



## **KERRY LOCAL AUTHORITIES**

### **NOISE ACTION PLAN**

**Round Two**

***June 2013***



## EXECUTIVE SUMMARY

This Round Two Noise Action Plan has been prepared by Kerry Local Authorities to address environmental noise from major roads in the county with more than three million vehicles per annum. The action planning area covers the national roads and non-national roads in Kerry. The Round Two Noise Action Plan seeks to review and update the Round One Noise Action Plan prepared and published by Kerry Local Authorities in November 2008.

The plan was prepared in accordance with the requirements of EU Directive 2002/49/EC (known as the Environmental Noise Directive, or "END"), which was transposed into Irish Law by the Environmental Noise Regulations 2006, SI No. 140 of 2006.

The aim of the Directive and the Regulations is to provide for the implementation of an EC common approach to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise.

Environmental noise is unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic and noise in agglomerations over a specified size. Types of noise **not** included in the Regulations are noise that is caused by the exposed person, noise from domestic activities, noise created by neighbours, noise at workplaces or noise inside means of transport or due to military activities in military areas.

Noise Mapping Bodies and Action Planning Authorities were assigned responsibility under the regulations to draw up noise maps and prepare action plans for Round Two from the following noise sources:

- major railways with more than 30,000 trains per annum (not applicable to Kerry);
- major airports with more than 50,000 flights per annum (not applicable to Kerry);
- major roads with more than 3 million vehicles per annum; and
- agglomerations of greater than 100,000 inhabitants (not applicable to Kerry).

The National Roads Authority (NRA) is the mapping body for major National Roads, other non-National major roads are the responsibility of the Local Authority in whose area they occur. The NRA agreed to map all major roads in Round 2 as part of a centralized agreement with Local Authorities. The NRA estimated from noise mapping and geodirectory data that approximately 8,440 individuals and 6,411 individuals located within the action planning area in Kerry are located in areas where the noise levels exceed the  $L_{den}$  value of 55dB and  $L_{night}$  value of 50dB respectively.

The purpose of this Action Plan is to endeavour to manage the existing noise environment and protect the future noise environment within the action planning area. Management of the existing noise environment may be achieved by prioritising areas for which further assessment and possible

noise mitigation may be required. Protection of the future noise environment may be achieved by acoustical planning, which further incorporates noise into the planning process via measures such as land-use planning, development planning, sound insulation measures, traffic planning and control of environmental noise sources.

#### **ACTION PLAN POLICY STATEMENT**

***Kerry Local Authorities will seek to address environmental noise from major roads in the county, will endeavour to maintain satisfactory noise environments where they exist and will have regard to acoustical planning in the planning process (within the confines of the 2000 Planning and Development Act) to endeavour to ensure that future developments include provisions to protect the population from the effects of environmental noise in the interests of residential amenity and public health.***

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## **1.0 BACKGROUND/INTRODUCTION**

### **1.1 Purpose and Scope of the Environmental Noise Directive.**

EU Directive 2002/49/EC (known as the Environmental Noise Directive, or "END") deals with the assessment and management of environmental noise.

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."*<sup>1</sup>**

The Directive requires that Member States:

1. Undertake strategic noise mapping to determine exposure to environmental noise;
2. Ensure information on environmental noise and its effects is made available to the public;
3. Adopt action plans, based upon the noise mapping results with a view to 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.

### **1.2 Purpose and Scope of the Environmental Noise Regulations.**

The END was transposed into Irish Law by the Environmental Noise Regulations 2006, SI No. 140 of 2006. The regulations provide for the implementation in Ireland of a common approach adopted 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.

For the purposes of the Directive and Regulations, environmental noise is unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic and noise in agglomerations over a specified size. Types of noise not included in the regulations are noise that is caused by the exposed person, noise from domestic activities, noise created by neighbours, noise at workplaces or noise inside means of transport or due to military activities in military areas.

The regulations specify the process to be followed in addressing environmental noise from transport sources, implemented over two rounds.

### **Round One – 2007/2008**

Noise mapping bodies made strategic noise maps with regard to the following thresholds:

- Major roads with >6 million vehicles per annum.
- Major railways with >60,000 trains per annum.
- Major airports with >50,000 movements per annum.
- Agglomerations with >250,000 inhabitants.

Noise Action Plans in relation to Round One were completed and submitted to the EPA and EU in 2009.

### **Round Two – 2012/2013**

Round two provides for noise mapping bodies to generate strategic noise maps in respect of the following thresholds:

- Major roads (defined in the regulations as roads with > 3 million vehicles per annum).
- Major railways (defined as > 30,000 trains per annum).
- Major airports with >50,000 movements per annum.
- Agglomerations with > 100,000 inhabitants.

Revised/amended action plans are to be prepared on foot of the extended strategic noise maps. The fundamental objective of the action plans is the prevention and reduction of environmental noise.

### **1.3 Roles and Responsibilities of designated bodies.**

The Environmental noise regulations designate noise mapping bodies and action planning authorities for the making of strategic noise maps and noise action plans as follows:

#### **1.3.1 Noise Mapping Bodies:**

- For national roads, the National Roads Authority (NRA) is the noise mapping authority, on behalf of the action planning authority concerned;
- For non-national roads, each local road authority is the noise mapping authority concerned;
- For major airports, the relevant airport authority is the noise mapping body, on behalf of the action planning authority concerned;
- For major railways, Iarnród Éireann or the Railway Procurement Authority, as appropriate, is the noise mapping body on behalf of the action planning authority concerned;
- For the agglomeration of Dublin, Dublin City and County Councils; and
- For the agglomeration of Cork, Cork City and County Councils.

#### **1.3.2 Action Planning Authorities**

The Action Planning Authorities are the Local Authorities within whose functional areas the major road/railway/airport/agglomerations are located.

The Environmental Protection Agency (EPA) is the national authority for the purposes of the regulations.

## **1.4 Key Phases.**

### **1.4.1 Identification of areas to be mapped.**

In Kerry, strategic noise maps and associated action plans must be prepared for major roads only. The requirements for major railways (>30,000 train passages per year), major airports (>50,000 movements per year) or agglomerations of greater than 100,000 do not apply as the thresholds are not exceeded.

The definition of a major road for the noise mapping/action planning Round two of the Regulations is a road with more than 3 million vehicles per annum. The National Road Authority (NRA) as the Noise Mapping Body for all national roads undertook a national noise model and generated noise maps for the entire national road network. Noise from major sources is regarded as affecting an area if it causes either an  $L_{den}$  value of 55dB or greater, or an  $L_{night}$  value of 50dB or greater, anywhere within an area. The NRA noise maps produced provide a visual representation of sections of the national road network and their associated noise bands.

With regard to the non-national roads it was also decided to carry out a centralized approach to Noise Mapping in the country and the NRA agreed to undertake all major roads mapping as part of a centralized approach. The necessary information required to enable the NRA to carry out this mapping was provided by each Local Authority. Kerry County Council designated Regional Roads in the County above 3 million vehicles per year as major roads and provided the NRA with the necessary information to enable the NRA to produce noise maps which provided a visual representation of the sections of the non-national road network identified and their associated noise bands.

### **1.4.2 Strategic noise maps**

#### **1.4.2.1 Purpose**

The purpose of the strategic noise maps is to identify the areas affected by different levels of environmental noise from major roads, railways, airports and agglomerations as described under 1.2 above. The maps are a visual representation of estimated noise contour bands within the action plan area from 55dB  $L_{den}$  to greater than 75dB  $L_{den}$  and 50dB  $L_{night}$  to greater than 70dB  $L_{night}$ , in 5dB bands. The maps have been linked to population data to estimate the numbers of people located in each environmental noise band. This information is then used to produce noise action plans, which will be used to assist with the management of existing environmental noise from the major sources and protect the future noise environment.

