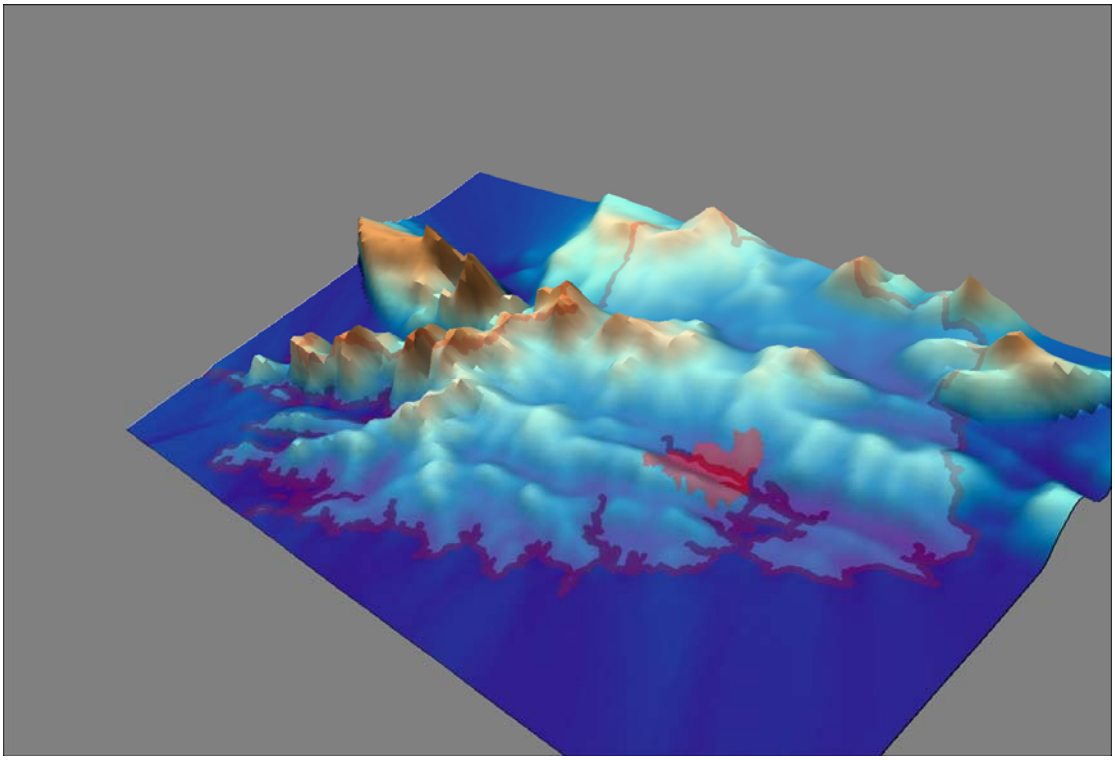
Agglomeration Statistics	Area (km2)	Area as % of Total
Cork City Council	39.6	21%
Cork County Council	146.4	79%
Overall	**186**	

3.3 Description of the topography

A graphical representation of the topography of the County of Cork is given in **Figure 3.2**. The image shows a 3D elevation of Cork (red boundary) containing the agglomeration area (red area).

Analysis of the elevation values shows a range of values from 10m AOD (Above Ordnance Datum) to 180m AOD.

Figure 3.2: 3-D representation of the County of Cork



Cork City is the most southerly situated city in Ireland, and has long been associated with port activities, given its location on the River Lee, with a natural harbour in a sheltered estuary and its proximity to the Atlantic seaboard.

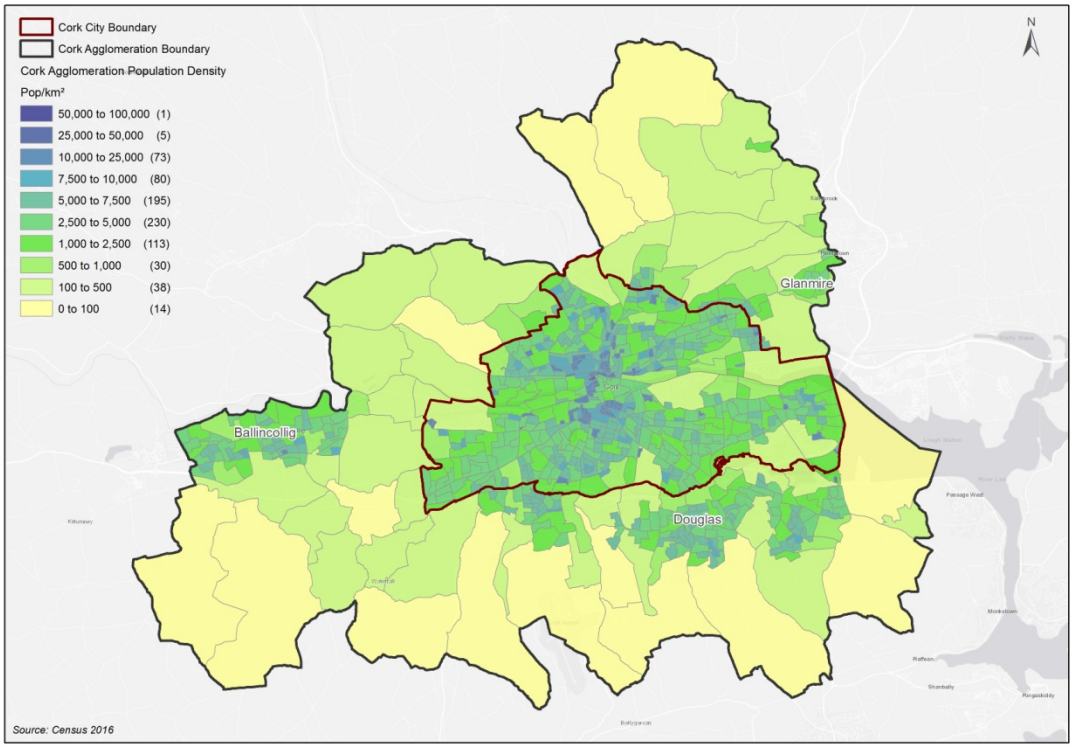
The landscape of Cork City is formed by a unique set of natural and built elements that have evolved over time. The distinctive ridgelines and topography to the north of the city are formed by the lower ranges of the Boggeragh Mountains to the north-west and the Nagle Mountains to the north. The southern ridges belong to the Sheehy Mountains, the peaks of which lie to the east of Cork County.

The rivers Lee and Sullane merge around Macroom to the west of the county, and flow east along the post-glacial valley into the Lee proper, through Cork City, into Lough Mahon, Cork Harbour and south into the Atlantic Ocean [7].

3.4 Description of the general population

The total population for the county of Cork is 542,868 [2]. This reduces to a population of 195,768 for the Cork Agglomeration area. **Figure 3.3** shows the population density for the Cork Agglomeration in terms of Small Area Populations (SAP's). SAP's provide the most detailed layer of population data available in Ireland with approx 80-100 households on average in each small area.

Figure 1.3: Population Densities for the Cork Agglomeration; Census



As can be seen from the figure the higher population densities are concentrated within the urban environment of the Cork City Council boundary. Population densities drop significantly for areas inside the Cork County Council jurisdiction with the exception of satellite settlements such as Ballincollig, Glanmire and Douglas.

The population of 195,768 can be further broken down into the relevant authority as shown in **Table 3.2.**

[2] Census 2016 – www.cso.ie

Table 3.2: Population breakdown for the Cork Agglomeration Area

Agglomeration Statistics		Population	% of total
Cork City Council		125,657	64%
Cork County Council		70,111	36%
Overall		195,768	100%

3.5 Noise Sensitive Groups

The END Directive and the Regulations aim to identify and protect existing noise sensitive premises in addition to residential dwellings. The following, highlighted in the previous Noise Action Plan's, are considered as potential noise sensitive groups:

- Hospitals, nursing and convalescence homes;
- Educational facilities;
- Childcare/crèche facilities;
- Cemeteries;
- Places of Worship.

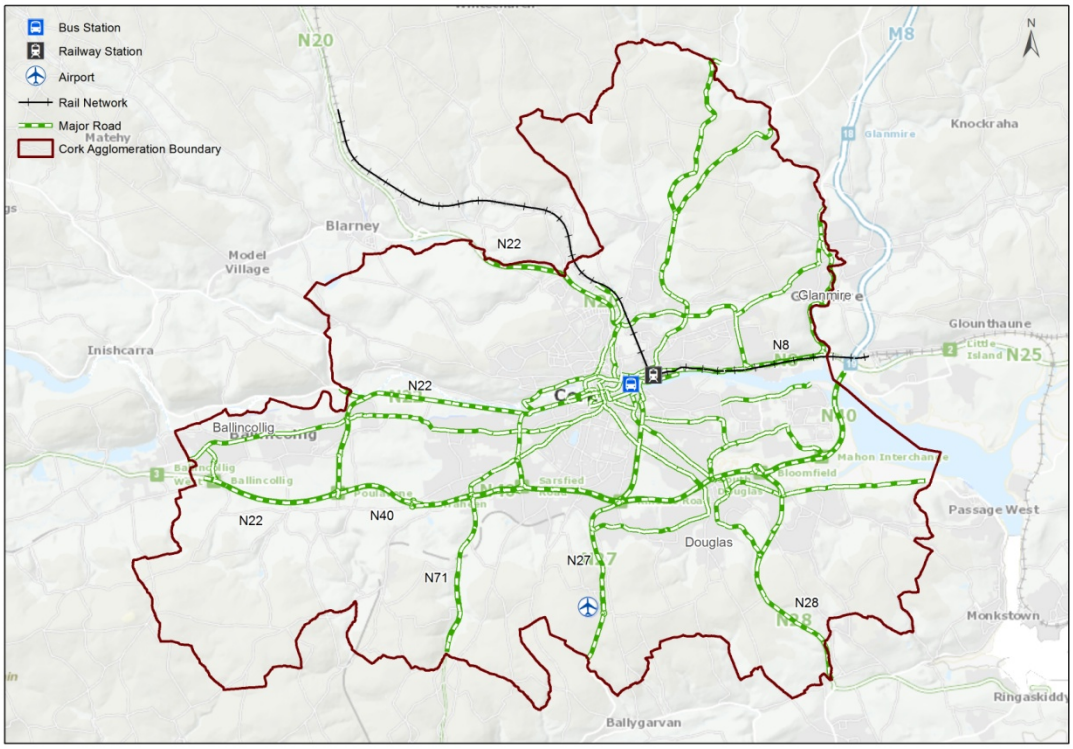
3.6 Description of the main infrastructural services

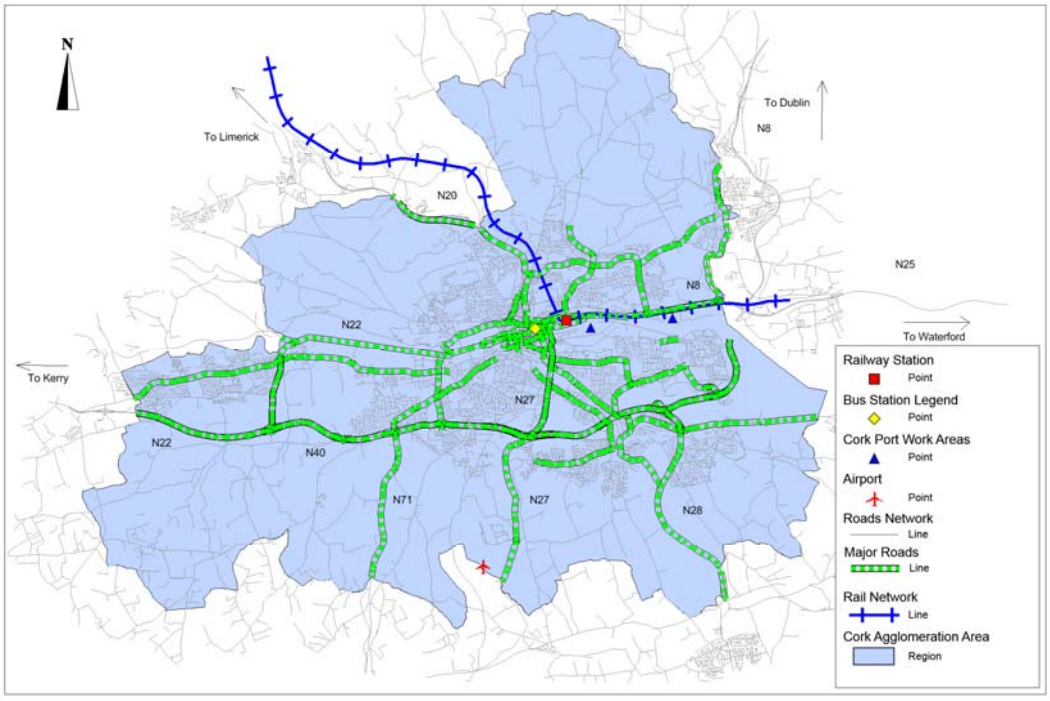
The main transport infrastructure in the Cork Agglomeration consists of the:

- Road Network;
- Rail Network;
- Air Transport;
- Port Network.

Figure 3.4 gives an overview of the location of the relevant main transport infrastructure within the Cork Agglomeration Area.

Figure3.2: Main transport infrastructure in the Cork Agglomeration Area





There are approximately 1,000 km of a road network within the Cork Agglomeration area. This network is made up of a mixture of road types such as single and dual carriageway and the following road categories:

- National Road (N/M) – National Roads are major long distance routes linking the principal ports, airports, cities and large towns. National Secondary roads are medium distance routes connecting important towns.

- Regional Road (R) – Regional Roads are also referred to as Regional Main roads and are the main feeder routes, into and provide the main links between National roads.

- Local Roads (L) – Local Roads include all rural and urban roads other than those classified as national or regional roads. These are sub-divided in turn into primary, secondary and tertiary local roads.

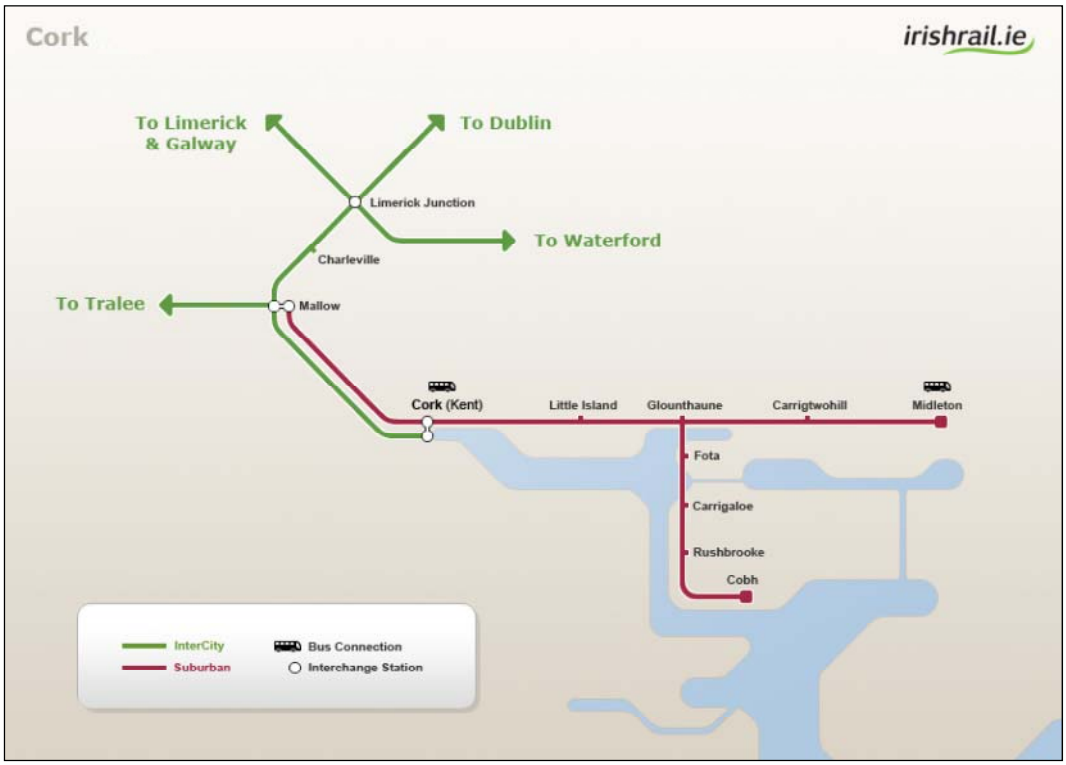
Major Roads as highlighted green in **Figure 3.4,** correspond to the major roads as reported to the EU i.e. which carry more than 3 million vehicles per year. These major roads are predominantly made up of National Roads.

Three types of bus services are available to commuters in the agglomeration area. These consist of

1. Intercity – Connects cities;
2. Regional Services including Cork Airport – Connects the City to commuter towns/villages;
3. City Services – bus services in and around the cork city area

A railway service operates from Kent Station in Cork City, offering intercity and suburban services. The main route consists of the Cork to Dublin intercity route. Regional services are provided to major town and villages such as Cobh, Midleton and Mallow. **Figure 3.5** gives a general overview of the rail connectivity in the Cork area.

Figure3.3: Rail Network in Cork



3.7 Quiet Areas

The Environmental Noise Directive defines a 'Quiet Area' as

"quiet area in an agglomeration" means an area, delimited by an action planning authority following consultation with the Agency and approval by the Minister, where particular requirements on exposure to environmental noise shall apply"

There are a number of possible means of defining quiet areas within agglomerations, from purely noise related criteria, to wider definitions which take into account related aspects such as land, local amenity value, accessibility and historic usage.

A quiet area could be an area with low sound levels or an area, which should not be exposed to high sound levels due to the type of an area or the nature of the activities that take place within it.

In the life of this action plan it is proposed to identify quiet areas in consultation with the public.