#### **1.4.2.2 Preparation**

For the second Round of implementation of the Regulations, the NRA prepared strategic noise maps for all major roads in the country, including national and non-national roads with more than 3 million vehicles per annum. The NRA maintains the National Traffic Model for all national roads in Ireland and national roads were identified based on traffic flow data from the National Traffic Model.

For non-national roads Kerry County Council collected and collated road traffic flow data from all Regional Roads within the county likely to have traffic above 3 million vehicles per year. This was collected from either using existing historic traffic data or by carrying out new traffic counts.

From this data Kerry County Council produced Datasets on traffic flow data including traffic flow, speed, surface type, %HGV's etc and datasets of 3D propagation model including buildings, ground terrain, ground cover, barriers/walls, bridges and underpasses.

This information was forwarded to the NRA as the Noise Mapping Body under the centralised Approach for non-national roads, who prepared strategic noise maps for these non-national roads.

The grids of noise assessment results delivered from the noise mapping software are used to produce 5dB noise band contours for the graphical mapping of results and to produce reclassified grids into a set of 5dB categories for the following decibel bands:

<b>L<sub>den</sub></b>	<b>L<sub>night</sub></b>
➤ 55-59	➤ 50-54
➤ 60-64	➤ 55-59
➤ 65-69	➤ 60-64
➤ 70-74	➤ 65-69
➤ >/=75	➤ >/=70

The resultant noise maps are a visual representation of the estimated noise level bands within each action plan area.

### **1.4.3 Development of noise action plans.**

#### **1.4.3.1 Purpose.**

The purpose of the action plans is to manage environmental noise from the major sources, to improve noise levels where necessary on a prioritised basis, to preserve satisfactory noise environments where they exist and to protect the future noise environment. This Round Two Noise Action Plan seeks to review and update the Round One Noise Action Plan prepared and published by Kerry Local Authorities in November 2008.

#### **1.4.3.2 Scope**

The local authority areas covered by the noise action plans are those areas identified by noise mapping as being affected by environmental noise from the major noise sources. The action plans refer to places near the major noise sources i.e. major roads, major railways and major airports and within any relevant agglomeration. The noise from these sources is regarded as affecting an

Action Plan Area if it causes either an  $L_{den}$  value of 55dB(A) or greater or an  $L_{night}$  value of 50dB(A) or greater anywhere within an area.

#### **1.4.3.3 Public participation**

The Environmental Noise Directive and the Noise 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 finalizing action plans.

Article 11(6) of the END imposes the following duty on member states in relation to public consultation:

- *Member States shall ensure that the public is consulted about proposals for action plans, given early and effective opportunities to participate in the preparation and review of the action plans, that the results of that participation are taken into account and that the public is informed on the decisions taken. Reasonable time frames shall be provided allowing sufficient time for each stage of public participation. If the obligation to carry out a public participation procedure arises simultaneously from this Directive and any other Community legislation, Member States may provide for joint procedures in order to avoid duplication.*

Regulation 12(2) of SI 140 of 2006 provides that:

- *Information for the public on noise maps and action plans shall be clear, comprehensive and accessible and shall include a summary of the most important points.*

It is the policy of Kerry Local Authorities to engage in public consultation with our citizens in regards to policies and plans developed by Kerry Local Authorities for Kerry, in accordance with national guidelines and best practice.

#### **1.4.4 Implementation of the Action Plan**

Mitigation and protection measures detailed in Section 7 of this Action Plan will be implemented if required, on a prioritised, phased basis over the five-year life of the Plan. Monitoring measures may be undertaken where noise-mapping data must be verified by measurement prior to the implementation of any corrective action.

## **2.0 Existing noise management legislation and guidance**

### **2.1 National Legislation and guidance**

*"The I-INCE publication "A Global Approach to Noise Control Policy" (Ref. 3) classifies three areas which require noise policies:*

- *Occupational Noise*
  - *Unwanted or harmful sound in the workplace, indoors or outdoors, caused by sources in the vicinity of a workplace;*
- *Community Noise (also referred to as environmental noise)*
  - *Unwanted sound in a non-occupational setting, indoors or outdoors, caused by sources over which an individual has little or no control, including sounds produced by neighbours; and*
- *Consumer Product Noise*
  - *Unwanted or harmful sound at the position of a user or bystander of a noise producing product over which an individual may have some control, including noise in passenger compartments of vehicles, but excluding occupational and community noise.*

*As the Regulations are concerned only with Community Noise, there will be no further discussion on Occupational or Consumer Product Noise which are covered by separate regulations namely "Safety, Health and Welfare at Work (Control of Noise at Work) Regulations 2006 (S.I. No. 371 of 2006)" and "European Communities (Noise Emission by Equipment for Use Outdoors) (Amendment) Regulations 2006 (S.I. No 241 of 2006).*

*Within Community Noise there are a number of individual items which require consideration and management:*

- *Community Noise*
  - *New Roads, railways, airports, industry or recreational activities adjacent to residential properties or noise sensitive premises such as schools or hospitals, or recreational spaces;*
  - *New residential properties or noise sensitive premises such as schools or hospitals, adjacent to existing roads, railways, airports, industry or recreational activities;*
  - *The development of mixed residential/commercial use buildings and multi-part residential buildings;*
  - *The management of noise levels within noise sensitive properties, such as schools and hospitals, to address external noise break-in as well as room to room transmission and noise levels within public spaces;*
  - *Noisy neighbours, barking dogs;*
  - *Gardening machinery, construction activities, ice cream vans and street cleaning;*
  - *Air-conditioning equipment;*
  - *Public house, nightclubs, restaurants or other recreational activities; and*
  - *Industrial operations, workshops and factories*

*A fully encompassing noise management policy needs to provide guidelines, targets and possibly limits for each of these aspects, backed up by legislative powers and Regulations as appropriate."*

Many of the above aspects may be addressed through the planning process for new or altered developments having regard to the National Guidelines.

## **2.2 Current Community Noise Management Situation**

The EPA notes in the Guidance Note for Noise Action Planning that *"at present there is no clear official or statutory guidance which could help promote the effectiveness or clarity of the provisions within the Act; however, within the framework of the Regulations the EPA may consider it appropriate to develop such guidance in the future"*. The measures in place at present which address particular aspects of community noise are outlined in the following sections (2.2.1 to 2.2.6):

### **2.2.1 Environmental Protection Agency Act 1992**

The existing statutory provisions have primarily come about on foot of the Environmental Protection Agency Act of 1992. Sections 106 to 108 of the Act are of direct relevance, and may be summarised as follows:

- **106** gives the relevant Minister certain powers to regulate noise that may give rise to a nuisance or be harmful to health or property;
- **107** gives powers to local authorities and the EPA to serve notice to take steps to control noise;
- **108** sets out a process whereby noise issues may be taken to the District Court, which may make an order requiring that the person or body responsible for the noise takes steps to eliminate or ameliorate the noise in question. S108 enables private individuals to take a case to the courts at very low financial cost. This procedure is recommended for use by the public, particularly where the problem is caused by noisy neighbours in privately owned or rented accommodation.

### **2.2.2 IPPC and Waste Licensing**

Noise conditions are routinely imposed as part of an IPPC licence. The relevant guidance is set out in the EPA publication *"Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)"*<sup>4</sup>. This document contains suggested noise limits of 55dB LA<sub>r,T</sub> for daytime (07:00 to 19:00hrs), 50dB LA<sub>r,T</sub> for evening time (19:00 to 23:00hrs) and 45dB(A) LA<sub>eq,T</sub> for night-time (23:00 to 07:00hrs) for Noise from Licensed Sites; Whilst these limits have a very specific application, they have appeared in many different contexts and often form the basis for conditions in planning permissions. Similar noise conditions are also imposed on waste-licensed facilities.