4 THE RESPONSIBLE AUTHORITY FOR ACTION PLANNING

4.1 Name and Contact details for the Responsible Authority

As the Cork Agglomeration traverses two Local Authority jurisdictions, this Noise Action Plan has been prepared jointly by Cork City Council and Cork County Council.

Contact Details:

The Transportation Division, [Cork City Council]
Roads and Transport Directorate,
Cork City Council,
City Hall,
Cork.

Email: traffic@corkcity.ie

OR

National Roads Design Office, [Cork County Council]
Richmond,
Glanmire,
Co.Cork.

Email: info@corkrdo.ie

4.2 Description of other bodies of relevance

The Environmental Protection Agency (EPA) has responsibility for submitting summaries of the action plans to the European Commission.

Draft copies of the Noise Action Plan will be forwarded to stakeholders who had an input into the strategic noise mapping stage i.e.

- TII
- Iarnród Éireann (Irish Rail)
- Cork Airport (Part of the DAA (Dublin Airport Authority) Group)

Public consultation will also take place with the citizens of the Cork Agglomeration area.

4.3 Description of associated working groups/steering groups

The Cork Agglomeration Noise Action Plan was prepared in consultation with Cork County Council, Cork City Council and the EPA.

4.4 Description of any noise-reduction measures planned or in place

As part of its remit in relation to the planning and supervision of construction and maintenance works on national primary and secondary routes, TII has implemented noise reduction measures on national road projects in the Cork Agglomeration area.

National Road Projects

These noise reduction measures have been implemented on the N40 South Ring Road, N22 Ballincollig Bypass, the N40 Kinsale Road Interchange, and the N40 Sarsfield Road to Bandon Road South Ring Road Improvement Scheme, which include mitigation measures such as noise barriers, low noise road surfacing, earth bunds etc.

Road Resurfacing

Other measures that are in place consist of installing low noise road surfaces on national routes, regional and local road within the agglomeration area. These low noise surfaces have replaced, where suitable, hot rolled asphalt or concrete surfaces and have had the effect of reducing noise emissions by 2 – 4 dba.

Traffic Calming

Traffic calming programmes have been installed and are operating in a number of areas in the city and county. These have the effect of reducing driver speeds which has a significant effect on noise.

Urban Traffic Control

Cork City Council also operates an Urban Traffic Control (UTC) system to efficiently operate and manage the road network. These systems would include:

- SCOOT (Split Cycle Offset Optimisation Technique)
- MOVA (Microprocessor Optimised Vehicle Actuation)

The SCOOT system is an adaptive control system that automatically responds to fluctuations in traffic control using data obtained from sensors installed in the roadway. The signal settings continuously change on a network basis providing for optimal coordination between junctions together with providing for efficient operation at individual approaches at junctions.

SCOOT system controls traffic signals on a network basis while MOVA controls and operates isolated junctions. It can however also be used for linked schemes. MOVA is typically used at large isolated junctions where coordination between adjacent junctions in not necessary. It facilitates the automatic modification of signal timing settings to accommodate efficient traffic control.

Sustainable Travel

There has also been significant investment in bus routes, cycle routes and key pedestrian routes in the Cork Agglomeration. One of the key strategic elements of the Cork Area Strategic Plan (CASP) is the implementation of an integrated transport system, based on the completion of essential strategic road links, the development of the suburban rail network and a high quality bus network supported by Park and Ride facilities and improved cycle and pedestrian networks.

Cork Walking Strategy 2013-2018

The Cork Walking Strategy was adopted in 2015. It is a 5-year strategy that seeks to enhance a culture of walking, outside the core City Centre, by providing better pedestrian connectivity between settlements, district centres, employment hubs, educational facilities and public transport services. It examines the quality of the existing network of street and neighbourhoods, and analyses Central Statistics Office data of modal choice for journeys to workplaces and to places of education for journeys up to 2km in length.

Cork Cycle Network Plan 2015

Cork City Council and Cork County Council prepared a Cycling Network Plan for the Cork City Metropolitan Area and surrounding towns. The objective is to provide a clear plan for the future development of the cycling network within the Metropolitan Area to encourage the greater use of cycling for trips to/ from school, work, recreation and leisure.

Cork Metropolitan Transport Study (CMATS)

The Cork Metropolitan Transport Study (CMATS) is being developed by the National Transport Authority in collaboration with TII, Cork City Council and Cork County Council. It is currently only in draft format however. CMATS will set out a framework for the planning and delivery of an accessible, integrated

transport (all modes) network (infrastructure and services) to support the development of the Cork Metropolitan Area up to 2040.

Green Routes

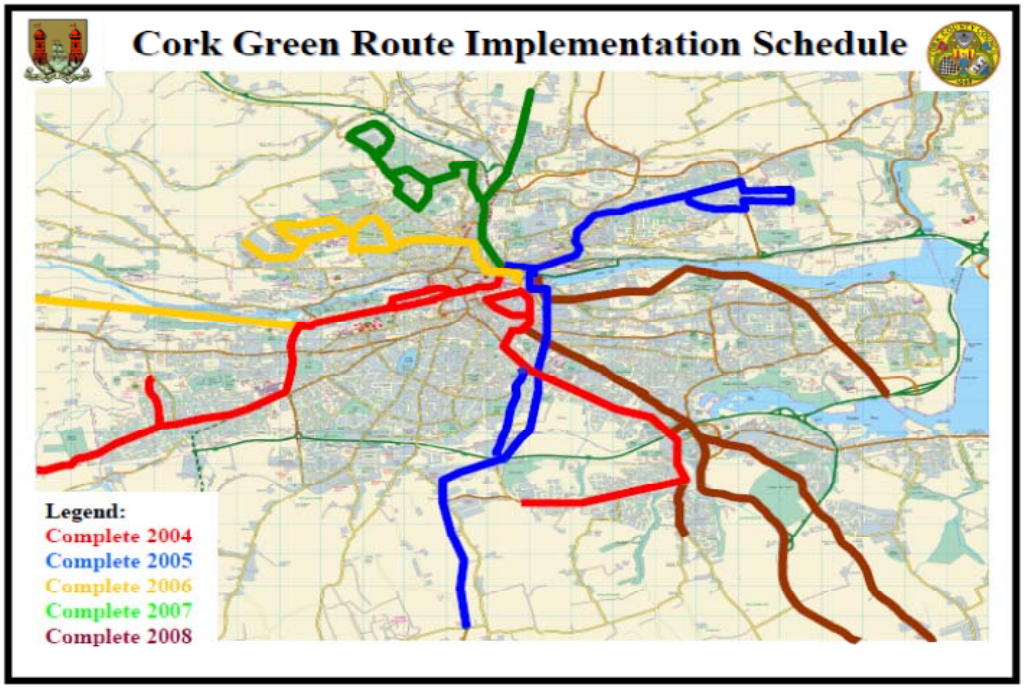
The main aim of the green route schemes is to give priority to alternative modes of transport by providing bus corridors, cycle lanes and improving pedestrian facilities, thus reducing car journeys which will in turn lead to a reduction in air and noise pollution.

Bus Eireann, Cork City Council and the National Transport Authority monitor the bus network performance on an ongoing basis. Various improvements have been implemented in recent years and surveys demonstrate the positive impact on bus journey times particularly on those sections of the network where bus priority has been provided. This improves the attractiveness of choosing the bus over the private car for commuters. Further bus priority measures will be implemented over the next number of years to support the uptake of public transport.

Bus Eireann is continually working to extend the range of services provided to new catchment areas and to improve routes. The addition of new fleet provides increased capacity and also allows for improvements in frequency of routes.

Figure 4.1 gives an overview of the green routes accommodating the Cork Agglomeration area.

Figure 4.1: Green Route Implementation



Cycling Facilities

There has also been significant financial investment in cycle routes in the Cork Agglomeration Area and in particular in the city centre since Round 2. Through the narrowing of carriageway widths, road space along some of the key corridors in the city has been allocated to cycle lanes. This forms one of the key strategic elements in the implementation of an integrated transport system. The reduced carriageway widths also promote slower traffic movements which improves road safety for vulnerable road users making walking and cycling more attractive as well as reducing traffic noise.

Since 2012 cycling infrastructure has been installed throughout the agglomeration area either as independent cycle route schemse or as part of other improvement works. These schemes include:

- Parnell Place Street Enhancement Scheme;
- Douglas to City Centre Cycle Corridor;
- UCC to City Centre including Washington Street - Western Road, Sullivan's Quay –French's Quay - Proby's Quay, Popes Quay to North Mall;
- Kent station to City Centre linkage;
- Skehard Road/ Boreenmanna Road Junction Improvement Scheme;
- Bachelor's Quay – Kyrl's Quay;
- Ballybrack Woods.

Bike Rental Scheme

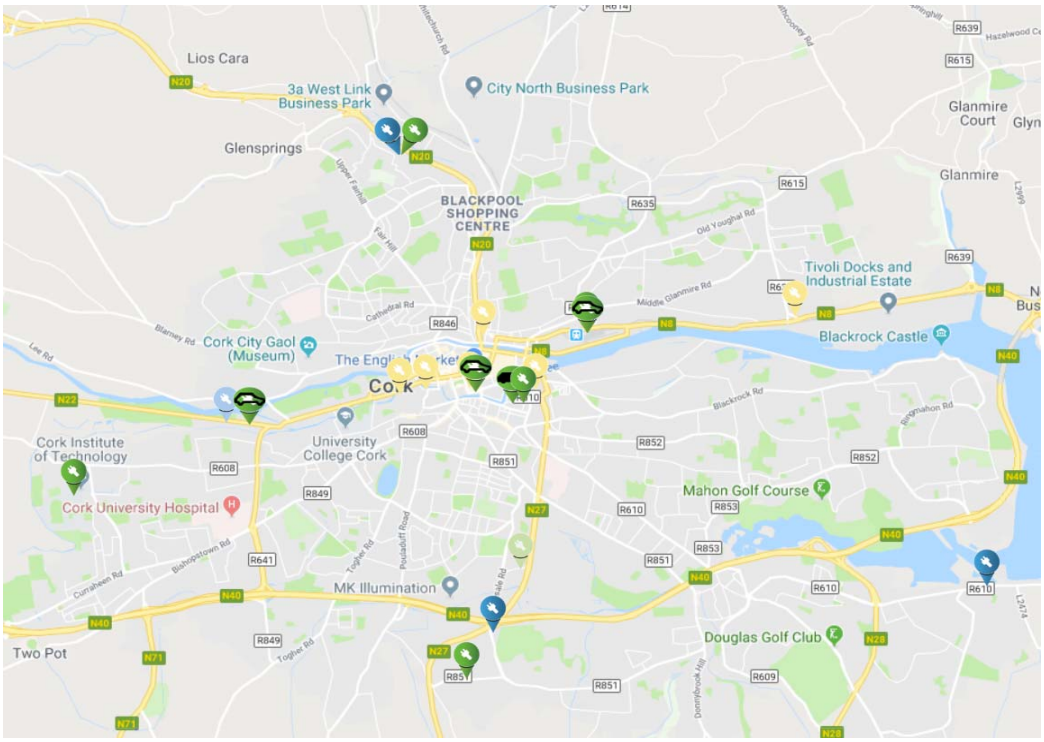
With funding from the National Transport Authority (NTA), a bicycle rental scheme was installed in Cork City in 2014. The rental scheme, know as the Coke Zero Bike Rental Scheme consists of 330 bikes set out across 32 stations that are located at various points around and adjacent to the central 'island' of the city. The Coke Zero Bike Rental Scheme spans east west following the river Lee from Kent railway station to University College Cork at Gaol Cross. The rental stations are shown in **Figure 4.2.**

Figure 4.2 Coca Cola Bike Rental Scheme stations

Electricity Car Charge Points

Cork City Council has made streetscape in the City, as well as at the Black Ash Park & Ride facility, available to the ESB for electricity car charge points. This encourages the use of electric cars which emit less road noise at low speeds though the City. The location of the electric car charge points installed by the ESB and others in the Cork Agglomeration is presented in **Figure 4.3.**

Figure 4.3 Electric Car Charge Points



4.5 Sound Level Monitoring

4.5.1 Locations and Purpose of Monitoring

During the life of the 2013-2018 Noise Action Plan, two noise monitors were installed for long-term validation of environmental noise levels adjacent to roads identified in the Noise Action Plan 2018–2013. The monitoring carried out was free-field monitoring using Type 2 sound level meters. There are currently two of these Type 2 meters in operation, which were supplied by Sonitus Systems. One noise monitor is installed adjacent to the N28 (**Figure 4.4**) at a facility operated by Cork County Council just off the Rochestown Road which is one of the buildings closest to the national road. The second noise monitor is located within St James cemetery off the N71 at a structure near the middle of the cemetery relative to the N71 (**Figure 4.5**).

These are representative of a noisier and a quieter location close to a major road.

Figure 4.4: Noise Monitor near N28

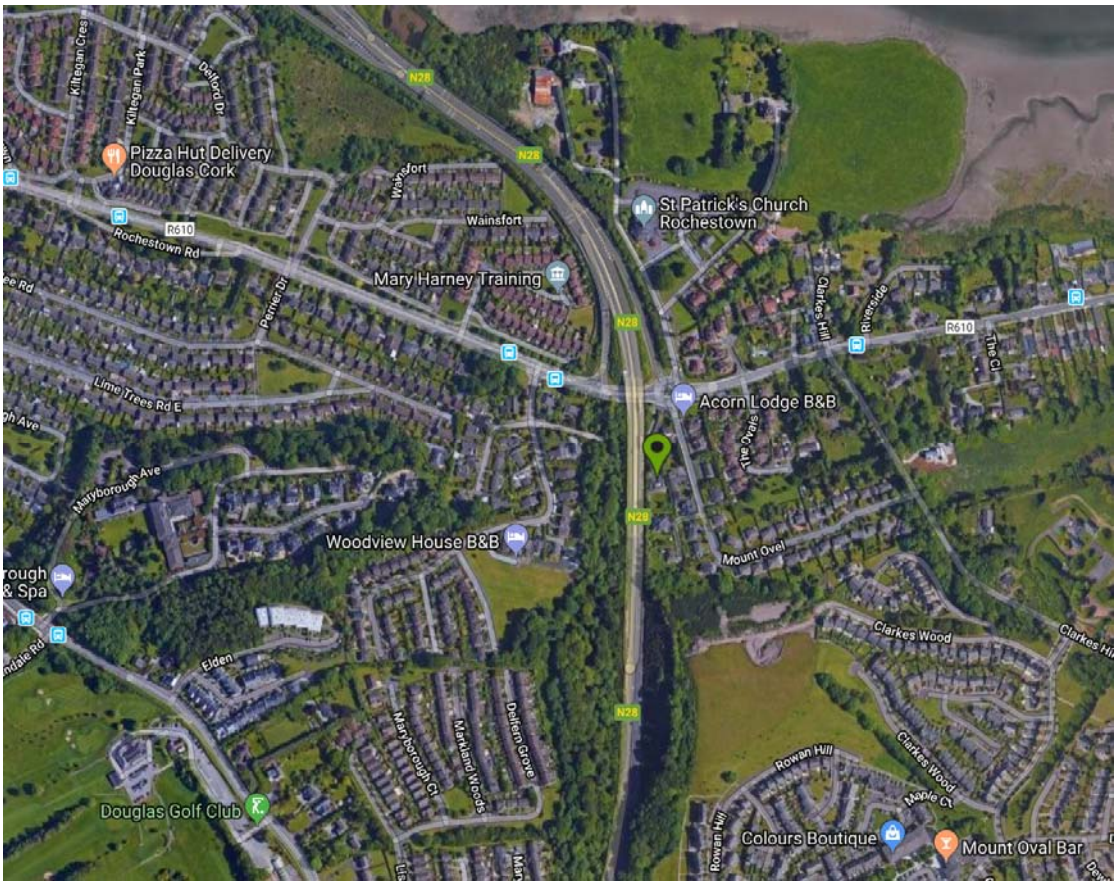


Figure 4.5: Noise Monitor near N71

4.5.2 Results of sound level monitoring

The results of the monitoring compared against the noise levels expected under the 2013 and 2018 strategic noise mapping are presented in **Table 4.1.**

Table 4.1 sound level monitoring of road noise between 2017. Location	**Period**	**Strategic noise mapping 2013: Expected Lden (dBA)**	**Strategic noise mapping 2018: Expected Lden (dBA)**	**Measured Lden (dBA)**	**Strategic noise mapping 2013: Expected Lnight (dBA)**	**Strategic noise mapping 2018: Expected Lnight (dBA)**	**Measured Lnight (dBA)**
Rochestown Rd	01/06/17 to 31/12/17	70 - 75	70 - 75	74	55 - 60	55 - 60	59
St James Cemetery	01/06/17 to 31/12/17	50 - 55	50 - 55	48	<50	<50	42

The results of the monitoring are in broad agreement with the strategic noise mapping for 2013 and 2018. The sound levels at N28 Rochestown seem to be higher in reality than expected. The monitor is located close to where the posted speed limit changes from 100km/hr to 60km/hr.

The 60km/hr speed limit is for the purpose of providing sufficient length for the weaving of merging and diverging traffic to and from the N28, N40 and Rochestown Road. The actual speed of traffic is greater than the posted speed which effects the noise emission. This effect of the higher than expected speed is offset by the surface of Hot Rolled Asphalt (HRA) being replaced with a low noise emission surface during the course of the 2013-2018 noise action plan. It is also noted that the L_{night} measured is higher than expected. The measured values between 0.00hr and 5.00am fall within the expected range. The measured noise from 5.00am to 6.00am however is more typical of daytime levels. This skews the L_{night} reading which thus does not correlate with the predicted levels.

5 SUMMARY OF THE NOISE MAPPING RESULTS

5.1 Objectives of the Noise Mapping

The main goals of the Noise Mapping study was to

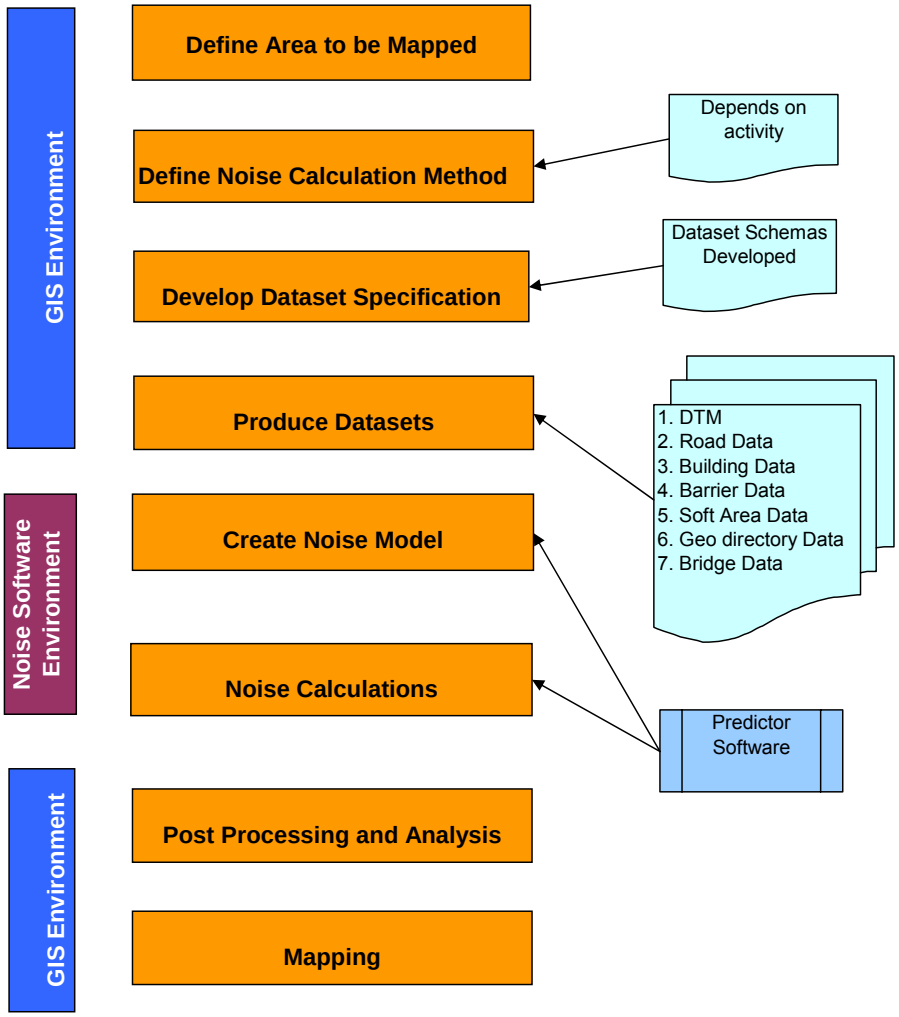
- Comply with the requirements set out in the END directive and SI. No. 140 of 2006 as revoked by European Communities(Environmental Noise) Regulations 2018;
- Produce noise contour maps to inform citizens of the environmental noise environment within the Cork Agglomeration;
- Summarise the number of people/dwellings exposed to specific noise ranges in the agglomeration;
- Summarise the area of lands exposed to specific noise ranges in the agglomeration;
- Provide information of potential noise hot-spots to be assessed;
- Provide a useful tool for planning authorities in protecting the Cork Agglomeration noise environment;
- Assist in the development of an environmentally sustainable future in the agglomeration;
- Provide a tool for monitoring the trends in environmental noise;
- Provide information to the Noise Action Planning Authorities (NAP's) in the production of Noise Action Plans.

5.2 Overview of the preparation of the noise map

The noise maps were prepared by the Noise Mapping Authorities for the Cork Agglomeration as defined by the Environmental Noise Regulations 2006, as revoked by European Communities (Environmental Noise) Regulations 2018. Cork County Council and Cork City Council. These maps were submitted to the EPA in 2018.

The main steps involved in the noise mapping process were as shown in the flowchart in **Figure 5.1.**

Figure 5.1: Main technical steps in the Noise Mapping Process



5.2.1 Data Sources

The Noise mapping process required a number of detailed datasets to be created, in order to construct the 3D environment for noise calculations.

The main datasets are shown in **Table 5.1.**

Table 5.1: Main datasets along with attribute data

	Datasets					
	Road	**Buildings**	**Topography**	**Barriers**	**Bridges**	**Ground Type**
Attributes	Direction	Height	Contour Height	Barrier Height	Bridge Height	Hard/Soft
	Texture Depth					
	Road Width					
	Surface Type					
	Speed					
	18hr Traffic Flow					
	% HGV					
	Gradient					

5.2.2 Methodologies

The strategic noise maps for **roads** were produced using the UK national method "Calculation of Road Traffic Noise" (CRTN), as recommended in Environmental Noise Regulations 2006. CRTN expresses noise levels in terms of the index L_{10} hourly or L_{10} (18-hour) dB (A). The value of L_{10} hourly dB(A) is the noise level exceeded for just 10% of the time over a period of one hour. A back end calculation in the noise modelling software package, Predictor V8.1, allowed the CRTN values to be converted into the required EU noise reporting requirements of L_{den} and L_{night} values.

5.3 Presentation of results

The model produced results for specific time periods, the main periods being reported being L_{den} and L_{night}. Details relating to calculated time periods can be found in the Appendix A of the document.

In simple terms L_{den} can be thought of as the weighted noise level average over a year long period with L_{night} the noise level average over a year long period during the hours 23.00 to 07.00. For more detailed information relating to the noise periods refer to **Appendix A.**

A summary of the main results from the strategic noise mapping is given in **Table 5.2**. The table shows the following main information:

- Population exposed to noise ranges for specific time periods divided into the following noise source categories;
    - All Roads
    - All Rail
    - All Air
- Area of land exposed to relevant noise levels;
- Number of dwellings exposed to noise level ranges.

Table 5.2: Population, Area and Dwelling Statistics for Noise Levels in the Cork Agglomeration

Element	ALL ROAD	%	ALL RAIL	%	ALL AIR	%
Value Ranges						
Population	**Population**		**Population**		**Population**	
Lden <55	121200	63%	190500	100%	182200	95%
Lden 55-59	29200	15%	300	0%	8700	5%
Lden 60-64	19300	10%	100	0%	0	0%
Lden 65-69	19000	10%	0	0%	0	0%
Lden 70-74	2200	1%	0	0%	0	0%
Lden >=75	0	0%	0	0%	0	0%
total	190900	100%	190900	100%	190900	100%
Lnight <55	145100	76%	190800	100%	190900	100%
Lnight 55-59	21200	11%	100	0%	0	0%
Lnight 60-64	20800	11%	0	0%	0	0%
Lnight 65-69	3800	2%	0	0%	0	0%
Lnight 70-74	0	0%	0	0%	0	0%
Lnight >=75	0	0%	0	0%	0	0%
total	190900	100%	190900	100%	190900	100%
Area (km2)						
Area Lden <55	57	0%	186	0%	174	0%
Area Lden 55-59	68	0%	0	0%	10	0%
Area Lden 60-64	35	0%	0	0%	1	0%
Area Lden 65-69	18	0%	0	0%	1	0%
Area Lden 70-74	6	0%	0	0%	0	0%
Area Lden >=75	2	0%	0	0%	0	0%
total	186	0%	186	0%	186	0%
Dwellings Lden <55	50800	62%	81700	100%	78500	96%
Dwellings Lden 5559	12200	15%	200	0%	3400	4%
Dwellings Lden 60-64	8400	10%	0	0%	0	0%
Dwellings Lden 65-69	9400	11%	0	0%	0	0%
Dwellings Lden 70-74	1100	1%	0	0%	0	0%
Dwellings Lden >=75	0	0%	0	0%	0	0%
total	81900	100%	81900	100%	81900	100%

The complete table that includes the Major Roads can be found in **Appendix F**.

Strategic noise maps produced for the Cork Agglomeration are given in **Appendix C** of the report and are also available for viewing at www.corkcoco.ie or www.corkcity.ie websites. The maps show the noise contours for the relevant L_{den} and L_{night} reporting deliverables, for each of the noise sources.

5.4 Limitations of the maps/results

The noise maps were generated using industry standard noise modelling software. The noise modelling software used averaged data sets that best describe the defining parameters of the noise model. While the calculations behind the software are complex, they only provide strategic estimates of the likely noise levels resulting from these conditions. Consequently, model results should be validated on site prior to any mitigation works being undertaken.

The Round 2 noise maps were produced based upon predicted noise levels using 20m grid spacing at a receptor height of 4m above ground levels.

The Round 3 noise maps which inform this Noise Action Plan were prepared using:

- TII 1m contours
- OSI LIDAR 1m contours
- R2 model contours
- Updated traffic data, where available
- Geometry which was checked against PRIME2 WAY
- CORINE 2012
- EPA spreadsheet of G value per CORINE class
- R2 Predictor model for barriers and bridges
- PRIME2 building polygons
- R2 Predictor model buildings (height data)
- R2 Railway noise level results
- R2 Aircraft noise level results

6 Areas to be subjected to Noise Management Activities

6.1 Noise Action Thresholds

There are currently no statutory limits in place in relation to environmental noise levels at EU or national level.

Roads

The EPA produced "*Guidance Note for Noise Action Planning*" recommends the following values for the proposed onset levels for **assessment of noise mitigation measures** for road traffic noise

- 70 dB, $_{Lden}$ and
- 57 dB, $_{Lnight}$

In relation to **assessment of noise preservation measures**, the guidance note recommends the following proposed onset values

- 55 dB, $_{Lden}$ and
- 45 dB, $_{Lnight}$

These values were also used in the noise action plan 2013 – 2018. The previous Noise Action Plan Plans had a value of 65dB Lden as the onset level for actions, with values greater than 60 Lden also to be examined (potential annoyance effects). The reason for the change of onset levels was twofold

- To be consistent and comparable with other Local Authorities who had adopted the EPA recommended onset levels
- To concentrate efforts on those areas at the noise higher levels

Rail

For Railways the guidance note recommends the following values for the proposed onset levels for assessment of noise measures for road traffic noise

- 68 dB, L_{den} and
- 59 dB, L_{night}.

The proposed onset levels, for assessment of noise level preservation where they are good are:

- 55 dB, Lden and
- 45dB, Lnight

These levels reflect an annual average 24 hour period.

Air

The guidance note recommends the following proposed onset levels for assessment of noise mitigation measures of

- 63 dB, $L_{Aeq,16hr}$ and
- 57 dB, L_{night}

values for airports.

The proposed onset levels for assessment of noise preservation where they are good are

- 55 dB, L_{den} and
- 45 dB, L_{night}

These levels reflect an annual average 24 hour period.

The noise summary table demonstrates that values for Air and Rail do not exceed the proposed onset levels for assessment of noise mitigation as outlined above. Road traffic noise is the predominant noise source within the Cork Agglomeration Area.

6.2 Description of the criteria/ decision matrix to be used for the identification of areas qualifying for action

A decision support matrix is a chart which enables identification, analysis and rating of the strength of relationships between various sets of information. It enables a number of different factors to be examined and facilitates the assessment of the relative importance of each. **Appendix E** shows the decision matrix adopted for the Cork Agglomeration Area.

The purpose of the decision matrix is to place a value on each dwelling based upon multiple criteria. The matrix developed takes into account the following criteria

- Noise band values
  - L_{den}
  - L_{night}

By scoring each dwelling based upon noise values, clusters of dwellings can be identified and grouped together producing clusters of dwellings where noise intervention or noise management measures can be prioritised.

6.3 Application of the criteria/ matrix

The priority decision matrix works by scoring the L_{den} and L_{night} value depending on the noise band the property falls in.

Example

If a property has a value of 68 dB L_{den} and 58 dB L_{night} the matrix would score the property 7, i.e. (4+3) using the score range in the matrix, as illustrated in **Table 6.1.**

Table 6.1: Decision Matrix Example

Decision Selection Criteria		Example Property Lden	Score Range Lden	Example Property Lnight	Score Range Lnight	Sub-Total
Noise Band db(A)	<50		0		1	
	50 – 55		1		2	
	55-60		2	58	3	3
	60-65		3		4	
	65-70	68	4		5	4
	70-75		5		6	
	75-80		6		7	
	>=80		7		8	
		Total Score				7

Applying the matrix, a single figure can be applied to all properties, taking consideration of the L_{den} and L_{night} values.

6.4 Results of the analyses

A priority list was formulated based upon the strategic maps, scoring matrix and based upon the action thresholds set out in Section 6.1. This list contains a total of 173 areas requiring further assessment and is set out in **Table 6.2**.

Table 6.2 contains eleven (11) headings as follows:

- **No:** Position on priority list;
- **Road ID:** Unique reference number relating to actual segment of road;
- **Decision Matrix Score:** Max decision matrix score in the small area being considered;
- **No of Buildings >50L_{den}:** Number of buildings in small area being considered with a L_{den} in excess of 50$L_{den;}$
- **Area Average House Matrix Score:** Average decision matrix score in the small area being considered;
- **Area Population:** Population of the small area being considered;
- **Area:** General area/location;
- **Hotspot:** Cluster area;
- **Small Area:** Unique small area reference number, as set out by the Central Statistics Office (CSO);
- **ED:** Name of Electoral Division (ED) as set out by the CSO;
- **Ward:** Local Authority electoral areas

Table 6.2: High Priority Areas in the Cork Agglomeration

High Priority Areas in the Cork Agglomeration Area										
No	**Road ID**	**Decision Matrix Score**	**No of Buildings >50Lden**	**Area Average House Matrix Score**	**Area Population**	**Area**	**Hotspot**	**Small Area**	**ED**	**Ward**
1	R-610-21	12	81	6.4	222	N27 / Sourthern Road	1	048017002	City Hall A	South- Central
2	R-610-21	12	98	4.6	183			048071004	Turners Cross A	South- Central
3	L-99315-1	10	98	4.6	183			048071004	Turners Cross A	South- Central
4	R-610-23	10	56	6.5	334			048068001	Tramore A	South-East
5	R-610-24	10	74	4.5	196			048001004	Ballinlough A	South East
6	R-610-21	10	66	5.5	229	R610		048017003	City Hall A	South Central
7	N27 (Kinsale Rd)	12	35	4.7	146	N27	2	047235026/02	Lehenagh	Ballincollig - Carrigaline
8	Hazelwood Grove	10	19	8.7	258	Hazelwood Grove		047235026/02	Lehenagh	
9	N27 (Kinsale Rd)	10	35	4.7	146	N27		047235026	Lehenagh	South West
10	N71	12	27	4.3	116	N27	3	047178008	Inishkenny	Ballincollig - Carrigaline
11	N71	10	29	6.4	202	N71 Ballinvoultig		047178006	Inishkenny	
12	N28	12	39	6.3	262	N28 (Ballinimlagh)	4	047132018	Douglas	Ballincollig - Carrigaline

13	N28	11	95	5.5	248	N28		047132074	Douglas	
14	L-1076-25	10	97	7.3	301	N40	5	048066001	Togher A	South West
15	Sandbrook/ The Headlands	10	21	7.3	265			047178015	Inishkenny	Ballincollig - Carrigaline
16	Elmvale Court	10	93	6	237			047178016	Inishkenny	
17	R-608-15	10	33	7	205	Barrack Street	6	048055005	South Gate B	South Central
18	R-608-19	10	18	7.2	172	Barrack Street		048055004	South Gate B	
19	R-608-19	10	18	6.6	213	Barrack Street		048055001	South Gate B	
20	R-608-21	10	43	6.5	233	Barrack Street		048028002	Gillabbey A	
21	R-608-21	10	30	7.5	258	Barrack Street		048034001	Greenmount	
22	R-608-24	10	44	8.1	186	Bandon Road		048063007	The Lough	
23	R-608-24	10	45	7	227	Bandon Road		048028007	Gillabbey A	
24	R-851-1	10	32	7.9	147	Evergreen Street		048054010	South Gate A	
25	R-851-1	10	68	6.1	174			048055003	South Gate B	
25	L-5025-3	10	102	6.3	201	Capwell Road	7	048071003	Turners Cross A	South Central
26	R-851-14	10	103	6.4	260	Sth Douglas Rd		048074002	Turners Cross D	
27	R-851-14	10	97	5.6	228	Sth Douglas Rd		048071001	Turners Cross A	
28	L-1008-1	9	92	4.6	189	Curragh Road		048072006	Turners Cross B	
29	Glanmire	10	70	7.6	154	Glanmire	8	047277026	Rathcooney (Part Rural)	Cobh Glanmire

30	Glanmire	10	38	5.7	427	Glanmire		047277002	Rathcooney (Part Rural)	
31	R-851-25	10	89	5.5	204	Sth Douglas Rd	9	048070009	Tramore C	South East
32	R-851-25	10	56	5.5	266			048068002	Tramore A	
33	R-851-36	10	86	6.1	184			048070012	Tramore C	
34	R-851-36	10	117	6.1	296			048070010	Tramore C	
35	R-851-36	10	128	4.9	335			048070005	Tramore C	
36	R-851-25	10	119	4.4	264			048070001	Tramore C	
37	R-851-29	10	126	3.5	306			048069004	Tramore B	
38	R-851-42	10	86	4.2	240			048070006	Tramore C	
39	R-851-42	10	105	4.6	249			048069003	Tramore B	
40	R-846-17	10	40	4.6	173	Sundays Well B	10	048060003	Sundays Well B	North Central
41	R-846-18	10	40	3.7	167	Shandon St		048053007	Shandon B	
42	R-846-18	10	12	7.4	142	Shandon St		048037006	Gurranebraher C	
43	R-846-18	9	10	5.7	217	Shandon St		048053003	Shandon B	
44	L-1088-2	10	75	6.7	176	Dublin Street	11	048019003	Commons	North Central
45	L-1088-2	10	95	5.4	184	Dublin Street		048062013	The Glen B	
46	R-851-4	10	72	7.5	223	Evergreen Street	12	048020001	Evergreen	South Central
47	R-851-6	10	42	6.4	255			048020004	Evergreen	
48	R-851-7	10	51	7.3	233			048020006	Evergreen	
49	R-851-7	10	63	7.2	211			048020002	Evergreen	
50	R-853-1	10	85	5.7	207	Well Road	13	048013003	Browningstown	South East
51	R-853-1	10	71	6.8	187	Well Road		048043001	Mahon B	
52	Main Street, Ballincollig	10	29	5.2	239	Main Street,	14	047016038	Ballincollig	Ballincollig - Carrigaline
53		10	5	4.4	421			047016065	Ballincollig	
54		10	25	4.1	149			047016062	Ballincollig	