### **2.2.3 Wind Energy Planning Guidelines**

With specific regard to wind energy developments, the DoEHLG document "Wind Energy Development Guidelines <sup>5</sup>" suggests using the  $L_{A90,10min}$  descriptor with a "lower fixed limit of 45dB(A) or a maximum increase of 5dB(A) above background noise at nearby noise sensitive locations". The latter requirement may be relaxed in areas with low background levels. A fixed limit of 43dB(A) at nighttime is deemed appropriate, as there is no requirement to protect external amenity.

### **2.2.4 Quarries and Ancillary Activities**

Section 261 of the Planning and Development Act, 2000, introduced a new system of one-off registration for all quarries. Only those quarries for which planning permission was obtained in the 5-year period before S261 became operational were excluded. The Department of the Environment published guidelines for Planning Authorities for quarries and ancillary activities in April 2004<sup>6</sup>, including recommended noise conditions for inclusion as part of registration or where a full planning permission was required. Kerry County Council has now completed the process of quarry registration in accordance with Section 261 of the Planning and development Act 2000 and at present there are a total of 100 registered quarries in the county. Depending on the complexity of the quarrying operation, noise conditions were included as part of the registration process and as part of the planning process for quarry extension applications. For larger quarry operations, environmental noise conditions along the following lines have been imposed by the planning authority: *Noise emissions from the facility shall not exceed 55dB  $L_{Aeq,30 mins}$  during the daytime and 45dB  $L_{Aeq,15 min}$  during the night time at the façade of the nearest noise sensitive locations, subject to adjustment in the event of a change in the accepted limits for industrial noise.*

Noise and vibration conditions have also been imposed for quarries in which blasting is carried out. These conditions generally state: *"Vibration levels from blasting shall not exceed a peak particle velocity of 12 mm/second, measured in any three mutually orthogonal directions at any sensitive location. Blasting shall not give rise to air overpressure values at sensitive locations which are in excess of 125dB (Lin)<sub>max peak</sub> with a 95% confidence limit. No individual air overpressure value should exceed the limit value by more than 5 dB (Lin)."*

### **2.2.5 Building Regulations**

The current Irish Building Regulations call for certain constructions to offer "reasonable resistance" to both airborne and impact sound. In the absence of any form of objective criterion, reference is often made to the guidance values put forward in the "Similar Construction" method described in Technical Guidance Document.

### **2.2.6 Planning.**

Aside from the guidelines for quarries, there is currently no national policy or guidance to address noise issues as part of the planning process, Kerry Planning Authorities will set conditions relating to noise as part of a planning permission where the planning authorities consider that excessive noise may result from the development.

The National Roads Authority has published the document "*Guidelines for the Treatment of Noise and Vibration in National Road Schemes*", which sets out the procedure to be followed in respect of the planning and design of national road schemes.

The Department of the Environment, Heritage and Local Government (DoEHLG) has published the following documents relating to sustainable development in the urban environment (ref guidance document):

- Sustainable Urban Housing: Design Standards for New Apartments (Guidelines for Planning Authorities), September 2007;
- Sustainable Residential Development in Urban Areas: Consultation guidelines for Planning Authorities, May 2009;
- Urban Design Manual: A best practice guide (A companion document to the Planning Guidelines on Sustainable Residential Development in Urban Areas), May 2009; and
- The document dealing with Design Standards for New Apartments calls for "*attention at the design and construction stages to prevent undue noise transmission between units*". There is no mention of appropriate design goals or the methodology to be employed, other than reference to Part E of the Building Regulations (see below).

The guidelines for Sustainable Residential Development highlight the need to "*Deliver a quality of life which residents and visitors are entitled to expect, in terms of amenity, safety and convenience*". They go on to state: "*Privacy is an important element of residential amenity*". Whilst they are not mentioned specifically, environmental noise and noise transfer between dwellings are both key considerations in respect of amenity and privacy.

The Urban Design Manual lists Privacy & Amenity as one of twelve key issues, with specific reference to the need to prevent sound transmission in homes by way of appropriate acoustic insulation or layout. There is some comment in relation to the use of appropriate building materials and also the zoning of dwellings to minimise the potential for excessive noise transfer.

## 2.3 Local Planning Policy

### 2.3.1 Kerry County Council Draft County Development Plan 2009-2015

The Kerry County Council County Development Plan for Kerry (2009 to 2015) recognises the significance of addressing noise issues in a planning context. Section 13.12.3 of the Draft Development Plan states:

*"Any industrial or commercial development shall not by way of noise, odors, pollution and traffic or in any other way, be injurious to the residential amenity of adjoining properties<sup>8</sup>"*

The County Development Plan also recognises the importance of setback distances for proposed developments from public roads. Section 13.5.2 details the building line setback requirements from public roads for *"low density residential developments in non-serviced areas i.e. where no public wastewater scheme and/or water are available"* as follows;

<b>Building Line</b>	National routes: National Primary	Minimum 50m
	National Secondary	Minimum 30m
	Other Roads:	Minimum 20m
	<i>It is desirable that dwellings are set back as far as possible from roads in order to minimise their impact. In certain instances the building line will be established by reference to the adjacent structures.</i>	

### 2.3.2 Tralee and Killarney Environs Local Plan, 2007:

The Tralee and Killarney Environs Local Plan 2007 highlights the importance of development regulation in the vicinity of Kerry Airport. Any proposed development within the surrounding area of the Airport or further development of the Airport itself must be assessed with regard to noise.

*"It is important to safeguard the airports operation and expansion, and therefore development should be restricted between Currow and the Airport and between the Airport and the N22. The following matters need to be considered in relation to proposed developments around the airport:*

- Developments may be proposed in noise sensitive areas and should be vetted accordingly;*
- Residential development should be restricted in these areas so as to safeguard inhabitants and safeguard the airport's future expansion;<sup>9</sup>"*

### 2.3.3 Kerry Local Authorities General Policy

Kerry Local Authorities will comply with all its statutory obligations under the Environmental Pollution Act, 1992, the Local Government (Planning and Development) Act, 2000 (as amended), the Safety Health and Welfare at Work Act, 2005 and any regulations prescribed under the acts.

### **3 Description of the Action Planning Area**

#### **3.1 County Kerry.**

The Noise Action Plan applies to the areas adjacent to roads in Kerry, which experience traffic volumes in excess of 3 million vehicles per annum, as per the Environmental Noise Regulations 2006. The Kerry County Development Plan 2009-2015 states:

*"County Kerry is located in the South West of Ireland and covers an area of 1,815 sq. miles. It is the fifth largest County in Ireland and is bounded on the west by the Atlantic Ocean, to the north by the Shannon Estuary and to the east by Limerick and Cork. The latter County also forms its southern boundary.*

*The County can be divided geographically into low-lands and gentle hills in the North and rugged hills and mountains in the South and West. The Dingle, Iveragh and Beara Peninsulas are primarily mountainous in nature.*

*County Kerry is noted for its agriculture, tourism and beautiful landscapes and it contains Ireland's highest mountain, Carrauntuohill. Kerry has two Gaeltacht areas, which are of national importance, Gaeltacht Chorca Dhuibhne which is situated on the Dingle Peninsula and Gaeltacht Uibh Ráthaigh which is situated on the Iveragh Peninsula.*

*Three main towns dominate: Tralee, the County town and administrative centre, Killarney, the main tourist town and Listowel, a more traditional market town, with a strong cultural identity.*

*The coastal nature of the County should not be underestimated. The County contains many unique off shore islands with strong heritage and faunal significance both for County Kerry and for Ireland as a whole. The climate is influenced by its maritime location and this produces considerable rainfall. This has meant that agriculture tends to be dominated by grassland based activities with limited arable production. The climate, particularly the south western most tip, is noted for its mildness with frost being a rarity.*

*Kerry is often referred to as "the Kingdom" because of its independent nature. It can also be called the Kingdom in terms of heritage. Aspects of this heritage are internationally and nationally recognised such as Skellig Mhichíl and Staigue Fort. The County's heritage and its location at the western edge of Europe have so far escaped from intense development pressure.*

*In both linguistic and cultural terms, the Gaeltachts of Kerry are unique, with Irish being the living language of the people in everyday life. The Irish language is intrinsically linked to the heritage and culture of the Gaeltacht Region.<sup>8</sup>"*

### 3.2 Population Data:

"The population of the County was 126,130 in 1996 and increased to 132,527 in 2002 and 139,835 in 2006. The current development plan and housing strategy are based on projections from 2006. In 2009 the population is expected to be 145,621 and by 2015 this will have grown further to 160,363. The increase in population between 2002 and 2006 constituted a 5.5% increase compared with the state average of 8.2%.

Population forecasts make it possible to estimate the number of people that may be expected to live in the county in 2015. Population projections can also help to provide estimates on how many dwellings and the services that will be needed in the future. A knowledge of the expected population, dwellings, land and infrastructural requirements provides the necessary information required to plan for the future. It allows growth to be managed so that all people living in a range of locations have a choice of homes, jobs, schools and services that meet their needs.

The towns of Tralee and Killarney were identified as a "Linked Hub" under the National Spatial Strategy.

In February 2007 the DoEHLG issued revised 'National Population Projections and Regional Population Targets 2006 – 2020'. Through the South West Regional Authority, Counties Cork and Kerry further analysed these figures to produce County population projections. This approach ensured consistency from County to Regional to National level.<sup>10</sup> The figures are outlined in the Table below:

#### County Population Projections

Area	2002	2006	2012	2115	2020	Growth rates		
						2006-2020	2006-2012	2012-2020
County Kerry	132,527	139,835	151,647	160,785	176,016	1.66	1.36	1.88
Linked Hub 1	35,124	37,347	41,325	45,009	51,150	2.27	1.7	2.7
Remainder metro 2	32,289	35,082	37,428	39,835	43,847	1.61	1.08	2
Metropolitan (including Hub)	67,413	72,429	78,753	84,844	94,997	1.96	1.41	2.37
Principal towns in Primary functional Areas outside Metro, incl Listowel	11,631	12,245	14,061	15,129	16,909	2.33	2.33	2.33
Balance	53,483	55,161	58,832	60,811	64,110	1.08	1.08	1.08

<sup>1</sup> Tralee and Killarney

<sup>2</sup> The metropolitan area is defined as the Hub towns including the Area covered by the Hub settlements plan

### **3.3 Transport Infrastructure in Kerry**

#### **3.3.1 Road Network**

There are approximately 4,713km of roads in Kerry. There are three National Primary Routes; the N21 (Tralee to Limerick), the N22 (Tralee to Cork) and the N23 (Castleisland to Farranfore). The total length of the three National Primary Routes is approximately 96km (2% of the total road network). There are five National Secondary Routes in the county (N69, N70, N71, N72 and N86) comprising approximately 336km (7%). There are 455km Regional Roads (10%) and 3826km (81%) of Local Roads in the county. The majority of the road length (91%) is made up of Regional and Local Roads, a reflection of the predominantly rural nature of the county. All routes with traffic volumes greater than 3 million vehicles per annum in Kerry were assessed as part of the national noise mapping model undertaken by the NRA.

#### **3.3.2 Rail Network**

At present, the only rail network in Kerry is the service between Tralee and Mallow. Just over 6,000 trains per annum travel this route, 20% of the number for which rail noise mapping/action planning would be required for implementation of Round two of the regulations.

#### **3.3.3 Air Transport**

Kerry airport, located near Farranfore, is a regional Airport. The Airport is strategically located in the centre of the Tralee-Killarney Hub mid-way between the two main population centres of Tralee and Killarney and is adjacent to the National Primary Road network thereby making the airport easily accessible to the centres of tourism and commerce throughout the county. There are between 10,000 and 11,000 movements into and out of the airport per annum, which rarely fluctuates. These include commercial scheduled, commercial charter and training flights. Training flights account for approximately less than 2% of this total. The aforementioned information was supplied by Kerry Airport Management.

A major airport is defined in the legislation as a civil airport that has 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. The number of movements per year at Kerry airport is significantly lower than the threshold required for Action Planning.

### **3.4 Extent of Action Planning Area**

The Kerry action planning area is defined from the legislation as the area affected by noise from a major road carrying greater than 3 million vehicles per annum. The NRA as the noise mapping body generated noise maps for national roads in Kerry with traffic volumes in excess of 3 million vehicles per annum. These national road noise maps were based on traffic figures from the NRA National Traffic Model.

The noise mapping of non-national roads was carried by a centralized approach with the NRA appointed as the noise mapping body to carry out this noise mapping on behalf of Local Authorities. Regional roads with traffic volumes in excess of 3 million vehicles per annum were

identified by Kerry County Council by using existing historical traffic count data and/or carrying out new traffic counts on regional roads within the county.

The action planning areas with respect to national roads in Kerry identifiable from the NRA noise maps are:

Action Planning Area	AADT 2012
N21 Tralee to Ballycarty Road	19,433
N22 Existing Killarney Bypass	15,580
N70 Tralee to Killorglin (within Tralee)	7,991
N69 Tralee to Listowel (within Tralee)	9,405

The action planning areas with respect to non-national roads in Kerry identifiable from the NRA noise maps are:

Action Planning Area	AADT 2012
R551 from Mounthawk Roundabout to the Ballonagh Junction	11,170
R551 from Aquadome Roundabout to Dominican Church	12,706
R874 from N86 to the Railway Station	9,529
R 919 from County Buildings to the Ballymullen Roundabout at N70	10,194
R876 Cleeny Roundabout to Garda Station	9,547

The boundary of the lands is not defined by distance from the noise source but rather it is the land area defined by computer modelling to be affected by noise levels of greater than 50dB(A)  $L_{night}$  and/or 55dB(A)  $L_{den}$ .

#### **4.0 Responsible Authority for Action Planning**

##### **4.1 Name and Contact Details**

Roads, Transportation and Safety Department,  
Kerry County Council,  
County Buildings,  
Tralee,  
Co. Kerry.  
Phone: 066 7123500  
Fax: 066 7129764  
Email: [kcc@kerrycoco.ie](mailto:kcc@kerrycoco.ie) [gaelge@ciarrai.ie](mailto:gaelge@ciarrai.ie)

##### **4.2 Description of other bodies of relevance.**

Kerry Local Authorities are responsible for the maintenance and upkeep of all National, Local and Regional Roads in the county. Kerry Local Authorities in consultation with the NRA and the Department of Transport are responsible for the design and construction of new roads in the county.

##### **4.3 Description of noise reduction measures already in place.**

The most common noise reduction measures currently in place in Kerry are mitigation measures as a result of and incorporated into the construction of new National Road Schemes to national design guidelines to minimise impact on residential amenity. The following are National Road Improvement Schemes (RIS) completed in Kerry since 2000:

<b>Scheme Name</b>	<b>Approx. Length</b>	<b>Year of Opening</b>
• N21 Castleisland Bypass	approx 5km	2010
• N22/N69 Tralee Bypass	approx 13.5km	2013*

*\*Note: This scheme is currently under construction and scheduled for completion in 2013.*

*Noise attenuation measures such as Noise Barriers and Environmental Bunds as recommended by the relevant Environmental Reports and Environmental Impact Statements in accordance with the appropriate NRA Guidelines have been constructed with regard to the abovementioned Schemes.*

Traffic calming measures have been implemented in a number of areas of the county. In addition to the primary road safety benefit of these measures, they also effect a reduction in road noise because of the lower noise levels produced by slower moving vehicles. These Traffic Calming Measures include physical buildouts, gateway signage treatment, lighting and line markings. One example is the Traffic Calming at the Ballyseedy staggered junction on the N21 Tralee to Castleisland Road.