55		10	11	8.2	193			047016056	Ballincollig	
56	L-1001-13	10	37	8.7	235	Blackrock Road	15	048044010	Mahon C	South East
57	L-1001-10	10	35	6	270			048040001	Knockrea A	
58	L-1001-11	10	45	6.7	268			048041002	Knockrea B	
59	R-614-2	10	56	5.3	234	Summerhill North	16	048056007	St Patricks A	North East
60	R-614-4	10	56	7.8	191			048056005	St Patricks A	
61	R-614-5	10	44	6.1	214			048056004	St Patricks A	
62	R-846-4	10	48	6.6	232	Sundays Well Road	17	048059002	Sundays Well A	North West
63	L-1019-1	10	56	6.2	183	Shanakiel Road		048051010	Shanakiel	
64	L-1020-12	9	59	6.5	443	Blarney Street	18	048039003	Knocknaheeny	North West
65	L-1020-12	9	80	6.5	216	Blarney Street		048059001	Sundays Well A	
66	L-1083-4	10	66	6.7	173	Blarney Road		048051011	Shanakiel	
67	R851	10	119	7	198	Douglas Village	19	047132077	Douglas	Ballincollig - Carrigaline
68	R851	10	103	5	221	Douglas Village		047132041	Douglas	
69	R-608-30	10	46	7.2	175	Magazine Road	20	048032001	Glasheen B	South West
70	R-608-29	10	42	4.9	293	Magazine Road		048029001	Gillabbey B	
71	R-608-34	10	35	7.7	279	Magazine Road		048032002	Glasheen B	
72	R-608-39	10	90	4.5	363	Magazine Road		048031001	Glasheen A	
73	N-8-24	10	30	4	229	McCurtain	21	048056006	St Patricks A	North East

74	N-8-22	9	11	7.3	207	Street		048056001	St PatrickS A	
75	L-1075-5	10	32	5.4	158	Thomas Davis Street	22	048011003	Blackpool A	North Central
76	N-20-14	9	56	4	167	N20		048011002	Blackpool A	
77	R-610-26	10	42	7.9	193	Douglas Road	23	048068003	Tramore A	South East
78	R-610-32	10	108	4.7	255	R610		048069001	Tramore B	
79	R-610-27	10	69	5.1	270	R610		048002005	Ballinlough B	
80	N-8-37	12	38	5.7	427	N8		047277002	Rathcooney (Part of)	Cobh-Glanmire
81	L-920274-2	12	56	6.5	334	L920274		048068001	Tramore A	South-East
82	L-90281-4	10	97	7.3	301	Westside Estate		048066001	Togher A	South West
83	Bridgefield Close	10	86	6.3	364	N40		047052001/047052002	Bishopstown (Part Rural)	Ballincollig - Carrigaline
84	R-610-32	10	108	4.7	255	R610		048069001	Tramore B	South East
85	Rathcooney Road	10	41	5.2	217	Rathcooney Road		047277024	Rathcooney (Part Rural)	Cobh Glanmire
86	L-1027-8	10	41	6.1	210	Dublin Hill		048062011	The Glen B	North Central
87	L-99536-3	10	57	4.1	275	South City Link Rd		047235027	Lehenagh	Ballincollig - Carrigaline
88	R-851-15	10	56	6.5	334	R851		048068001	Tramore A	South East
89	Churchs Hill	10	70	7.6	154	Glanmire		047277026	Rathcooney (Part Rural)	Cobh Glanmire
90	N27-24	10	105	5.4	211	Green Lawn		048074001	Turners Cross D	South Central
91	N28	10	81	4.4	259	Maryborough Hill		047132019	Douglas	Ballincollig - Carrigaline
92	L-50374-3	10	116	5.3	288	Halldene Avenue		048010006	Bishopstown D	South West

93	R-852-56	10	92	5.2	252	Skehard Road		048042007	Mahon A	South East
94	L-1018-1	10	15	6.9	147	Popes Quay		048053005	Shandon B	North Central
95	L-1013-20	10	116	6.1	318	Pouladuff Road		048050003	Pouladuff B	South Central
96	Garrane Dara	10	22	7	214	Garrane Dara		047178010	Garrane Dara	Ballincollig - Carrigaline
97	L-1083-9	10	6	45	324	Blarney Road		048051008	Shanakiel	North West
98	L-1001-4	10	55	5.9	170	Blackrock Road		048041005	Knockrea B	South East
99	L-1001-4	10	18	5.5	243	Blackrock Road		048040002	Knockrea A	South East
100	L-1001-4	10	46	6.2	149	Blackrock Road		048041003	Knockrea B	South East
101	N22	10	86	6.3	364	N22 Straight Road		047052001/ 047052002	Bishopstown (Part Rural)	Ballincollig - Carrigaline
102	L-1076-25	10	97	7.3	301	Togher Road		048066001	Togher A	South West
103	L-1076-25	9	127	4.4	403	Togher Road		048066005	Togher A	South West
104	L-1103-9	10	45	6.2	365	College Road		048029005	Gilabbey B	South West
105	L-1103-6	10	83	5.4	365	College Road		048030001	Gilabbey C	South West
106	L-1103-6	10	4	8	346	College Road		048030005	Gilabbey C	South West
107	L-1029-6	10	105	5.3	322	Old Youghal Road		048046013	Mayfield	North East
108	N28	10	102	5.4	296	N28		047132060	Douglas	Ballincollig - Carrigaline
109	L-1014-5	10	59	4.6	245	Lough Road		048063002	The Lough	South Central
110	L-1001-6	10	30	5.4	193	Blackrock Road		048040004	Knockrea A	South East

111	Church Hill	10	48	5.2	403	Church Hill		047277025	Rathcooney (Part Rural)	Cobh Glanmire
112	L-1076-1	10	112	5.1	242	Togher Road		048067003	Togher B	South Central
113	L-50377-1	10	115	5.3	272	Dunville Estate		048010004	Bishopstown D	South West
114	N28	10	19	5.6	99	N28		047132033	Douglas	Ballincollig - Carrigaline
115	L-1072-4	10	51	6.4	304	Redforge Road		048019004	Commons	North Central
116	R-608-42	10	89	6.4	286	Magazine Road		048031003	Glasheen A	South West
117	R-608-42	10	31	5.3	219	Magazine Road		048030004/01	Gilabbey C	South West
118	R-608-39	10	73	5.6	217	Magazine Road		048030002	Gilabbey C	South West
119	L-1013-2	10	56	6.8	141	Pouladuff Road		048034008	Greenmount	South Central
120	L-1013-4	10	78	5.5	269	Pouladuff Road		048063003	The Lough	South Central
121	Rochestown Road	10	138	6.1	264	Rochestown Road		047132043	Douglas	Ballincollig - Carrigaline
122	Church Road/R610	10	51	5.3	155	Church Road		047132072	Douglas	Ballincollig - Carrigaline
123	Rochestown Road	10	74	6.8	262	Rochestown Road		047132053	Douglas	Ballincollig - Carrigaline
124	R-635-16	10	53	4.5	234	North Ring Road		048048007	Montenotte B	North West
125	N-27-9	9	15	4.8	165	Boreenmanna Road		048001003	Ballinlough A	South Central

126	N-27-9	10	40	4.6	382	Old Blackrock Road		048017001	City Hall A	South Central
127	R-852-56	10	94	4.6	307	Skehard Road		048043004	Mahon B	South East
128	R-852-55	9	123	4.1	325	Skehard Road		048043003	Mahon B	South East
129	R-614-8	10	18	4.6	116	Ballyhooly New Road		048047008	Montenotte A	North East
130	R-614-9	10	39	6.3	269	Ballyhooly New Road		048058004	St Patricks C	North East
131	R-614-12	10	53	7	177	Ballyhooly New Road		048058001	St Patrick C	North East
132	R-614-12	10	33	6.3	236	Ballyhooly New Road		048047006	Montenotte A	North East
133	R-614-12	10	50	6.86	215	Ballyhooly New Road		048047007	Montenotte A	North East
134	R639	10	75	4.9	209	Glanmire		047277023	Rathcooney (Part Rural)	Cobh Glanmire
135	Kiltegan Park	10	75	5.6	192	Kiltegan Park		047132048	Douglas	Ballincollig - Carrigaline
136	R-846-1	10	40	7.1	360	Western Road		048006003	Bishopstown A	South West
137	R-846-1	10	89	5.1	204	Western Road		048051009	Shankiel	South West
138	L-1001-5	10	20	4.9	289	Blackrock Road		048040005	Knockrea A	South East
139	R-608-30	10	46	7.2	175	Magazine Road		048032001	Glasheen B	South West
140	R-608-29	10	42	4.9	293	Magazine Road		048029001	Gillabbey B	South West

141	Grange Road	10	72	4.4	234	Grange Road		047132003	Douglas	Ballincollig - Carrigaline
142	Grange Road	10	87	5.6	183	Grange Road		047132038	Douglas	Ballincollig - Carrigaline
143	L-1014-2	9	53	6.3	295	Lough Road		048063006	The Lough	South Central
144	R-853-16	10	77	4.2	248	Church Road		048042008	Mahon A	South East
145	Old Youghal Road	10	38	5.7	427	Glanmire		047277002	Rathcooney (Part Rural)	Cobh - Glanmire
146	Old Youghal Road	9	41	5.2	217	Glanmire		047277024	Rathcooney (Part Rural)	Cobh - Glanmire
147	Rathcooney Road	9	36	3.7	329	Glanmire		047277020	Rathcooney (Part Rural)	Cobh - Glanmire
148	L-1013-9	10	61	5.6	196	The Lough		048063004	The Lough	South Central
149	N40	10	91	6.5	210	N40/ Tramore Road		048066006	Togher A	South West
150	N-8-35	9	20	7	372	N8		048065001	Tivoli B	North East
151	L-1001-16	9	127	6	298	Blackrock Road		048044007	Mahon C	South East
152	R-852-49	9	108	5.1	319	Skehard Road		048043002	Mahon B	South East
153	R639	9	68	5.2	209	R639		047277015	Rathcooney (Part Rural)	Cobh - Glanmire
154	L-1098-1	9	24	5.8	267	Sharnan Crawford Street		048028005	Gillabbey A	South Central
155	R-847-4	9	11	5.5	139	Coal Quay		048015001	Centre B	South Central
156	N20	9	63	4.8	12	N20		047298009	St Marys (Part Rural)	Cobh - Glanmire

157	N22	9	93	4.7	341	Ballincollig		047016009	Ballincollig	Ballincollig - Carrigaline
158	L-1051-2	9	81	5.3	175	Albert Road		048018003	City Hall B	South East
159	L-1069-2	9	63	5.1	223	Mount Agnes Road		048022002	Fair Hill B	North West
160	L-1063-2	9	105	5.4	211	Kinsale Road		048074001	Turners Cross D	South Central
161	N-20-10	9	59	5.2	143	North City Link/ Watercourse Court		048012007	Blackpool B	North Central
162	N-20-16	9	59	6.1	219	N20		048023010	Fair Hill C	North West
163	L-1066-3	9	15	5	155	Leitrim Street		048052007	Shandon A	North Central
164	L-1085-1	9	19	6.8	154	Coburg St		048052008	Shandon A	North Central
165	L-1006-1	9	40	4.6	382	Eglinton Street		048017001	City Hall A	South Central
166	L-1001-9	9	27	5.8	252	Blackrock Road		048041004	Knockrea B	South East
167	R-846-29	9	14	6.7	312	Gerald Griffin Street		048052003	Shandon A	North Central
168	N-71-13	9	87	5.1	264	Sarsfield Road		048009007	Bishopstown E	South West
169	N-71-13	9	130	4.6	349	Sarsfield Road		048009006	Bishopstown E	South West
170	R-849-23	9	134	4.2	314	Bishopstown Road		048009012	Bishopstown E	South West
171	R-849-36	9	67	5.3	999	Bishopstown Road		048008012	Bishopstwon C	South West
172	R-849-36	9	48	3.7	234	Bishopstown Road		048009005	Bishopstown E	South West
173	R-849-35	9	74	4.6	164	Glasheen		048031002	Glasheen A	South West

7 MITIGATION AND PROTECTION MEASURES

7.1 How areas above onset of assessment criteria will be processed

The areas indicated to be subject to environmental noise levels above the assessment threshold can be reviewed on a prioritised basis. These priorities are indicated in **Table 6.2.**

In considering a prioritised area the first step is to undertake a field survey on site to validate the noise mapping results. Once the noise mapping results have been confirmed the assessment of appropriate mitigation measures can be considered, subject to available funding. Predictions for the future environmental noise situation of these areas must be taken into consideration when deciding on long term noise reduction strategy.

7.2 How areas below protection threshold will be preserved

Areas of favourably low environmental noise exposure will be preserved through the careful management of any activity which could impact on the acoustic environment. By considering the noise impact of any future development at the early stages of the planning process, it will be possible to minimise any adverse effects on the local soundscape and thereby provide protection for relatively quiet areas.

7.3 How areas between the thresholds will be managed

Careful consideration of environmental noise pollution when planning for sustainable development will be a key factor in the management of the acoustic environment. Incorporation of environmental noise strategies into the land-use and zoning processes will aid the controlling of noise exposure during the ongoing development of the agglomeration area.

7.4 Known future developments within the action planning area and how noise impact from these are to be managed

Known future developments within the action planning area include:

- City Centre Movement Strategy (CCMS);
- Harley Street Footbridge;
- Cork Docklands Redevelopment;
- Cork Northern Ring Road;
- N28 Upgrade;

- N8/N25 Dunkettle Interchange

City Centre Movement Strategy (CCMS)

The City Centre Movement Strategy was recommended as part of the Cork Area Transit System (CATS) Strategy and its purpose is to support the movement of sustainable modes in the city centre. The City Centre Movement Strategy will involve the development of a new traffic management plan for the city which will improve journey times for buses and provide an enhanced environment for pedestrians and cyclists.

The key principles of the CCMS include:

• the re-allocation of roadspace on the city centre streets to ensure a more appropriate balance between the different transport modes serving the city and provide travellers to the city with a greater choice of travel mode;

• the management of through traffic within the central city streets, this will act to improve the environment for all users including public transport users, pedestrians and cyclists.

Phase 1 & 2 of CCMS saw the introduction of a bus lane on St. Patrick Street. The lane operates for three and a half hours per day and forms part of a much broader suite of measures designed to modernise and improve the transportation system within the City. These measures have contributed to a significant increase in bus passenger numbers on City centre services in recent months. The further improvement of public transport services is critically important to the ongoing development of the City with improved access and movement opportunities for workers, residents and visitors.

Pedestrian/Cyclist Bridge at Harley Street

Pedestrian/Cyclist Bridge at Harley Street is under construction and due to open in 2019. Users of the bridge will enjoy a safer and healthier journey, free from the conflict of vehicles and immediate exposure to their exhaust fumes and noise.

Cork Docklands Redevelopment

The redevelopment of the former port and industrial areas of Cork Docklands, to the east of the City centre, for residential and commercial uses is a major objective of Cork City Council. The redevelopment will have the effect of moving significant port related truck traffic out from the City and Docklands area.

Increased travel demand will occur as a result of the Docklands development and this will be catered for by improved roads infrastructure, (new bridges over the River Lee, upgraded road network with Docklands, etc.) and the provision of a high grade public transport system to ensure high levels of non-car usage and that traffic and congestion levels are maintained at acceptable levels. Noise mitigation measures will also be implemented as part of these projects to ensure the development will have minimum impact on the surrounding area.

Cork Northern Ring Road

It is planned to construct a northern road to link the N22, N20 and M8, to the north of the City. The North Ring Road is expected to divert a significant volume of heavy commercial vehicles from the City centre and will thus result in reduced noise levels in the City. An Environmental Impact Statement (EIS) will be produced for the scheme to minimise the impact of the road development on the environment. The North Ring Road will be developed when funding becomes available.

N28 Upgrade

It is proposed to improve the existing N28 from the Bloomfield Interchange with the N40 South Ring Road to Ringaskiddy Village. The improved road will have a greater capacity to cater for the high traffic volumes.

The need for the N28 Cork to Ringaskiddy project has been highlighted in both the National Development Plan and the National Needs Study. Noise mitigation measures will be implemented where appropriate. An Environmental Impact Statement has been prepared for this scheme and was submitted to An Bord Pleanála (ABP) in 2017. A decision was made by ABP. However this decision is currently subject to a judicial review.

N8/N25 Dunkettle Interchange

It is planned to improve the existing junction of the N8 with the N25 at Dunkettle. This will involve the construction of additional structures and link roads to facilitate the free flow of traffic through the junction. The provision of a separate but connected junction to the little Island will facilitate the access to the industry on the island. The construction works for this junction are expected to be completed during the early part of this plan. While the junction is outside the agglomeration area it will effect traffic flows within.

7.5 How noise reduction effects of potential measures will be assessed

The effects of potential noise reduction measures are assessed by undertaking detailed acoustic modelling and on site noise surveys. The effectiveness and cost of any proposed measures are assessed to determine the most cost effective measure or combination of measures. Any environmental impacts of the mitigation measures are also to be assessed.