## **5.0 Summary of noise mapping results.**

### **5.1 Overview of the preparation of the noise map**

The strategic noise maps were prepared by the NRA using a computer model as recommended by the EPA in their Guidance Note for Strategic Noise Mapping. The EPA recommended that the UK CRTN methodology be used for the assessment of road traffic noise levels for the second round of strategic noise mapping. It notes that the method should be used with particular reference to the following:

- The NANR 93 project report;
- DMRB Volume 11 Section 3 Part 7 HD 213/11 Annex 4,
- Additional advice to CRTN procedures;
- TRL Project report PR/SE/451/02, Converting the UK Traffic Noise Index  $L_{10,18h}$  to EU Noise Indices for Noise Mapping, 2002; using traffic count information, particularly for the night period, wherever practicable.

Thus CRTN, taking cognisance of the supplemental reports identified above, was used for all noise mapping calculations

The NRA generated GIS grids of noise levels as an output of the noise modelling procedure. The maps show the noise contour bands in 5dB contours from 55dB to >75dB  $L_{den}$  and 50dB to >70dB  $L_{night}$ .

For Further information in relation to the preparation of the noise mapping please see Appendix II

## **5.2 Presentation of results.**

### **5.2.1 Noise Contour Maps**

The strategic noise maps are attached in Appendix IV and can also be viewed in higher resolution on the NRA website at the following link:

<http://nra.ie/Environment/NoiseMaps/StrategicNoiseMaps/>

Each map shows colour-coded contours of different noise bands, identifying areas that are relatively louder or quieter. The noise indicator contours shown on the noise maps are  $L_{den}$  and  $L_{night}$ . These are defined as follows (more detailed definitions can be found in Appendix I):

- $L_{day}$ : The A weighted average sound level over the twelve hour day period of 0700-1900 h;
- $L_{evening}$ : The A weighted average sound level over the 4 hour evening period of 1900-2300 h;
- $L_{night}$ : The A-weighted average sound level over the 8 hour night period of 2300-0700 h;
- $L_{den}$ : The day, evening, night rating level.  $L_{den}$  is a logarithmic composite of the  $L_{day}$ ,  $L_{evening}$ , and  $L_{night}$  levels but with a 5dB(A) weighting added to the  $L_{evening}$  value and a 10dB(A) weighting added to the  $L_{night}$  value.

The noise levels reflect an annual average 24-hour period. The  $L_{den}$  contours shown on the maps range from 55dB to 75dB in 5dB contour bands. The  $L_{night}$  contours range from 50dB to 70dB in

5dB contour bands. Areas with noise levels of less than 55dB  $L_{den}$  and less than 50dB  $L_{night}$  are not mapped because these levels are below the threshold for inclusion under the legislation.

### **5.2.2 Summary Exposure Statistics**

Annex VI of the END requires reporting of the estimated number of people living in dwellings exposed to various noise levels on the most exposed façade. In order to derive these results the following datasets were used

- population data from the CSO
- address data from the geo-directory
- façade points output by the noise model (describing the noise level at the facade of every building),
- building polygons, used by the noise model

The population data used was from Census 2011 and is using the 'small areas' geographies which are areas of between 50 and 200 dwellings, downloaded from the CSO website, as well as ED's, and Administrative counties. The address data used was Geo-Directory from quarter 2 2011 (Q2 2011). Façade points were the outputs of noise modelling. For the noise mapping 2012 project a noise model was created with a 2km buffer on each county. By analysing all these datasets together it was possible to estimate the average number of people for each residence in the test area (the small area) and assign a noise level to that building. These estimates were collated to derive an overall exposure level for the County.

*Full details of this process are presented in Chapter 10 of the EPA's Guidance Note for Strategic Noise Mapping.*

**Table 2: Population Exposure Data, (Lden)**

Road/ Location	Decibel Level Contour	Estimated Population	Approx Number of People as a %
Road	<55	32,863	80%
Road	55 - 59	2,552	6%
Road	60 - 64	2,939	7%
Road	65 - 69	2,536	6%
Road	70 - 74	413	1%
Road	> 75	0	0%
<b>Total Population</b>		41,303	

**Table 3: Population Exposure Data, (Lnight)**

Road/ Location	Decibel Level Contour	Estimated Population	Approx Number of People as a %
Road	<50	34,891	84%
Road	50 - 54	2,965	7%
Road	55 - 59	2,763	7%
Road	60 - 64	683	2%
Road	65 - 69	0	0%
Road	> 70	0	0%
<b>Total Population</b>		41,302	

**Table 4: Population Exposure Data, (Lden)**

Road/ Location	Decibel Level Contour	Approximate Area (km <sup>2</sup> )	Total Residences per noise contour	Estimated Population
Road	>55	49	4,370	8,440
Road	>65	9	1,757	2,949
Road	>75	0.02	0	0

**Table 5: Population Exposure Data, (Lnight)**

Road/ Location	Decibel Level Contour	Approximate Area (km <sup>2</sup> )	Total Residences per noise contour	Estimated Population
Road	>55	25	3,383	6,411
Road	>65	4	500	683
Road	>75	0	0	0

### **5.3 Limitations of the noise mapping process.**

#### **5.3.1 Limitations of the computer modelling method**

The data used to generate the noise maps was obtained from computer modeling rather than from actual noise measurement. This approach is in accordance with the Noise Regulations. There are technical and practical reasons for using computer modelling in preference to noise measurement to produce noise maps: **(ref 11)**. Noise levels at each monitoring location will generally result from a combination of different sources and physical measurement would not allow for the specific contribution from road noise to be determined. Furthermore, to produce a map based on measurements would require a large number of measurements to be made at each location over extended monitoring periods, at prohibitive expense.

The use of computer modelling to prepare noise maps is not a limitation of the noise mapping process because it is the method imposed under the Regulations. However, this noise mapping method does make it difficult to quantify the reduction in noise levels achieved by specific mitigation measures implemented at a local level. Without “before” and “after” noise monitoring results, improvements cannot be quantified. To address this limitation, Kerry Local Authorities proposes that where specific situations are identified for which mitigation measures may be required, a limited amount of noise monitoring will be conducted to confirm that noise levels are unsatisfactory. Where mitigation measures are implemented, further monitoring will be carried out to quantify the effectiveness of the measures.

Data obtained from computer modelling is somewhat limited in that it provides a single annual average noise level and does not identify changing noise profiles over time.

#### **5.3.2 The vehicle count data**

The noise maps produced by the NRA for the national road network were based on the NRA National Traffic Model.

The traffic data in relation to non-national roads in the county were gathered from historical records or traffic counts carried out specifically. The regional roads in the county which fall above the 8220 AADT are:

- R551 from Mounthawk Roundabout to the Ballonagh Junction. - 11,170 AADT
- R551 from Aquadome Roundabout to Dominican Church - 12,706 AADT
- R874 from N86 to the Railway Station. - 9,529 AADT
- R 919 from County Buildings to the Ballymullen Roundabout at N70. - 10,194 AADT
- R876 Cleeny Roundabout to Garda Station - 9,547 AADT

## **6 Identification of areas to be subjected to noise management activities**

### **6.1 Assessing and prioritising actions.**

There are no statutory limits in place in relation to environmental noise exposures at EU or national level. The EPA recommends<sup>12</sup> that the proposed onset levels for assessment of noise mitigation measures for noise due to road traffic should be as follows:

- 70dB,  $L_{den}$  and
- 57dB,  $L_{night}$

The proposed onset levels for assessment of noise level preservation for quiet areas, where the existing noise level is considered good are as follows:

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

In order to focus resources on areas in most need of improvement, a decision matrix will be applied, based on work carried out by Dublin Agglomeration as outlined in the *EPA Guidance Note for Noise Action Planning*. The final matrix score is determined based on three variables:

- 1. The calculated environmental noise level (from the noise mapping data).**
- 2. The type of location (e.g. town centre, commercial, residential).**
- 3. The noise source (i.e. road, rail, airport, agglomeration).**

#### **1. Calculated environmental noise level.**

The score under this variable is assigned based on the calculated  $L_{den}$  and  $L_{night}$  levels for the location.

#### **2. Type of location.**

This score is assigned based on the type of land use in the area and on the receptor. A higher score is assigned to open countryside on the basis of the expectation that residences in open countryside will have lower ambient noise levels than commercial areas and town centres. A higher score is also assigned to noise sensitive locations because of the requirement for low noise levels for them to function effectively (e.g. schools, churches, funeral homes, hospitals, nursing homes).

#### **3. Noise Source**

In Kerry, the noise source is the same for all assessments (i.e. noise from major roads). It has been suggested in *EPA Guidance Note for Noise Action Planning* that each Action Planning Authority may impose an additional weighting factor to the matrix to include the number of residents at each address. However Kerry Local Authorities does not propose to impose this additional weighting for the following reasons:

- The number of residents at a particular location may change with change of ownership.

- While there may be only one or two residents at a particular address, their lifestyle habits may be such that they spend considerably more hours around the home than for example a large family where the adults are at work all day and children are at school.

Data obtained from the matrix tool will enable Kerry Local Authorities to prioritise actions. A matrix assessment score of **17** or greater will be taken to indicate that the threshold levels may have been exceeded and that the location should be included in the shortlist for further assessment.

**Table 6. Matrix A: Example Decision Support Matrix to identify and prioritise noisy areas**

<b>Priority Matrix</b>				
Based on Maximum exposure levels in the assessment area				
<b>Location</b>		Roads (Kerry)		
<b>Decision Selection Criteria</b>		<b>Score Range Lden</b>	<b>Score Range Lnight</b>	<b>Sub Total</b>
<b>Noise Band</b>	<45	5	6	
	45-49	4	5	
	50-55	3	4	
	55-59	2	2	
	60-64	1	3	3
	65-69	2	4	
	70-74	3	5	3
	75-79	4	6	
	>/=80	5	7	
<b>Type of Location</b>	City centre	1	1	
	Commercial	1	2	
	Residential	2	3	
	Noise Sensitive	3	3	
	Open Countryside	3	3	6
	Quiet Area	3	3	
	Recreational open space	2	2	
<b>Type of noise source</b>	Air	3	4	
	Industry	2	3	
	Rail	2	3	
	Road	3	4	7
<b>Total score</b>				<b>19</b>

## **6.2 Preservation of noise levels in quiet areas and noise sensitive locations**

A quiet area in open country is defined as an area delimited by the action planning authority following consultation with the agency and approval by the minister, that is undisturbed by noise from traffic, industry or recreational activities. At present, there are no such areas identified along the stretches national and non-national which noise mapping has been carried out therefore quiet areas are not relevant to this action plan.

Noise Sensitive locations are locations for which a quieter noise environment is preferable for effectively carrying out the functions of the particular location. They include schools, libraries, hospitals, nursing homes, funeral homes, churches and other places of worship.

The noise maps will be examined to identify any noise sensitive locations situated within the action planning area. Any noise sensitive locations identified will be tested against Matrix 'A' to establish whether mitigation measures need to be carried out to improve the existing noise situation.

## **7. Mitigation and Protection Measures:**

### **7.1 The Source of Road Noise.**

The level of environmental noise generated by a particular road is dependent on a range of factors including the number and type of vehicles, the speed of the vehicles, the road surface and the incline. The extent to which the noise travels from the road is affected mainly by the following parameters: distance, weather, the presence of acoustic barriers, buildings, road width, road incline, nature of the topography and whether the ground is acoustically absorbent or reflective. The most significant factor in terms of noise generation is the noise produced by the vehicle. Vehicle noise arises from three sources:

- Propulsion noise (engine, powertrain, exhaust and intake systems);
- Tyre/road contact noise; and
- Aerodynamic noise.

Engine noise is the dominant source at lower speeds (under 30kph for passenger cars/under 50kph for lorries), tyre/road noise dominates above that and aerodynamic noise becomes louder as a function of the vehicle speed (ref European federation for transport and environment).

Vehicle noise limits are set in EU legislation and address propulsion noise for new vehicles. Current limits are shown in Appendix VI. Noise emissions are determined by means of a vehicle drive-by test, which measures the noise emitted as the vehicle drives by at 50kph and accelerates in front of the microphone position. The current drive by test does not include provision for evaluating noise performance in typical urban stop-start traffic situations at lower speeds, where engine noise is the dominant source. Another failing is that the test parameters are set in such a way that vehicles can be designed to pass the test but are considerably louder when driven on the road. A new type of vehicle test has recently been introduced which corrects for these limitations.

The EU noise limits are a valuable tool for ensuring that noise emissions are minimized for new vehicles. However they only apply to new vehicles. As vehicles age, the level of noise produced by the engine increases with wear and tear on the parts but there is presently no requirement in Ireland to assess noise emissions from older vehicles. Another practical limitation to the noise emission limits is that while a newly purchased vehicle may comply with its emission limit, modifications to or removal of the vehicle silencer will result in an excessively noisy vehicle. Installation of a sports exhaust on a vehicle is not illegal at present and is a major contributor to nuisance noise from road vehicles.

Tyre rolling noise emissions have increased over time, predominantly due to the trend towards wider and heavier tyres. Tyre/road contact begins to dominate the noise emission above 30km/h for passenger cars and above 50km/h for lorries. For this reason, it was deemed necessary to regulate tyre/road noise separately at EU level. EC Directive 2001/43/EC complements the vehicle noise emission limits by setting a test procedure and noise limit values for tyre rolling noise. The directive stated that the limit values should be reviewed and revised by summer 2004 but this revision has not yet taken place. A report making recommendations for the revision of the limit values and other aspects of the directive was presented to the European Commission in 2006. The report outlined a proposal for two phases of stricter limit values for 2008 and 2012, for tyres for

passenger cars and trucks. The recommendations of the report have not yet been implemented, although the report found that imposition of stricter tyre noise limits would have significant benefits in terms of road noise reduction. As vehicle tyres have a much shorter lifespan than the vehicles themselves, implementation and enforcement of tighter tyre rolling limits would also have a rapidly beneficial effect on road noise.

## **7.2 Measures To Reduce Noise From Major Roads.**

### **7.2.1 Existing Developments.**

There are a number of approaches that can be taken to reduce noise from major roads for *existing* dwellings:

Relocating the road away from high-density settlements by the construction of a Bypass is obviously the most effective method of minimising the numbers of dwellings likely to be affected by the road noise. Where areas are identified by further assessment as requiring possible mitigation, it may be possible to install noise barriers on major roads.

Traffic calming measures can be employed where the major road passes through a built-up area.

Changes to the road surface to use porous asphalt may be appropriate in some instances; the road surface must be regularly cleaned to keep the pores free of sediment otherwise the sound absorbing properties of the surface are reduced. Porous surfaces are more effective at higher vehicle speeds and are not as effective within 50kph speed restriction zones.

Improved insulation will reduce noise levels within dwellings but this is only effective when windows are kept closed.

### **7.2.2 Future Developments.**

The measures available for the protection of future developments from exposure to noise from major roads include acoustical planning measures in land use zoning and development layout, design and specifications, such as: locating residential developments away from major roads; using the lands around major roads feeding into towns for commercial/industrial development; incorporating noise issues into the design of housing developments by locating the access roads and green areas on the major road side of the development, thus increasing the separation distance between the houses and the roads; through the implementation of "Building Line Setback" distances specified in NRA guidelines and the Kerry County Development Plan (see section 2.3.1 above); using a higher standard of insulation for new dwellings adjacent to major roads and also using higher standards of insulation for the exposed façades of new dwellings. These are acoustical planning measures although not all are within the control of the planning authority.