7.6 Review of Possible Mitigation Measures

Noise mitigation measures can be divided into two distinct categories

- Physical measures – this would include alterations to the physical environment e.g. noise barrier, low noise surfacing etc.

- Non physical measures – this would include policy measures which would include land use planning measure and traffic management controls etc.

7.6.1 Physical Measures

A list of possible physical measures which could be adopted, depending on the surrounding environment, are listed hereunder.

Road Surface

The road surface texture plays a significant role in generating noise. Where traffic speeds are lower than 50km/h traffic noise is mainly attributable to engine, transmission and exhaust noise, especially from lorries. Where speeds are higher, the major component of traffic noise comes from the tyre/road interaction. In terms of road surfaces, a rougher surface increases the contact patch, which exacerbates tyre/road noise as the noise is relative to the length of the escape path for the trapped air. A low noise road surfacing is a potential way of controlling road traffic noise “at source”. Generic low noise road surface are considered to offer noise level reductions of the order 2 to 3 dB(A).

Noise Barrier – Building /Enclosure/Decking

The simplest form of mitigation measure is a noise barrier. A noise barrier can take many forms, e.g. a cutting, an earth bund, a stone wall or a proprietary noise barrier. The closer the barrier is to the source of noise, i.e. the road, the higher the reduction in noise levels. This is also true, to a lesser extent, for barriers positioned close to the receiver. Likewise, higher barriers offer more

attenuation than lower barriers. Proprietary barriers offer additional options, such an absorptive surfaces, which can give significant benefits, particularly if barriers are being placed on both sides of the road.

The two physical properties that determine a noise barrier's performance are insulation and absorption. All barriers must be able to insulate effectively. This means that the noise transmitted through the barrier surface is negligible. Where required, noise barriers should also absorb the noise striking their surface ensuring that the noise reflected off the barrier is minimal.

There are two main types of noise barriers and these are detailed below:

- Reflective Barriers – These barriers provide insulation only and are available in timber, aluminium and transparent acrylic.
- Absorptive Barriers – These barriers provide insulation and absorption. These barriers are generally constructed with fibrous or porous surface. As noise hits the absorptive surface, it "vibrates" resulting in a conversion of noise energy to heat. An absorptive barrier would be preferred option when reflected noise is going to be a problem for others in the immediate environment.

In terms of roadside physical barriers to noise, it is possible to install walls, cantilevered walls, timber walls and over decking to keep the noise within the boundaries of the road. Alternatively, it is also possible to locate noise tolerant activities between noise sensitive areas and particularly noise insensitive areas, such as multi storey car parks, retail parks or light industry.

Trees and Shrubs

Trees and shrubs do not provide any measurable noise reduction but they do have a beneficial masking effect by adding noise of their own. Pleasant sounds of rustling leaves and chirping birds can reduce the harshness of environmental noise.

Speed restrictions

The level of noise produced by vehicles in motion is related to both the engine and the friction between the wheels and the road surface. The noise produced by the vehicle, therefore, is increased as the vehicle travels faster – this is not a direct relationship and depends largely on the road surface. Reducing speed limits outside daylight hours, or throughout the day, will have a positive impact on the level of noise emanating from the road. This measure would be more effective in noise sensitive locations such as residential areas rather than across the entire road network.

Traffic Calming

Typical methods of traffic calming measures include speed ramps, rumble strips and chicanes. Unfortunately, however, due to the nature of these measures, they inherently create more noise. In the case of speed ramps the vehicle impacts the ramp and then accelerates away from the ramp. Rumble strips produce noise as the vehicle passes over them and chicanes are similar to the ramps in that vehicles tend to accelerate away from the traffic calming device .

Noise reducing measures of traffic calming include altering the road surface and surroundings to give the impression that:

- the road is narrower than it is
- there appears to be less forward visibility than there is

These measures individually will have the effect of reducing the through speeds of vehicles and collectively will further reduce speeds and therefore vehicular noise.

Façade Insulation/Acoustic Glazing

Façade insulation or acoustic glazing can be installed in buildings which are particularly noise sensitive, or have high levels of unwanted noise in their vicinity. Both measures prevent sound energy from crossing the façade due to the higher sound insulation performance.

Car Tyres

Under EU regulation 1222/2009, aimed at reducing fuel consumption, new tyres produced after July 2012 will have to bear the label shown in figure 9. This figure shows certain aspects of the tyre performance such as

- Fuel efficiency (rolling resistance)
- Wet Grip
- Noise

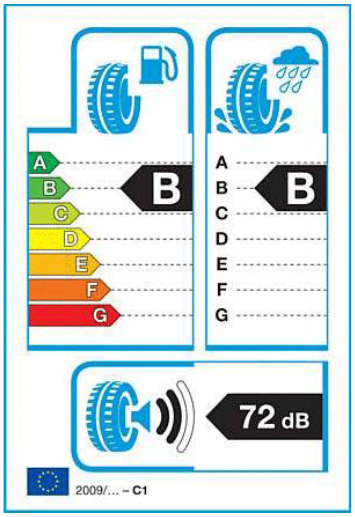
Using the same design as is used for familiar energy labelling on fridges, freezers etc. the label shows the tyres fuel/ Wet grip on a sliding scale from A (best) to G (worst).

EU Regulation 661/2009 sets out much of the detail in relation to type-approval requirements for the general safety of motor vehicles, which feeds into regulation 1222/2009. This regulation is entitled “type approval requirements for the general safety of motor vehicles, their trailers and

systems, components and separate technical units intended thereof" and its contents falls into three main areas

- Legislative Simplification – consolidation of individual directives
- Mandatory fitment of New Technologies
- Tyre Related Requirements – introduces a number of requirements relating to tyres aimes at reducing both rolling noise emissions and CO2 emissions, whilst maintaining safety levels.

Figure 7.1: Label required on all tyres produced from July 2012



The bottom part of the label shows exterior noise level, measured in decibels (dB). The black audio lines have the following interpretation;

- A single 'sound wave' shows that the tyre's noise level is 3dB better than the future European limit.
- Two black 'sound waves' shows that the tyre meets the future European limit.
- Three black 'sound waves' shows that the tyre only meets the current European limit for noise.

Car Engine

With the advent of the electric engine as a viable alternative to the combustion engine, as well as the dual powered vehicles, there is scope to reduce the engine noise produced by vehicles. This is especially relevant in low speed areas where such vehicles already use the battery powered engine while travelling slowly.

7.6.2 Non-Physical Policy Measures

EU / Government Policy

The EU has taken a proactive approach in relation to Noise. Directives introduced by the EU have had significant impacts on the control of noise on various noise sources in the community. A sample of some of the directives are given below;

- Directive 70/157/EEC - relates to the permissible sound level and the exhaust system of motor vehicles and gives requirements for their measurement. This directive is continually evolving with the latest amendments up to and including 2007/34/EC. Limit values from 74 dB(A) to 80 dB(A) depending on the vehicle category.

- Directive 2002/30/EC – relates to establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Community airports. This compliments the EU key objective of the common transport policy of sustainable development.

- Directive 2008/57/EC – relates to the interoperability of the rail system within the community. Essential requirements are set out in the directive which include but not limited to the following

    - Operation of the rail system must respect existing regulations on noise pollution
    - Operation of the rail system must not give rise to an inadmissible level of ground vibrations for the activities and areas close to the infrastructure and in a normal state of maintenance.

Land-Use Planning Measures

Land-use planning is an efficient, economic and effective way to control environmental noise in an area. Future road traffic problems can often be avoided through zoning mechanisms that do not permit noise sensitive land uses along transport corridors. Recreational, commercial and light industrial establishments can effectively provide buffer zones between busy roads and residential communities.

Specific measures relating to planning controls on individual developments can be introduced to mitigate road noise. Pending development of local authority or national guidelines, the World Health Organisation guidelines for community noise and BS 8233 may be employed as appropriate. This will ensure that all new developments have acceptably low noise exposures.

Demand Management

Vehicular noise is related to the quantity of vehicles in the area and, therefore, reducing the number of vehicles will reduce the level of noise produced. However, large reductions are required in order to make this perceptible. By reducing the traffic volume by 50% a 3dB reduction can be achieved. Care should be taken to ensure that the traffic is not just moved onto other roads, increasing noise levels there.

The possibility of reducing traffic volumes has to be considered against the general trend of almost constant growth in road traffic over recent years. Policies to encourage sustainable modes of transport as alternatives to the car have to be pursued to minimise the long term effects of traffic with the consequential congestion and noise nuisance results.

Public Transport

Encouraging public transport use can help reduce traffic related noise. More people using public transport means fewer vehicles on the road which in turn means less noise produced by transportation. Buses in Ireland currently run on standard diesel engines, which are considerably more efficient than petrol engines for transporting heavy loads. However, these engines are quiet noisy and potentially could be augmented or replaced by electric or bio-fuel engines to reduce the noise produced by the buses.

Better public transport information such as real time passenger information (RTPI) and lower fares along with dedicated routes are all potential measures to improve the service provided to encourage the migration from car use.

Heavy Vehicle Ban

Heavy vehicles have more wheels, are heavier and have larger engines than other vehicles and therefore removing them from streets or reducing the times at which they may be present will have a significant positive effect in terms of reducing traffic related noise.

This option has already been implemented in Dublin City where a Heavy Goods Vehicle (HGV) Management Strategy was introduced on the 19th Feb 2007. The strategy provides for a ban on 5+ axle vehicles during the hours of 07.00 – 19.00 seven days a week except for a limited number of permit scheme vehicles.

Parking Guidance

Parking guidance systems could help reduce traffic levels within a county or town by assisting vehicles to find a convenient parking place. Studies have shown that an effective parking guidance system can significantly reduce traffic circulating and seeking a parking space, thus reducing the overall levels of traffic in built up areas.

Vehicle Noise Level Testing

The National Car Testing process tests the roadworthiness of a vehicle and is "aimed primarily at improving road safety and enhancing environmental protection". A noise emissions testing could be incorporated into the test. The results of this test could be used in a similar manner to the level of carbon dioxide emissions in the annual VRT rate for each vehicle.

Driving Style

The way a person drives affects not only their fuel consumption but also the amount of noise produced by their vehicle. Aggressive driving, in particular, creates excessive noise. Driving in an inappropriate gear also produces excessive noise.

Mitigation Measures Summary

A summary of mitigation measures with corresponding indicative noise benefits is given in **Table 7.1.**

Table 7.1: Mitigation Measures and Indicative noise benefits

Mitigation Measures	Indicative Benefits (Noise Reduction)
Speed controls, and speed limit reductions	1 to 3dB
Traffic Signals Co-ordination (minimisation of braking/acceleration at junctions)	1 to 3 dB within 50m of junction
Alternative modes of transport (modal shift to public transport, bicycles, walking)	0.5 dB per 10% reduction
Lower Noise Vehicles (policies to support hybrid and electric vehicles)	1 to 3 dB (if substantial changeover)
Removal of rumble strips	3 to 5 dB within 20m
Low noise surfaces	2 to 3 dB
Noise Barriers/Screens	3 to 5 dB (at 1st floor windows)
New tyre technologies	1 to 2 dB
Land Use Mitigation Measures	
Set-back from roads rail	3 dB per doubling of distance
Use of commercial development buildings as noise screens	10 dB on quiet façade, and screened outdoor areas
Location of non-sensitive areas such as stairwells, kitchens, bathrooms on high noise side	10 dB in bedrooms
Enhanced façade sound insulation, air tightness	5 to 10 dB relative to current standard construction

7.7 Budgets / Cost-effectiveness assessment / cost-benefit analysis (CBA)

Cost is an essential feature to determine the effectiveness of any potential mitigation measures. A paper published on the Valuation of Noise by the Working Group on Health and Socio-Economic Aspects recommends an interim value of €25 per dB (L_{den}), per household per year which could be used to represent the benefits of reducing noise exposure.

Using the Valuation of Noise report, it would be beneficial prior to noise mitigation works being carried out, that a CBA could be carried out to identify the net financial gain. This could also be used as another tool in order to prioritise mitigation works.

7.8 Most appropriate Mitigation/Protection Measures

The Noise Action Planning Authorities will endeavour to manage exposure to environmental noise where necessary, using the most appropriate measures. These measures will aim to prevent or reduce noise in order to minimise the number of people affected by traffic noise emissions. The actions taken will be strategic in nature and represent a best practice approach to environmental noise mitigation and the limitation of exposure to environmental noise.

The Authorities will manage environmental noise in built up areas, where necessary, on a prioritised basis by:

- Traffic Management;
- Encouraging more environmentally friendly forms of transport such as cycling and walking;
- Encouraging the use of public transport;
- Implementing traffic calming measures;
- Encouraging the use of low noise road surfacing.

The Authorities will consider using the planning process, where necessary:

- To integrate the recommendations of noise action plans into future development plans;
- To integrate the mapping as a tool for land use planning;
- To ensure that future developments are designed and constructed in such a way as to minimise noise disturbances due to environmental noise;
- To integrate environmental noise planning guidelines into planning processes to ensure that new developments give cognisance to environmental noise pollution and noise mitigation.

The Authorities will consider noise screening where necessary by:

- Investigating the suitability of noise screening structures

The Authorities will aim to protect the future environmental noise climate by early incorporation of noise action planning into the planning and operational stages of future developments.

8 PUBLIC PARTICIPATION

8.1 General

The regulations require the Noise Action Planning Authorities to consult the public when drawing up and revising Action Plans. The public must be consulted about the proposals in the Action Plan and given an early and effective opportunity to participate in the preparation and review of the plan. The results of the public consultation must be taken into account in finalising the plan. The public must be informed of the decisions taken. Reasonable time must be provided for each stage of the public participation.

8.2 Public Consultation

This draft Noise Action Plan will be issued for public consultation for a period of six weeks from 22nd February 2019 to 5th April 2019. A further two weeks will be allowed for receipt of submissions/observations in relation to the action plan, meaning a closing date to submissions on 19th April 2019.

The draft NAP will be displayed on the Cork Road Design Office website www.corkrdo.ie, with relevant links put in place on the Cork County and City Councils main webpages. The draft NAP will also be available for Cork City Council

Notices will also be placed on the county and city webpage news bulletin sections. The documents and maps will be made available for inspection at the foyers of Cork City Council's offices at City Hall, Cork County Council's offices at County Hall and the Cork National Road Design Office, Richmond, Glanmire.

A notice will be placed in the local newspaper inviting the public to submit their views on the draft Noise Action Plan. The public can submit comments in writing or through the following link:

https://consult.corkcity.ie/

A copy of the notice will be contained in **Appendix G** of the report.

8.3 Outcome of Public Consultation

Xxxx submissions/observations were received during the course of the public consultation period. A summary of the submissions and responses are given in **Appendix G** of the report.

8.4 Consultation with Statutory and Other bodies

The Plan will be submitted to the following bodies in accordance with the European Communities (Access to Information on the Environment) Regulations 2007 S.I. No. 133 of 2007 and the guidance notes published by the Dept of the Environment, Heritage and Local Government.

- Department of Transport, Tourism and Sport
- Department of the Environment, Community and Local Government
- Environmental Protection Agency
- Health Services Executive Southern Administrative Area
- Transport Infrastructure Ireland
- An Garda Síochána

9 IMPLEMENTATION PLAN

9.1 Roles and Responsibilities

As the plan has being jointly prepared by each authority, Cork County and City Council, are each responsible for implementing the plan.

It is also envisaged that the TII will be involved with mitigation measures on the national routes.

9.2 Targets and Objectives

The long term objective of the plan is to adopt a strategic approach to the management and mitigation of environmental noise with a view to preventing and reducing environmental noise where necessary.

This will be accomplished on a phased basis as the funding allows.

9.3 Programme of Works

This NAP will span a five year period from 2018-2023. The plan will be reviewed, with an amended NAP introduced in 2023. The five year programme in **Table 9.1** will be implemented subject to budget forecasts and available resources.

Table 9.1: Cork Agglomeration Five Year Plan

Year	Outline Objectives
2019	Get NAP adopted as a policy document by both Cork City Council & Cork County Council; Use NAP as a policy document in relation to planning applications and developments in close proximity to major roads.
2020-2021	Carry out validation checks on top 5 hot spots Identify potential quiet areas Feed into the City and County Development Plans
2021-2023	Review impact and success of current NAP; Review data for Round 4 Strategic Noise Mapping

9.4 Evaluation, Review and Corrective Action Programmes

The noise action planning authority will review the effectiveness of the Noise Action Plan on an ongoing basis. This will be completed by performing an annual review of the progress made in relation to planned activities. The effectiveness of these measures will also be monitored.

9.5 Evaluation of previous Noise Action Plan

This is the second Noise Action Plan for the Cork Agglomeration Area.

A Round 1 Noise Action Plan was produced in 2008 for areas within Cork City that roads with a flow of greater than 6 million vehicles per year (AADT of >=16,438).

Cork City Noise Action Plan 2008 -2013

A pilot study was carried out by Cork City Council into a priority area, N27 South City Link Road (N27), highlighted in the Cork City Noise Action Plan 2008 -2013.The study involved noise measurements being taken in the field, noise calculations with respect to differing barriers being put in place and a cost estimate for implementing the pilot study. No works resulted from this pilot study due to a lack of funding. The N27 was however resurfaced with a low noise emission surface.

The Cork City Noise Action Plan 2008-2013 was primarily used as a reference document in relation to planning applications and developments in close proximity to major roads.

Cork Agglomeration Noise Action Plan 2013 -2018

Cork County Council invested in developing expertise and developed the noise action plan in house in conjunction with Cork City Council. Dublin City Council also assisted in providing their hardware to be used in running the noise model.

In total 104 high priority areas were identified for further assessment. Two noise monitors were acquired and installed on N71 and N28 as detailed in Section 4.

The Cork City Noise Action Plan 2013-2018 was again primarily used as a reference document in relation to planning applications and developments in close proximity to major roads.

Analysis of the roads statistics for the draft Cork Agglomeration NAP 2018-2023 indicate that **1%** of the population in the Cork Agglomeration area are being exposed to noise levels above the proposed onset level for assessment of noise mitigation measures of 70dB L_{den}. The corresponding value for the 2013 Noise Action plan was 5%.

This difference can be explained as follows:

- The construction of grade separated junctions along the N40 at Kinsale Road, Pouladuff, Sarsfield Road and Bandon Road;
- The resurfacing of many major roads in the agglomeration with low noise emission surfacing;
- The use of more robust model data input sets(traffic flow data , building height in the development of the Round 3 strategic noise maps;

10 SUMMARY AND CONCLUSIONS

The fundamental objective of this noise action plan is to prevent and reduce environmental noise within the Cork Agglomeration Area.

Roads are the dominant noise source within the Cork Agglomeration area.

Analysis of the roads statistics for the agglomeration indicate that **1%** of the population in the Cork Agglomeration area are being exposed to noise levels above the proposed onset level for assessment of noise mitigation measures of 70dB L_{den}.

The corresponding value for the 2013-2018 Noise Action Plan was 5%.

The reduction in the number of people exposed to levels over 70 dB L_{den} is partly attributable to:

- the construction of grade separated junctions along the N40 at Kinsale Road, Pouladuff, Sarsfield Road and Bandon Road;
- the resurfacing of many major roads within the Cork Agglomeration area with low noise emission surfacing;

Notwithstanding the above the model data used in Round 3 is significantly more robust than the data used for the Round 2 noise model. Therefore the reduction in the exposure to a noise above 70 db L_{den} is not attributable entirely to the works undertaken but also as a result of better data.

Preservation of noise levels below a threshold of 45dB L_{night} affects approximately 42% of the Cork Agglomeration population. The population analysis for rail and air noise demonstrate that noise from air and rail sources does not breach the proposed onset levels for assessment of noise mitigation (63 dB $L_{Aeq,16hr}$ and 68dB L_{den} respectively).

Noise and health are firmly on the agenda of the European Commission. The Cork Agglomeration Noise Action Plan 2018-2023 aims to minimise the population exposed to values of greater than 70dB L_{den} through mitigation measures such as noise barrier, low noise surfacing etc. subject to budgets and available resources. Quiet areas are to be identified and preserved through a combination of policy and planning.

This document will provide a basis for actions for the Noise Action Planning Authorities over a five year period from 2018, with the intention to reduce and protect the existing and future noise environment.

A cross directorate/action planning authority/noise mapping body collaborative approach is needed to ensure that progress can be made on delivering the objectives of the Cork Agglomeration Noise Action Plan 2018-2023.

Appendix A

Glossary of Terms

AADT – Annual Average Daily Traffic - It is the total volume of vehicle traffic of a highway or road for a year divided by 365 days

Agglomeration – Major Continuous Urban Area as set out within the Regulations

Attribute Data – A trait, quality, or property describing a geographical feature, e.g. vehicle flow or building height.

A-weighting – A frequency weighting applied to measured or predicted sound levels in order to compensate fro the non-linearity of human hearing.

CRTN – The Calculation of Road Traffic Noise 1988. The road traffic prediction methodology published by the UK, Department of Transport

dB – Decibel; the unit of sound pressure level, calculated as a logarithm of the intensity of sound. 0 db is the threshold of hearing, 120 db is the threshold of pain. Under normal circumstances, a change in sound level of 3dB is just perceptible. A change of 1 or 2 dB is detectable only under laboratory conditions. A change of 10dB corresponds to a halving or doubling the loudness of sound.

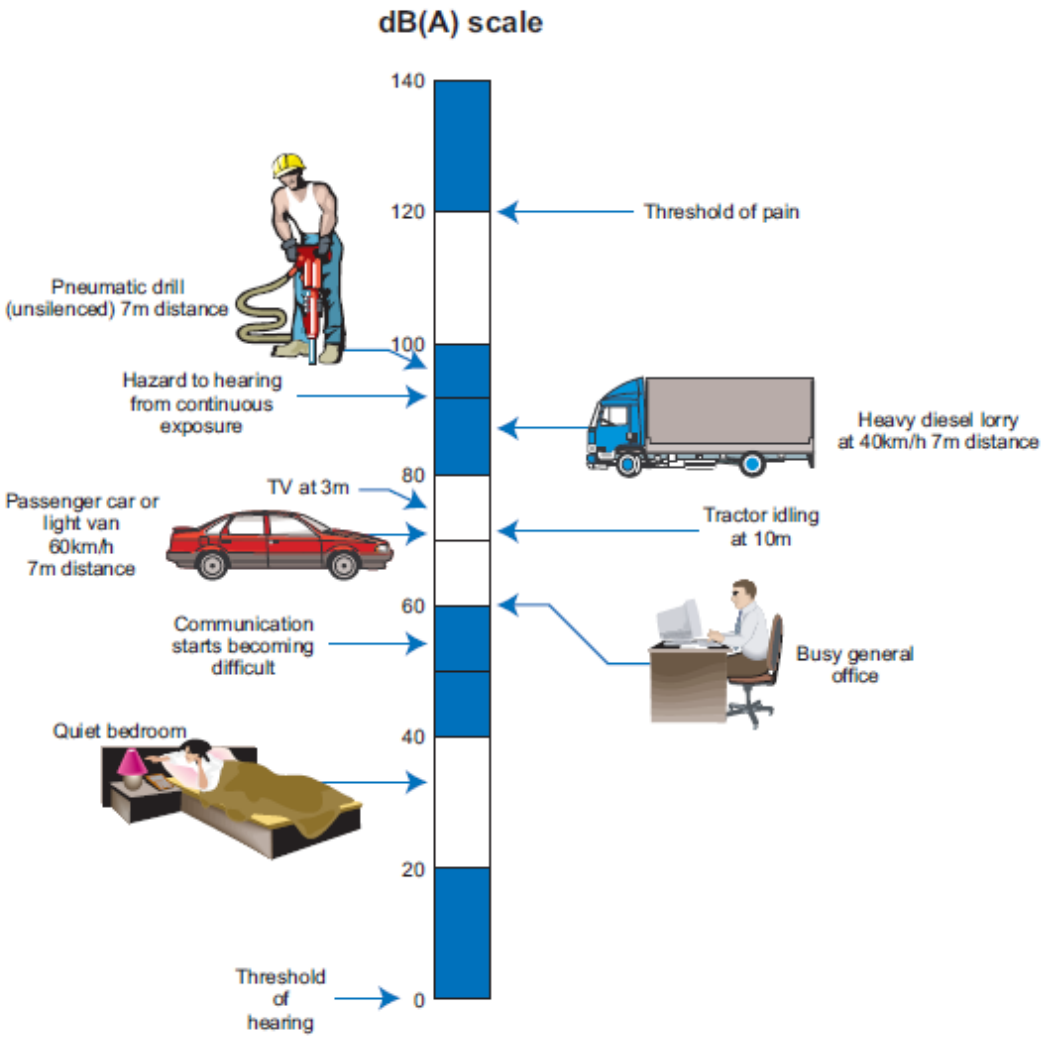


Figure 4 Typical Common Sounds on the dB (A) Scale; Source *Guidelines for the treatment of Noise and Vibration in National Road Schemes, Revision 1*

EC – European Commission

END – Environmental Noise Directive (2002/49/EC)

Environmental Noise – environmental noise is defined as unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic, and from sites of industrial activity

GIS – Geographic Information System

$L_{Aeq,T}$ – Average sound level measured/ calculated over a specified duration, outputted in decibels (dB)

L_{den} is the day-evening-night composite noise indicator adopted by the EU for the purposes of assessing overall annoyance. It is the 24 hour noise rating level determined by the averaging of the L_{day}, with the $L_{evening}$ plus a 5dB penalty, and the L_{night} plus a 10dB penalty. The relevant formula is given hereunder.

$$L_{den} = 10 \text{ Log } 1/24 \ (12 * 10^{\ Lday/10} + 4 * 10^{\ Levening+5\ /\ 10} + 8 * 10^{\ Lnight\ +\ 10/\ 10})$$

L_{day} is the A-weighted long-term average sound level as defined in ISO 1996-2; 1987, determined over all the day periods of a year

$$L_d \text{ (or } L_{day}) = L_{Aeq}, \text{ 12h (07:00 to 19:00)}$$

$L_{evening}$ is the A-weighted long-term average sound level as defined in ISO 1996-2; 1987, determined over all evening periods of a year

$$L_e \text{ (or } L_{evening}) = L_{Aeq}, \text{ 4h (19.00 to 23.00)}$$

L_{night} is the A-weighted long-term average sound level as defined in ISO 1996-2; 1987, determined over all the night periods of a year

$$L_n \text{ (or } L_{night}) = L_{Aeq}, \text{ 8h (23.00 to 07.00)}$$

L10 – The noise level exceeded for just 10% of a sample period. L10(1 hour) is therefore the noise level exceeded for 10% of the time over a period of 1 hour. L10(18hour) is the arithmetic average of the eighteen L10(1hour) values between 06:00 and 24:00 hrs.

$L_{A10,\ 18hr}$ – $L_{A10,18hr} = L_{A10,18hr}$ (06:00 to 24:00)

L_{Ar} T - The L_{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and impulsiveness of the sound.

OSI – Ordnance Survey Ireland

QF – Quiet Façade

WG-AEN – Working Group – Assessment of Exposure to Noise

WHO – World Health Organisation

Appendix B

Bibliography/References

[1] European Commission, *Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise,* OJ L 189/12, 18/07/2002*,* European Commission, 2002.

[2] Dept. of the Environment, *S.I. No. 140 of 2006 Environmental Noise Regulations 2006*, Dept. of the Environment, 2006 as revoked by European Communities(Environmental Noise) Regulations 2018.

[3] Dept. of the Environment, *Environmental Protection Agency Act, 1992,* Dept. of the Environment, 1992.

[4] Dept. of Transport, *Roads Act 1993*, Dept. of Transport, 1993.

[5] National Roads Authority, *Guidelines for the treatment of Noise and Vibration in National Road Schemes, Revision 1*, 25th October 2004, National Roads Authority, 2004.

[6] Environmental Protection Agency Office of Environmental Enforcement (OEE), *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) 1st Draft*, November 2011, EPA, 2011.

[7] Cork City Council, *Cork City Landscape Study 2008,* Cork City Council, 2008.

Cork City Council, *Cork City Development Plan 2009*, Cork City Council, 2009.

Cork City Council & ARUP, *Noise Action Plan*, Cork City Council, Oct 2008.

Cork County Council, *Cork County Development Plan 2009*, Cork County Council, 2009.

Cork County Council & ARUP, *Noise Action Plan*, Cork County Council, Oct 2008.

Dublin City Council, South Dublin County Council, Fingal County Council, Dún Laoghaire Rathdown County Council, *Dublin Agglomeration Action Plan relating to the Assessment & Management of Environmental Noise*, Dublin City Council, South Dublin County Council, Fingal County Council, Dún Laoghaire Rathdown County Council, July 2008.

Galway City Council, *Noise Action Plan 2008 – 2013*, Galway City Counci, Oct 2008.

Kerry Local Authorities, *Noise Action Plan*, Kerry Local Authorities, Sept 2008.

Limerick County Council & Sonitus Systems Ltd., *Noise Action Plan*, Limerick County Council, Oct 2008.

Navrud S., *The State-Of-The-Art- on Economic Valuation of Noise*, Department of Economics and Social Sciences Agricultural University of Norway, April 2002.

World Health Organisation (WHO), *Night Noise Guidelines for Europe*, World Health Organisation, 2009.

Websites

Qcity. 2013. *Qcity*. [ONLINE] Available at: http://www.qcity.org/. [Accessed Jan 2013].

SILENCE. 2013. *SILENCE*. [ONLINE] Available at: http://www.silence-ip.org/site/. [Accessed Jan 2013].

WHO | Noise pollution. 2013. *WHO | Noise pollution*. [ONLINE] Available at: http://www.who.int/topics/noise/en/. [Accessed Jan 2013].

Tyre labelling | AA. 2013. *Tyre labelling | AA*. [ONLINE] Available at: http://www.theaa.com/motoring_advice/safety/tyre-label-fuel-noise-grip.html. [Accessed Feb 2013].