### **7.3. Proposed Measures For Kerry Action Planning Area**

#### **7.3.1 Mitigation Measures:**

Residences located within the action planning area will be tested using the decision matrix (Matrix A) to prioritise areas for which further assessment may be required. From the Noise Maps produced the N21 from Tralee to Ballycarty and the N22 from Farranfore to Killarney sections of the national road network in Kerry may be considered for further assessment and possible action planning.

The section of National Road N21 Tralee to Ballycarty is currently operating at almost twice the design traffic volume as it is conveying both N21 and N22 traffic. At present the N22/N69 Tralee Bypass is under construction and scheduled for completion in 2013. On completion and opening of the N22/N69 Tralee Bypass, it is predicted that traffic volumes on the existing N21 Tralee to Ballycarty section will reduce by almost half as N21 and N22 traffic will be segregated. Therefore traffic noise will also be reduced along this section of the N21. Detailed traffic models and noise assessments were undertaken as part of the EIS for the N22/N69 Tralee Bypass. Specific mitigation measures are required in relation to noise on the scheme, such as noise barriers and environmental bunds in order to reduce the noise impact on the surrounding areas. Post opening of the N22/N69 Tralee Bypass Scheme traffic counts will be undertaken on the the N21 Tralee to Ballycarty section and an assessment will be made to determine if further noise assessment/action planning is necessary.

The section of the national road N22 Farranfore to Killarney identifiable from the Noise Maps with high noise levels is currently being progressed as a Road Improvement Scheme by Kerry National Road Design Office. This Scheme is at Design Stage and the Preferred Route has been selected and published. An SEA screening report is currently being undertaken with respect to the Scheme with it being likely that an EIS will be required. In any event an Environmental Report will be undertaken as a minimum. The Noise impact as a result of the scheme will be assessed as part of the Environmental assessment of the proposed scheme and mitigation measures will be determined.

Following the results of the strategic noise mapping for non-national roads the roads identified may need further assessment to confirm the noise levels on site and test the roads individually using the decision matrix (Matrix A). However, 4 of the roads namely

- R551 from Mounthawk Roundabout to the Ballonagh Junction.
- R551 from Aquadome Roundabout to Dominican Church.
- R874 from N86 to the Railway Station.
- R 919 from County Buildings to the Ballymullen Roundabout at N70.

are in the town of Tralee and the construction of the N22/N69 Tralee Bypass as identified above will reduce traffic volumes and therefore traffic noise along these sections of roads. The R876 Cleeny Roundabout to Garda Station is in Killarney and the construction of the N22 Farranfore to

Killarney Road scheme as also outlined above will reduce traffic volume and therefore traffic noise along this section of road.

Reducing traffic density is the most effective way to reduce road noise emissions. Kerry Local Authorities will strive to reduce traffic density on a countywide basis by:

➤ **Promoting Public Transport:**

The promotion of Public Transport is a stated objective of the *Kerry County Council County Development Plan 2009-2015*:

*"The Capital Investment Framework under the National Development Plan through which the transport system in Ireland will be developed over the period 2006 to 2015 is set out in the Government publication "Transport 21". Transport 21 provides for the capital funding only for major infrastructural projects but is complimentary of other Government Initiatives such as the Rural Transport Programme and The Sustainable Travel and Transport Plan. It is important to continue to develop the transportation infrastructure within the County of Kerry in order to improve the economic, physical and social well being of the county and its inhabitants. The continuing economic development of the county is dependent upon a good transportation network that is adequately and appropriately linked to the major urban centres and port regions. An adequate transportation network is required to maximise the efficiency of land-use and the transit of goods and people into, within and out of Kerry. This requires an integrated, sustainable and balanced approach between all aspects of travel including public and private transport systems, cyclist and pedestrian movements. In supporting the growth of local and urban development it is also essential to firmly integrate the future provision of the county's transportation infrastructure, particularly public transport, within overall land use strategies."*

Objective No.	General Transportation
	<i>It is an objective of the Council to:</i>
<b>INF 8-9</b>	<i>a) Increase the emphasis on public transport in accordance with the principles of sustainability. b) Protect and develop the county's principal transportation assets including ports, Kerry airport and strategic road and rail corridors. c) Promote the development of all transportation links both within and out of the county in co-operation with the three Town Councils of Tralee, Listowel and Killarney as well as Limerick County Council and Cork County Council so as to integrate the different modes of transport.</i>

➤ **Future development of Park and Ride facilities**

The development of Park and Ride Facilities in major towns throughout the county is also a stated objective of the Kerry County Council Draft County Development Plan 2009-2015

Objective No.	Car Parking
	<i>It is an objective of the Council to:</i>
<b>INF 8-33</b>	<p><i>a) Provide new and improve existing public parking areas. Such areas shall be provided as part of an overall traffic management scheme. b) Introduce pay parking to fund the provision of car parks as required. c) Facilitate the provision of 'park and ride' facilities for the major towns throughout the county</i></p>

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➤ **Improved traffic management and smoothing traffic flows.**

The preparation of Town Traffic Management Plans is a stated objective of the Kerry County Council Draft County Development Plan 2009-2015

Objective No.	Traffic Management
	<i>It is an objective of the Council to:</i>
<b>INF 8-35</b>	<b>Traffic Management Plans</b> <i>It is an objective of the Council to prepare and implement new, and improve existing, Traffic Management Plans for towns and villages as the need arises.</i>
<b>INF 8-36</b>	<b>Delivery plans/schedules in urban areas</b> <i>It is an objective of the Council to assess and where appropriate, regulate the delivery plans/schedules to urban areas so as to alleviate traffic congestion.</i>

The Tralee Transport Strategy has been through the Public Consultation Phase and was adopted by Tralee Town Council on the 9<sup>th</sup> April 2013. The Tralee Transport Strategy has taken into account the Smarter Travel Initiative by providing areas for vulnerable road users and making places more attractive for both the pedestrian and the cyclist

The main elements of the Plan include:

- *Shared Space on Russell Street, Bridge Street, New Road and Island of Geese;*
- *Shared Space facility in The Mall between Denny Street and Russell Street*
- *Restoration of Denny Street to a two way road with the current angular parking arrangement replaced with parallel parking;*
- *Taxi rank on the Mall relocated to three ranks located on Denny Street, Staughton Row and Rock Street Lower;*
- *Two-way traffic on Ivy Terrace while restricting HGV movements from Prince's Quay onto Ivy Terrace*
- *Parking Strategy to encourage people into the town and maintain a high turnover of on-street parking supply thereby increasing footfall;*
- *Introduction of a 30 kph Zone in the Town Centre;*
- *18 no. junction and road improvements at various locations around Tralee Town;*

Kerry Local Authorities will consider improvement or changes to road surfaces during routine road maintenance, where necessary, by:

- *Improving the quality of road surfaces by ongoing road maintenance programmes.*

- *Using low-noise road surfaces where appropriate.*

Where relevant, Kerry Local Authorities will investigate the feasibility of extending speed limit zones. For major national roads, this would be done in consultation with the NRA.

Kerry Local Authorities will ensure that council-owned fleet vehicles are maintained to an adequate level to minimise unnecessary noise generation.