Appendix C
Strategic Noise Maps/ Analysis Maps

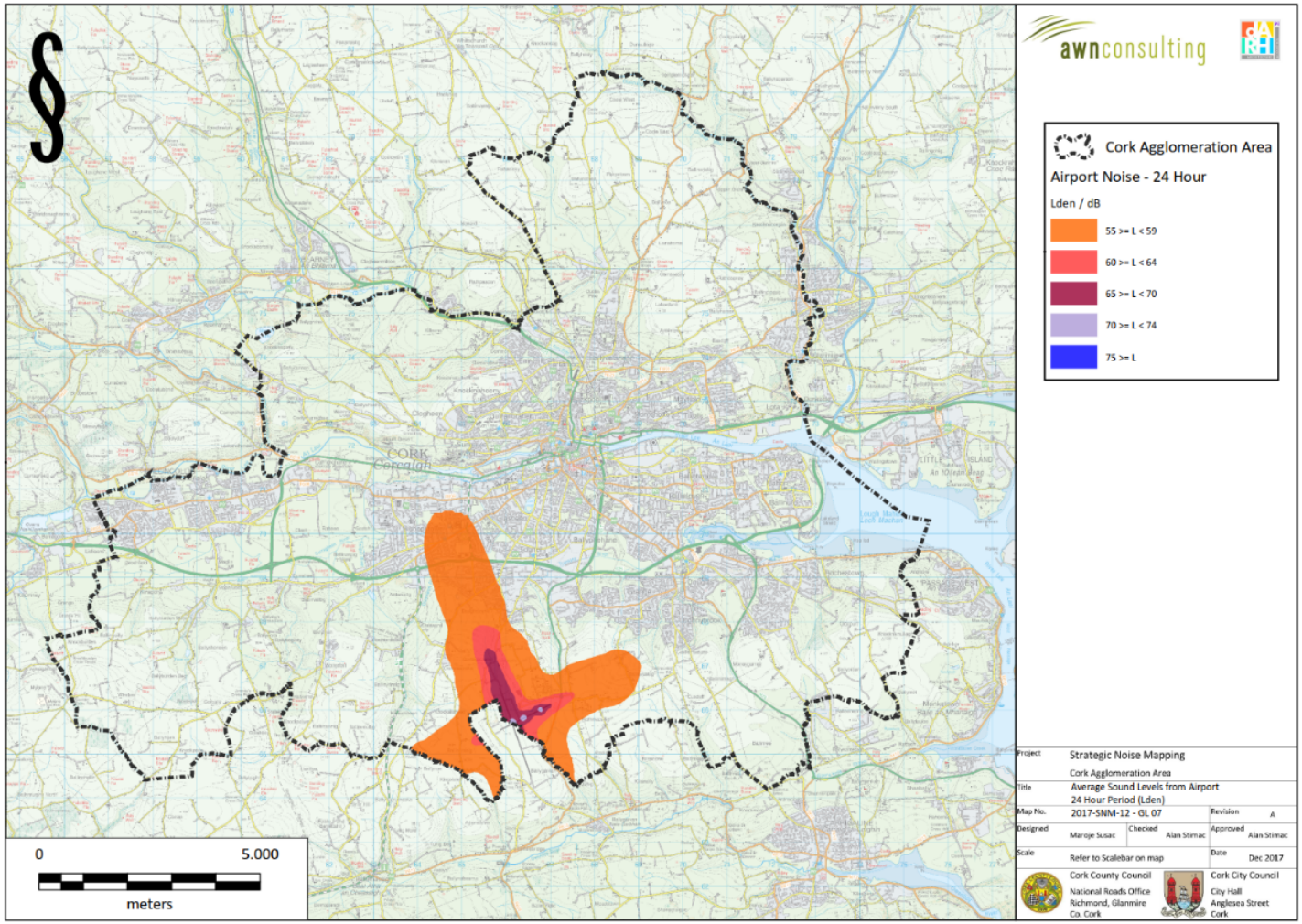


Figure 1: L_{den} Noise Level Bands for 2016 Assessment Year for Airports

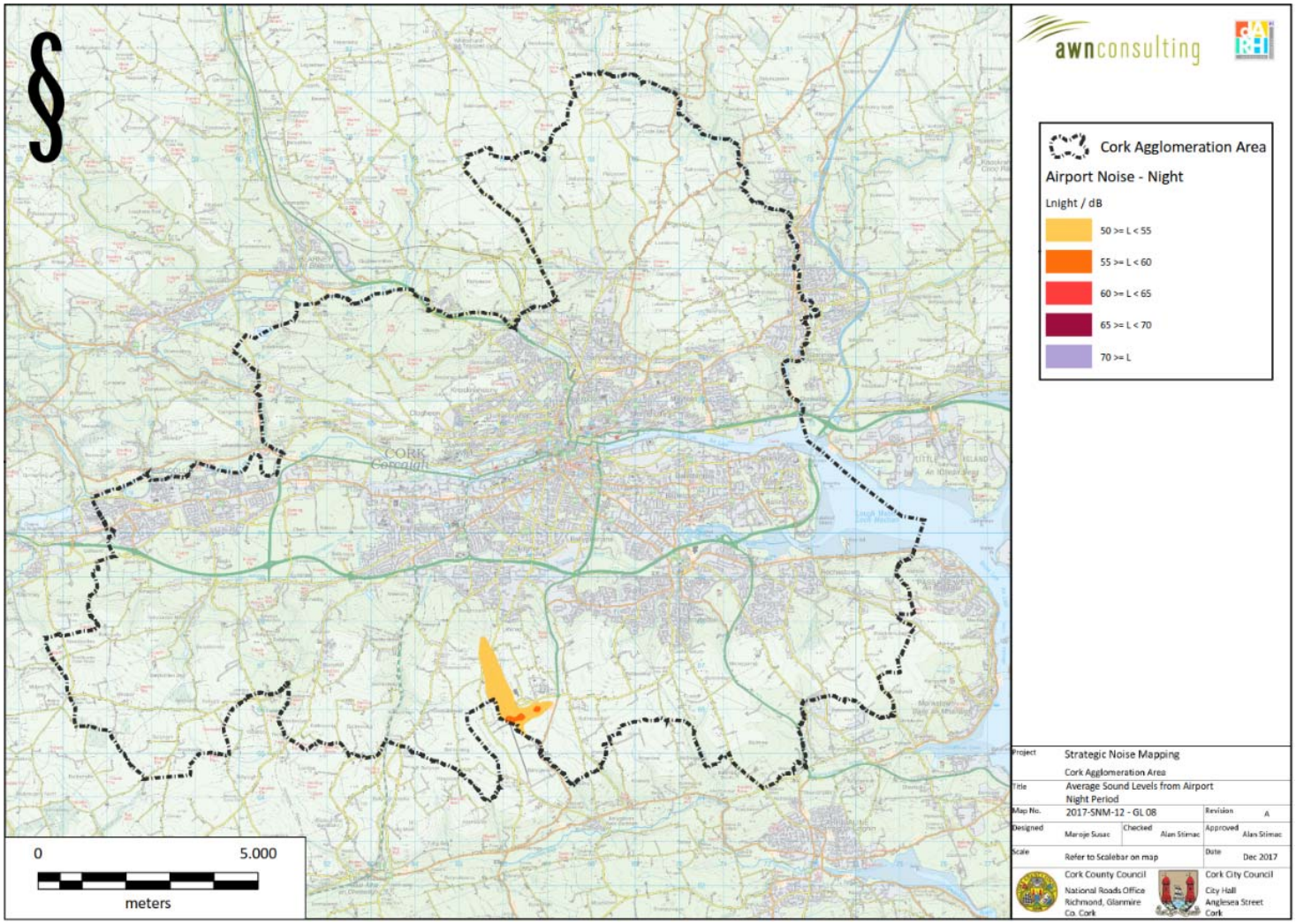


Figure 2: L_{night} Noise Level Bands for 2016 Assessment Year for Airports

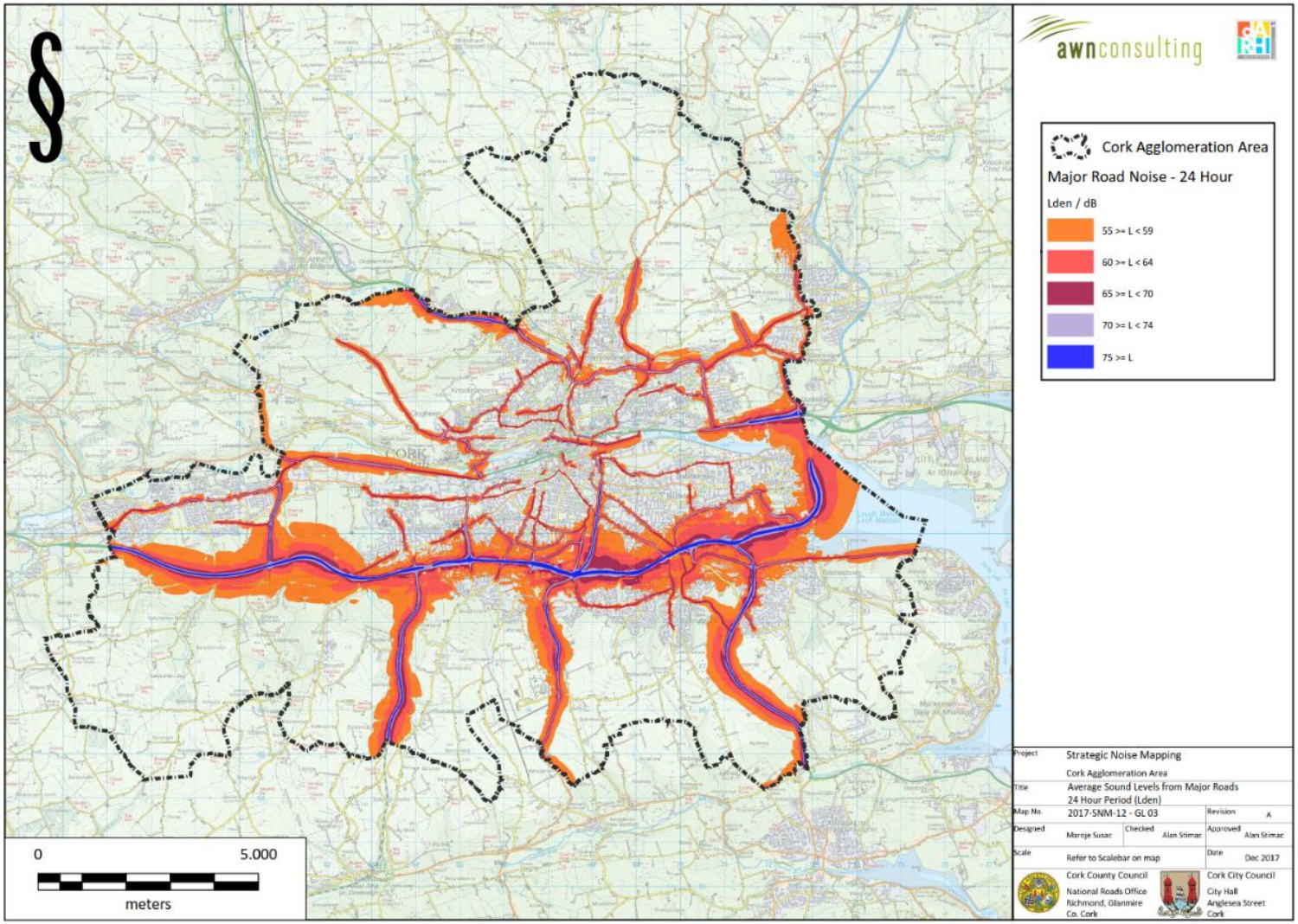


Figure 3: L_{den} Noise Level Bands for 2016 Assessment Year for Major Roads

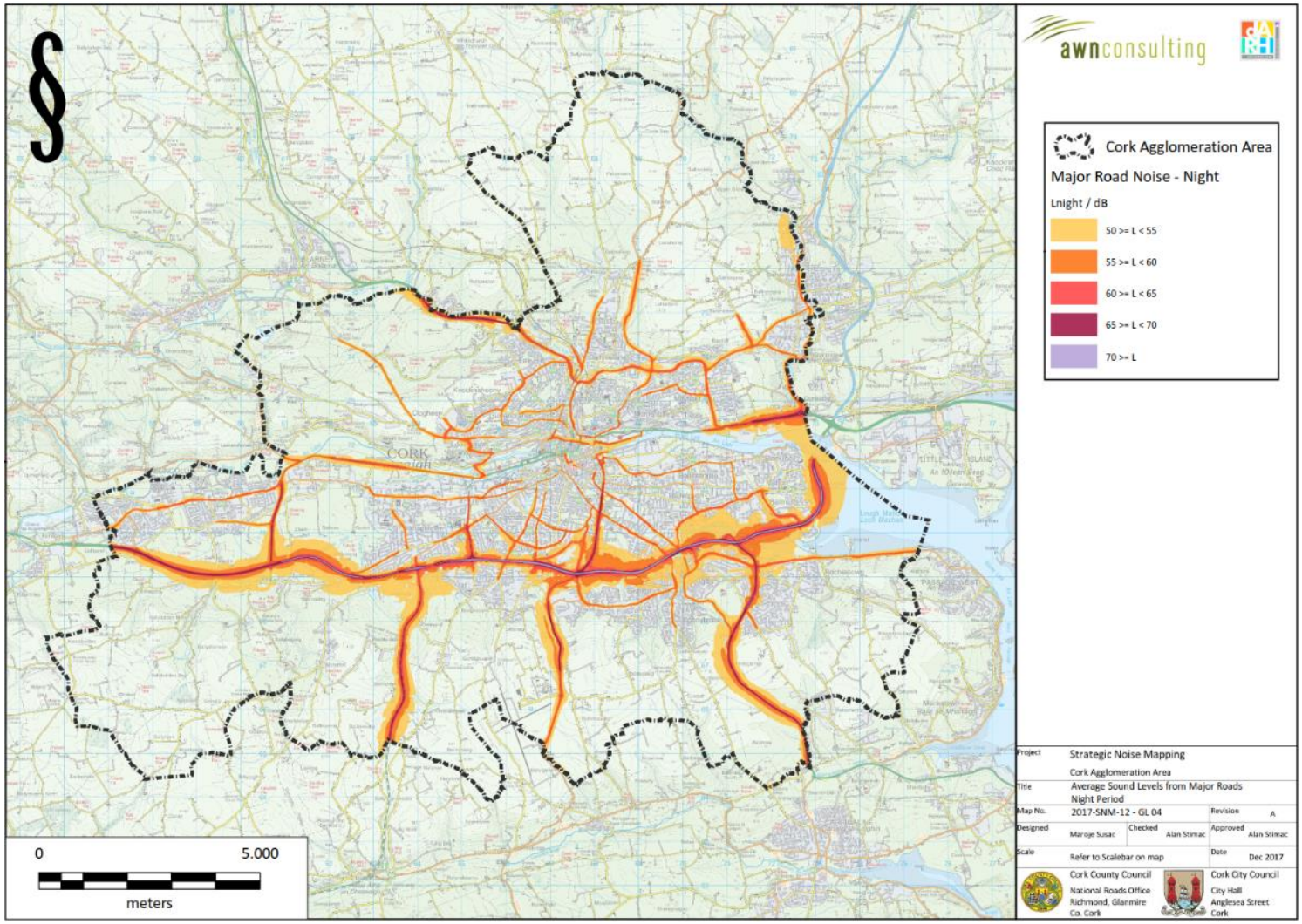


Figure 4: L_{night} Noise Level Bands for 2016 Assessment Year for Major Roads

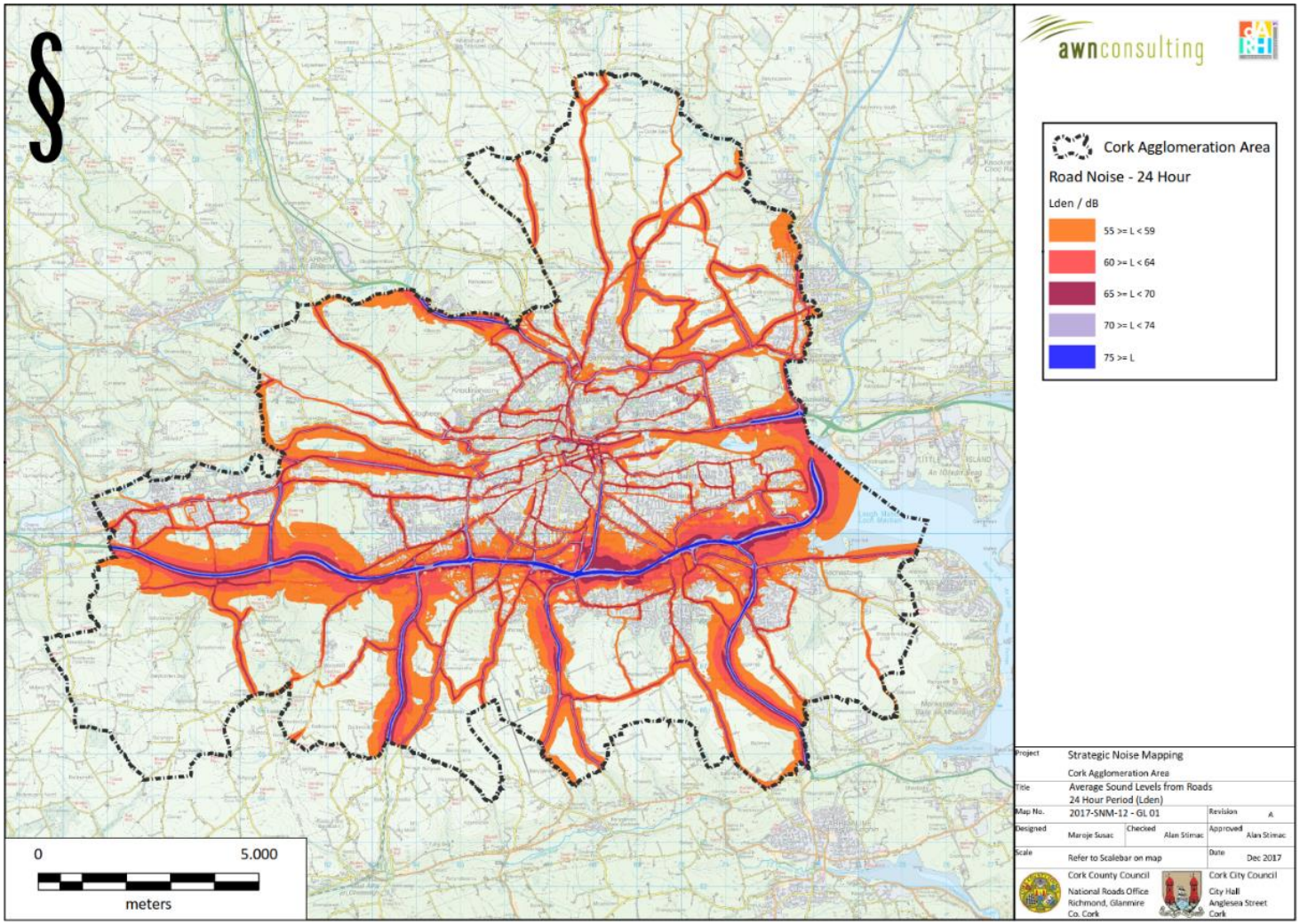


Figure 5: L_{den} Noise Level Bands for 2016 Assessment Year for Roads

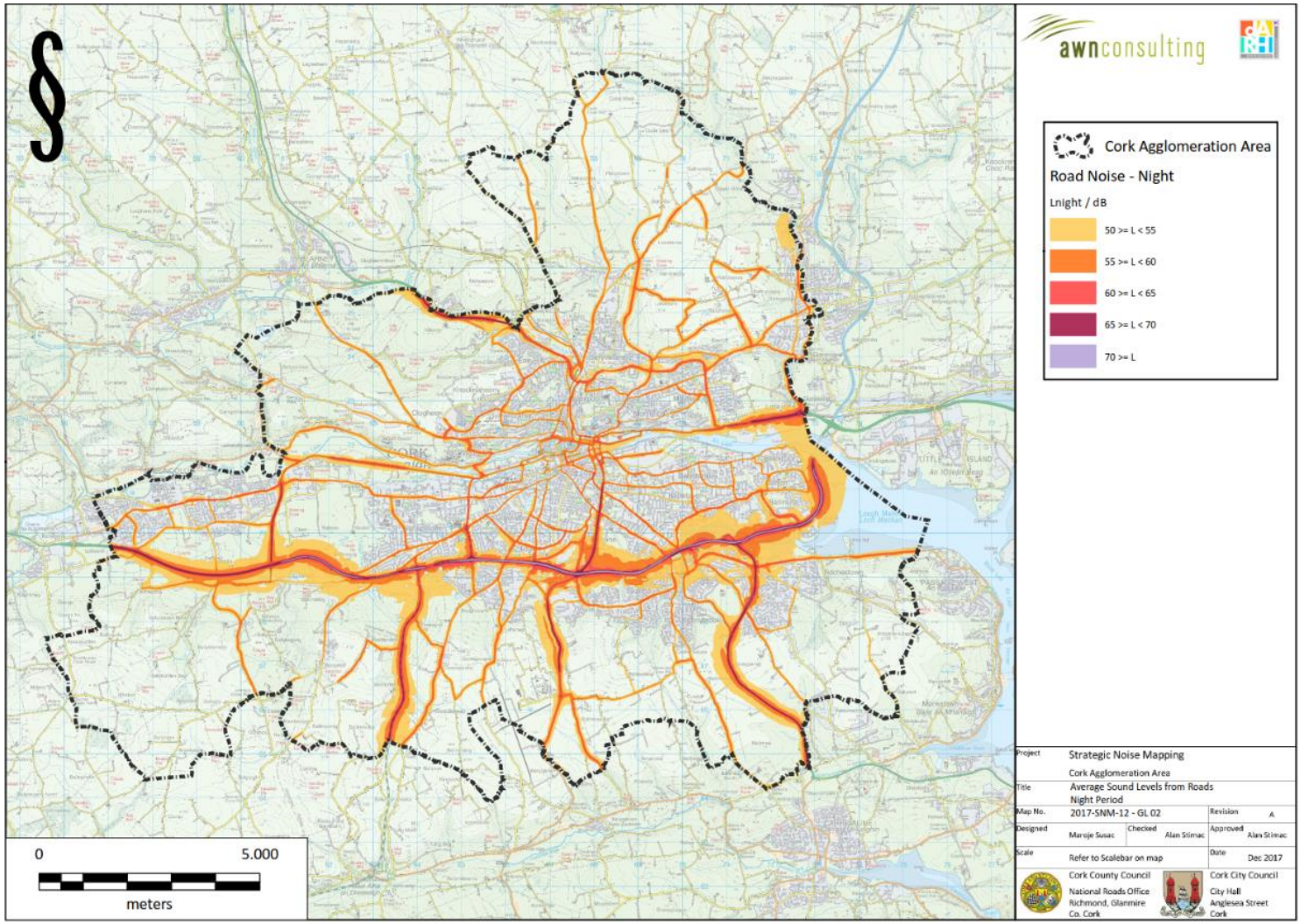


Figure 6: L_{night} Noise Level Bands for 2016 Assessment Year for Roads

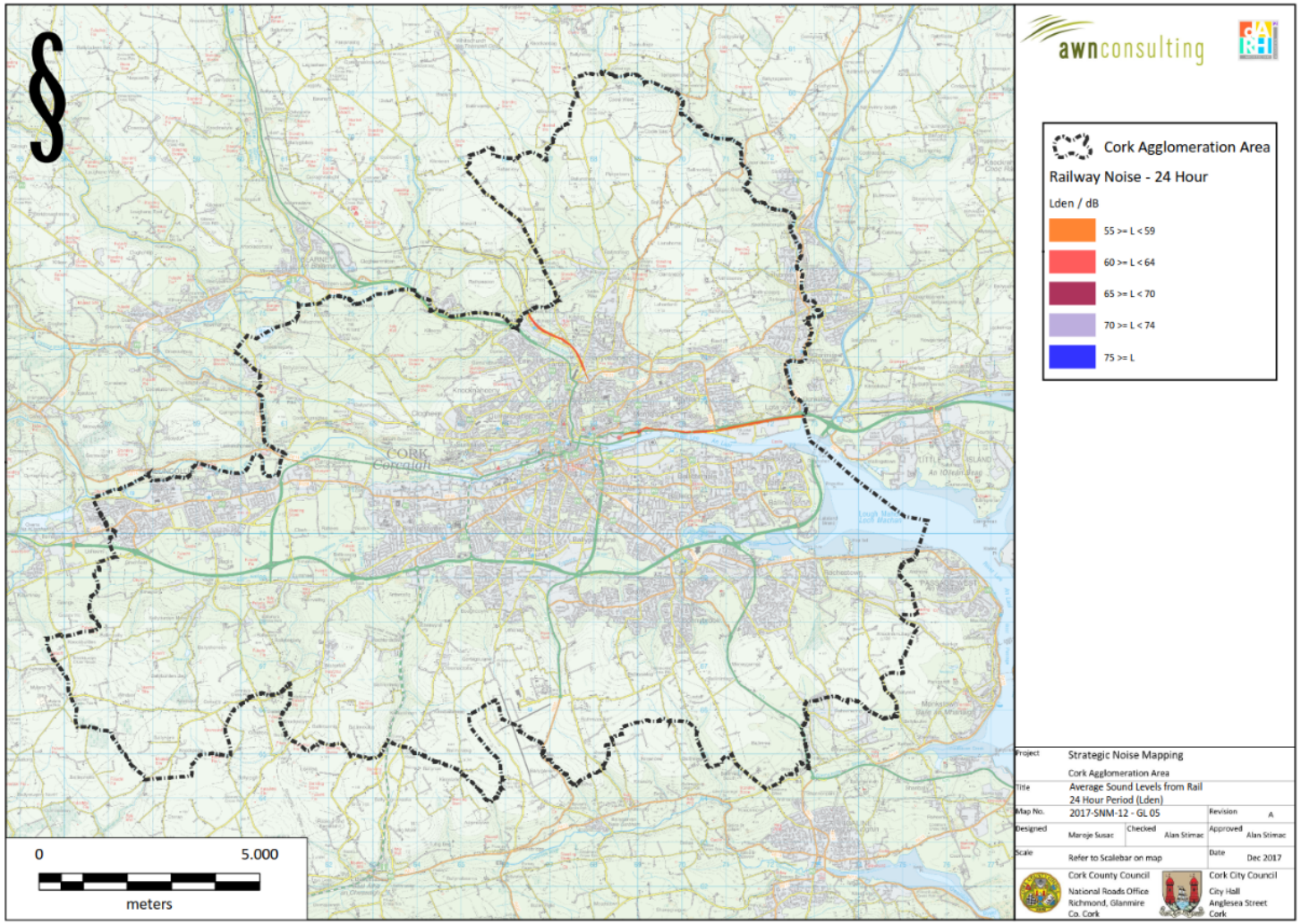


Figure 7: L_{den} Noise Level Bands for 2016 Assessment Year for Railways

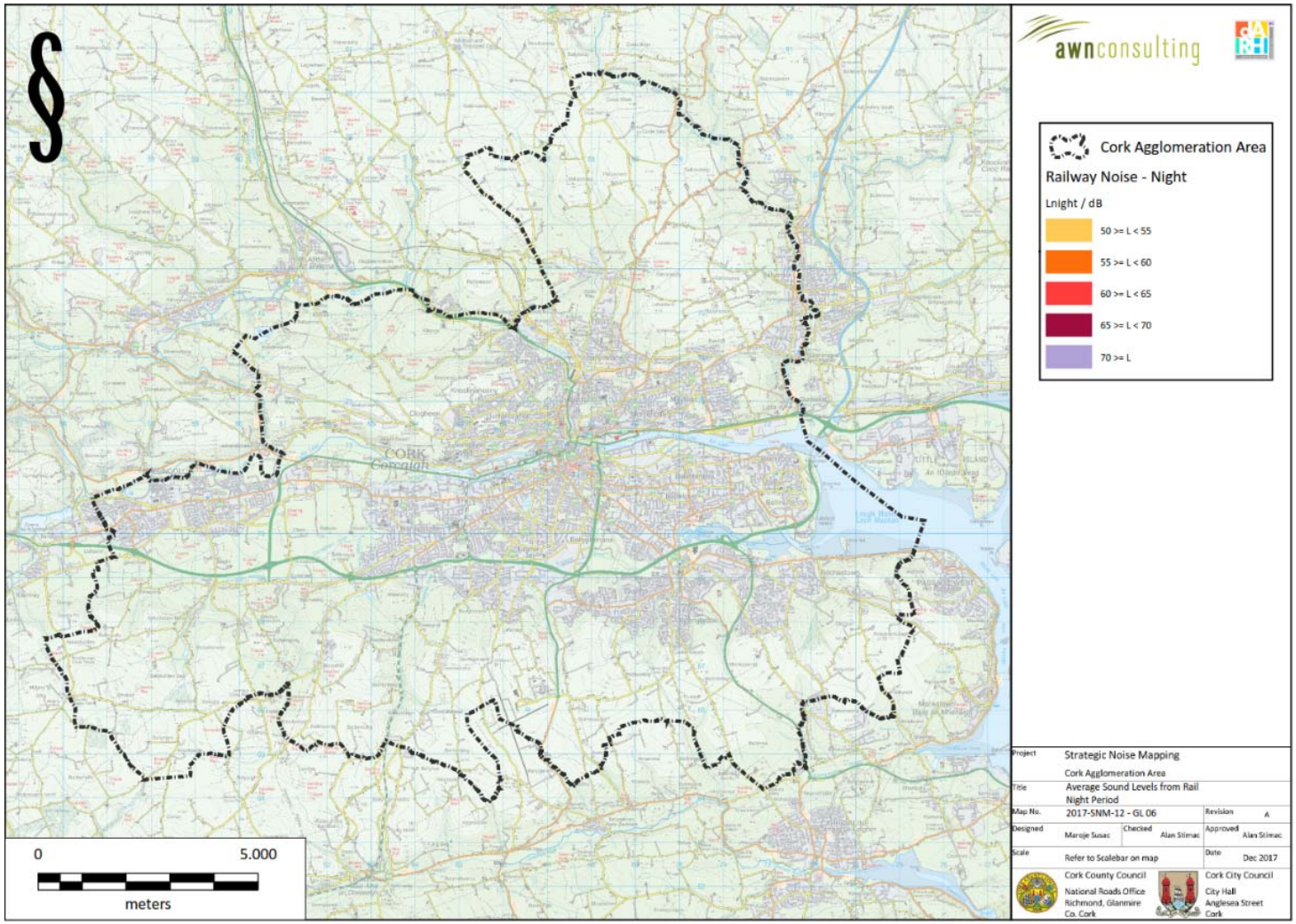


Figure 8: L_{night} Noise Level Bands for 2016 Assessment Year for Railways

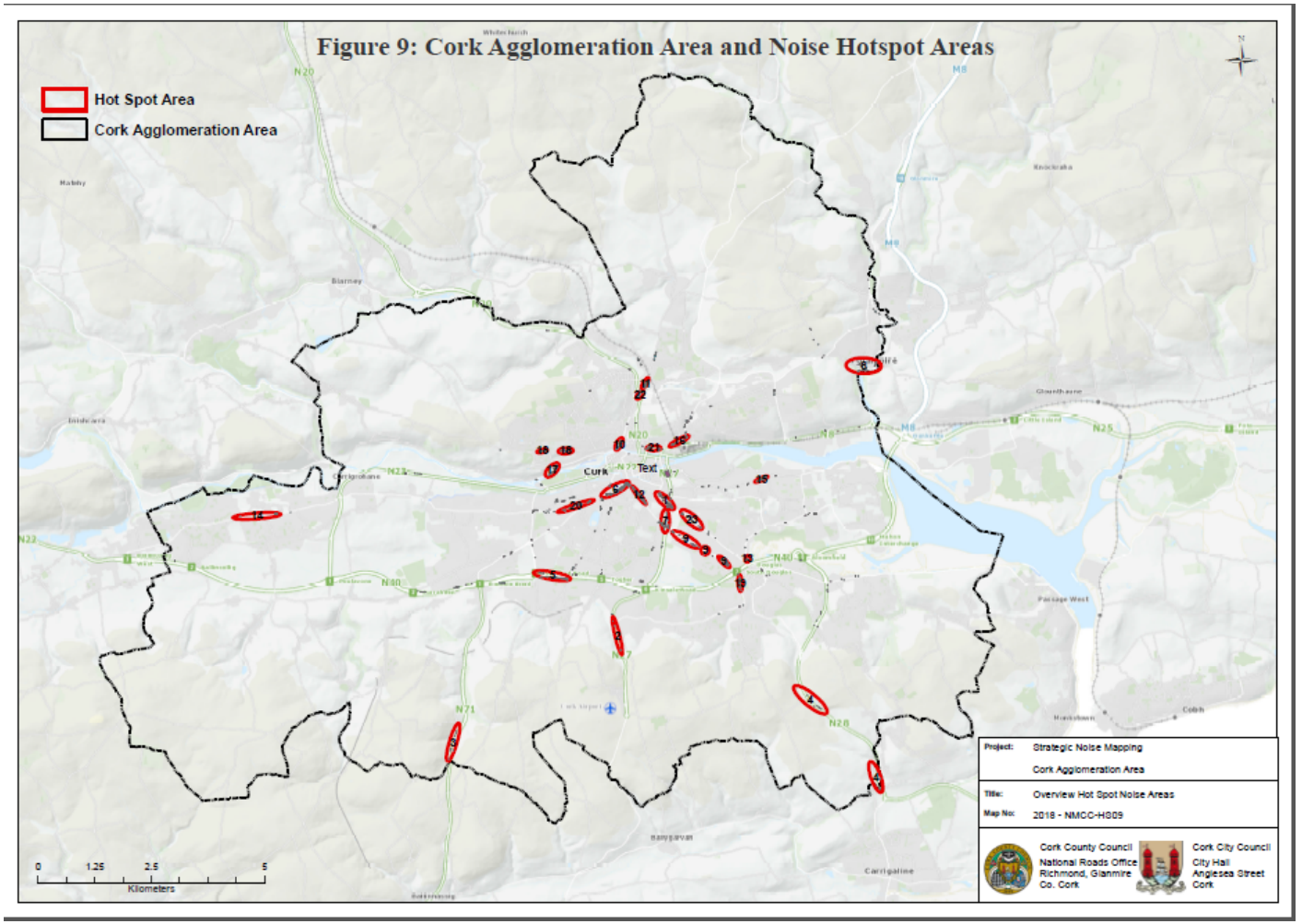
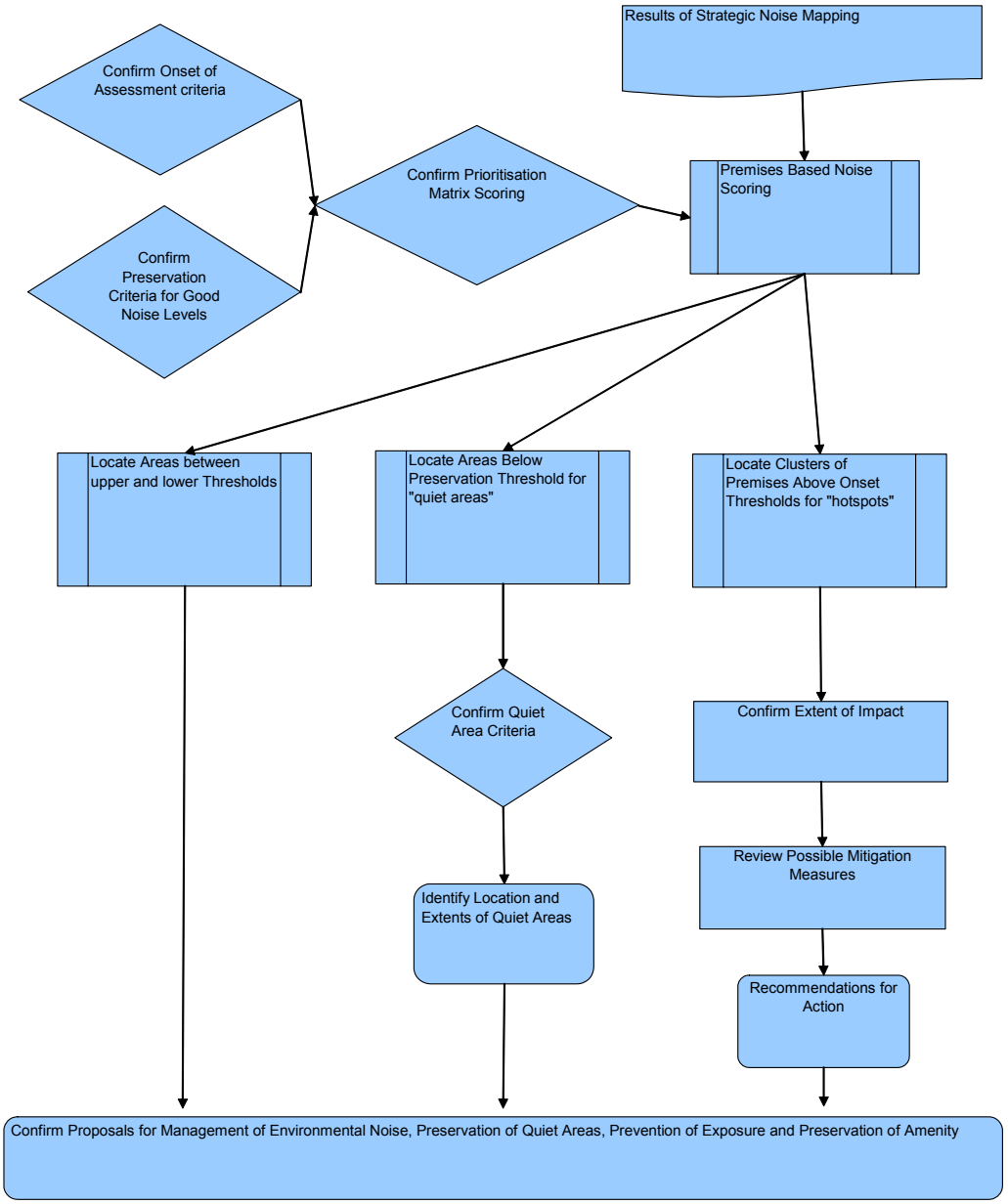


Figure 9: Overview of the hot spot areas in the Cork Agglomeration

Appendix D

Overview / flow diagram of process for action planning and decision making



Appendix E

Priority Decision Matrix

The priority decision matrix works by scoring the L_{den} and L_{night} value depending on the noise band the property falls in.

Example

If a property has a value of 68 dB L_{den} and 58 dB L_{night} the matrix would score the property 7, i.e. (4+3) using the score range in the matrix, as illustrated in **Table 6.1.**

Table 6.1: Decision Matrix Example

Decision Selection Criteria		Example Property Lden	Score Range Lden	Example Property Lnight	Score Range Lnight	Sub-Total
Noise Band db(A)	<50		0		1	
	50 – 55		1		2	
	55-60		2	58	3	3
	60-65		3		4	
	65-70	68	4		5	4
	70-75		5		6	
	75-80		6		7	
	>=80		7		8	
		Total Score				7

Applying the matrix, a single figure can be applied to all properties, taking consideration of the L_{den} and L_{night} values.

Appendix F

Cork Agglomeration Statistics

Element	ALL ROAD	%	ALL RAIL	%	ALL AIR	%
Value Ranges						
Population	**Population**		**Population**		**Population**	
Lden <55	121200	63%	190500	100%	182200	95%
Lden 55-59	29200	15%	300	0%	8700	5%
Lden 60-64	19300	10%	100	0%	0	0%
Lden 65-69	19000	10%	0	0%	0	0%
Lden 70-74	2200	1%	0	0%	0	0%
Lden >=75	0	0%	0	0%	0	0%
total	190900	100%	190900	100%	190900	100%
Lnight <55	145100	76%	190800	100%	190900	100%
Lnight 55-59	21200	11%	100	0%	0	0%
Lnight 60-64	20800	11%	0	0%	0	0%
Lnight 65-69	3800	2%	0	0%	0	0%
Lnight 70-74	0	0%	0	0%	0	0%
Lnight >=75	0	0%	0	0%	0	0%
total	190900	100%	190900	100%	190900	100%
Area (km2)						
Area Lden <55	57	0%	186	0%	174	0%
Area Lden 55-59	68	0%	0	0%	10	0%
Area Lden 60-64	35	0%	0	0%	1	0%
Area Lden 65-69	18	0%	0	0%	1	0%
Area Lden 70-74	6	0%	0	0%	0	0%
Area Lden >=75	2	0%	0	0%	0	0%
total	186	0%	186	0%	186	0%
Dwellings Lden <55	50800	62%	81700	100%	78500	96%
Dwellings Lden 5559	12200	15%	200	0%	3400	4%
Dwellings Lden 60-64	8400	10%	0	0%	0	0%
Dwellings Lden 65-69	9400	11%	0	0%	0	0%
Dwellings Lden 70-74	1100	1%	0	0%	0	0%
Dwellings Lden >=75	0	0%	0	0%	0	0%
total	81900	100%	81900	100%	81900	100%

Appendix G

Public Consultation