### **7.3.2 Protection Measures for future improvement:**

Kerry Local Authorities will endeavour to utilise the planning process as necessary:

- To incorporate the aims of the present and future noise action plans into the county development plan and into relevant local area plans, protecting larger areas from road noise. Special consideration should be given to zoning objectives, speed limits and established settlements within the area.
- Developers are encouraged (or required at the discretion of the Planning Authority) to produce a sound impact assessment and implement mitigation measures as follows:
  - *For new developments proposed within the current action planning area or*
  - *For developments proposed near major roads (i.e. traffic volumes in excess of 3 million vehicles per annum or otherwise on a case by case basis).*
- Where developments are planned adjacent to major roads, to incorporate acoustical planning into the development design e.g. designing the development so that the access road is adjacent to the major road noise source. It may also involve the use of buffer zones and/or noise barriers and traffic calming measures.
- To ensure that all future developments are designed and constructed so as to minimise noise disturbance.

The above measures may be restricted under the existing provisions of the current Planning, Building and Fire Acts.

Kerry Local Authorities will consider providing for a higher standard of façade and window insulation on the most exposed façades in new local authority housing developments located beside major roads, potentially with a pre-completion sound insulation test carried out prior to habitation.

Kerry Local Authorities will consider requiring a higher standard of façade and window insulation for all new multiple residential developments located beside major roads, potentially with a pre-completion sound insulation test required prior to habitation. Kerry Local Authorities will consider requiring a higher standard of façade and window insulation for single one-off housing applications beside major roads.

The powers of the Planning Authority to impose the above measures are restricted by the provisions of the existing Planning Acts.

Protection measures for future improvement may also include extending speed limit restrictions around built-up areas.

### **7.3.3 Monitoring Measures:**

Data presented in the noise maps shown in Appendix IV is obtained from computer modelling and is reported as a mean annual noise level,  $L_{den}$  and  $L_{night}$ . The model may overestimate the environmental noise levels resulting from major road traffic at a particular location. Where the decision matrix process identifies locations for further assessment, noise monitoring may be carried out to confirm that levels of environmental noise are unsatisfactory and that mitigation measures may be required. The possibility of other noise sources contributing to the measured noise level must be taken into account in this assessment. Where mitigation measures can be implemented, further noise monitoring will be carried out after implementation in order to quantify the improvement achieved.

Kerry Local Authorities will liaise with adjoining Local Authorities and the NRA to ensure that adequate expertise is available between the authorities to enable the next phase of noise mapping to be carried out. This expertise may be sourced within the local and regional authority or via the NRA or external consultants.

### **7.3.4 Consultative Measures**

In areas where Kerry Local Authorities do not have a regulatory role, but where improvements in regulatory controls will effect a reduction in environmental noise from major roads, Kerry Local Authorities will consult and liaise with the relevant authorities.

These areas may include:

- i. Liaising with the NRA to extend speed restriction zones for national roads passing through built-up areas. Of relevance to the present and future action planning areas.
- ii. Liaising with the NRA to impose set back distances for developments alongside national roads.
- iii. Consult with the Department of Environment regarding present restrictions on Planning Authorities in relation to the imposition of planning measures to address noise in the assessment of applications.
- iv. Recommend to the Planning Authority that measures proposed in this action plan be included in the review of the Kerry County Development Plan and in relevant Local Area Plans.
- v. Recommending to the Department of Transport that noise monitoring be incorporated as part of the NCT and DOE commercial vehicle tests. Wear and tear on a vehicle will increase noise emissions and should be addressed in vehicle testing. A vehicle with a missing or defective silencer will not pass the NCT test. However a vehicle with a modified

exhaust (approved sports exhaust) will pass the test unless the air emission limits are exceeded.

- vi. Recommending to the Department of Transport that modified sports exhausts be made illegal for normal road use. This recommendation will obviously have resource implications for the Gardai in terms of enforcement.
- vii. Possibly recommending to the Department of Justice that An Garda Síochána be provided with noise testing instrumentation for roadside checks (of limited effectiveness without supporting legislation and emission limits – recommendation (vi) above would be easier to enforce and also more effective).
- viii. Liaising with the EPA to establish limit values for community noise.
- ix. Recommending to the Department of Transport that tighter tyre rolling noise limits should be implemented at EU and national level.

## **8. Public Participation.**

The purpose of the Public Consultation is to allow for public participation and review of the Kerry Noise Action Plan. The Draft Kerry Local Authorities Noise Action Plan 2013 will be advertised in the Kerryman Newspaper (3<sup>rd</sup> July 2013) and the Kerry's Eye Newspaper (4<sup>th</sup> July 2013) and made available for inspection at:

**Roads, Transportation & Safety Department,  
Room 115,  
Kerry County Council,  
County Buildings,  
Rathass,  
Tralee,  
Co. Kerry.**

The Draft Noise Action Plan will also be available for inspection on Kerry County Council's website [www.kerrycoco.ie](http://www.kerrycoco.ie)

An advert will be placed inviting submissions from the general public which should be made in writing and addressed to:

**Administrative Officer,  
Roads, Transportation & Safety Department,  
Room 115,  
Kerry County Council,  
County Buildings,  
Rathass,  
Tralee,  
County Kerry**

and must be received by **5:00 p.m. on Friday 30<sup>th</sup> August, 2013.**

Further details of the Public Consultation process and the submissions will be provided in Appendix V of the Final Plan.

After the Public Consultation and timeframe for submissions has passed, the submissions will be considered, responses formulated and the Noise Action Plan will be finalised.

In Appendix V of the Kerry Local Authorities Noise Action Plan comments on the submissions will be included and the public will be informed of the decisions taken.

The final Kerry Local Authorities Noise Action Plan will again be published in a Local Newspaper advertising that the Kerry Local Authorities Noise Action Plan 2013 is available for inspection.

## **9. Implementation Programme:**

### **9.1 Roles and Responsibilities**

Under the Environmental Noise Regulations, 2006, the National Roads Authority (NRA) is the noise mapping body for major national roads in Kerry. Kerry Local Authorities are the noise mapping body for major non-national roads in the county. Kerry Local Authorities is the Action Planning Authority for major roads in Kerry. The volumes of rail and air traffic in the county are below the threshold for noise mapping and so the Regulations do not apply to these areas at present.

Kerry Local Authorities are responsible for preparation of this noise action plan and for meeting the stated objectives of the plan, including implementing measures to improve existing noise levels at a local level (if appropriate) and identifying and implementing measures for the protection of the future environment from road noise. Kerry Local Authorities are also responsible for identifying major non-national roads that fall under the second phase of implementation of the regulations (i.e. more than 3 million vehicles per annum) and ensuring that noise mapping is carried out for these roads.

The NRA is the noise mapping body for major national roads under the second phase of implementation of the regulations on behalf of Kerry Local Authorities.

### **9.2 Targets and Objectives:**

It is the aim of this action plan to manage environmental noise from major roads, to protect good satisfactory noise environments where they exist and to protect the quality of the future noise environment by acoustical planning.

### **9.3 Programme of Works**

The Noise Action Plan is to be implemented through a staged process over 5 years such that the works undertaken within the Action Plan will feed into the third round of strategic noise mapping in 2017.

#### **Year one (2013):**

- Review strategic noise maps to identify priorities
- Confirmation of extent of impact
- Draw up list of areas for noise mitigation review
- Apply the matrix assessment method described in section 6.1 to identify from noise maps specific areas for which further assessment may be warranted (i.e. monitoring).
- Review the decision support matrix
- Endeavour to put appropriate funding in place to proceed with (1) the design and (2) the implementation of mitigation if necessary.

**Year Two (2014):**

- Assess any identified sites
- Feasibility study for possible mitigation measures
- Cost benefit analysis for feasible measures
- Undertake consultative measures outlined in 7.3.4 above.

**Year three to five (2015 to 2017):**

If funding provided, commence implementation of the relevant actions. Ensure that adequate traffic flow data is collected for all roads in the county and that a sufficient number of locations are monitored to establish any further areas for assessment. Review effectiveness of measures recommended and implemented as part of this action plan at the end of the 5 year life of the plan.

Commence preparation of revised noise action plan.

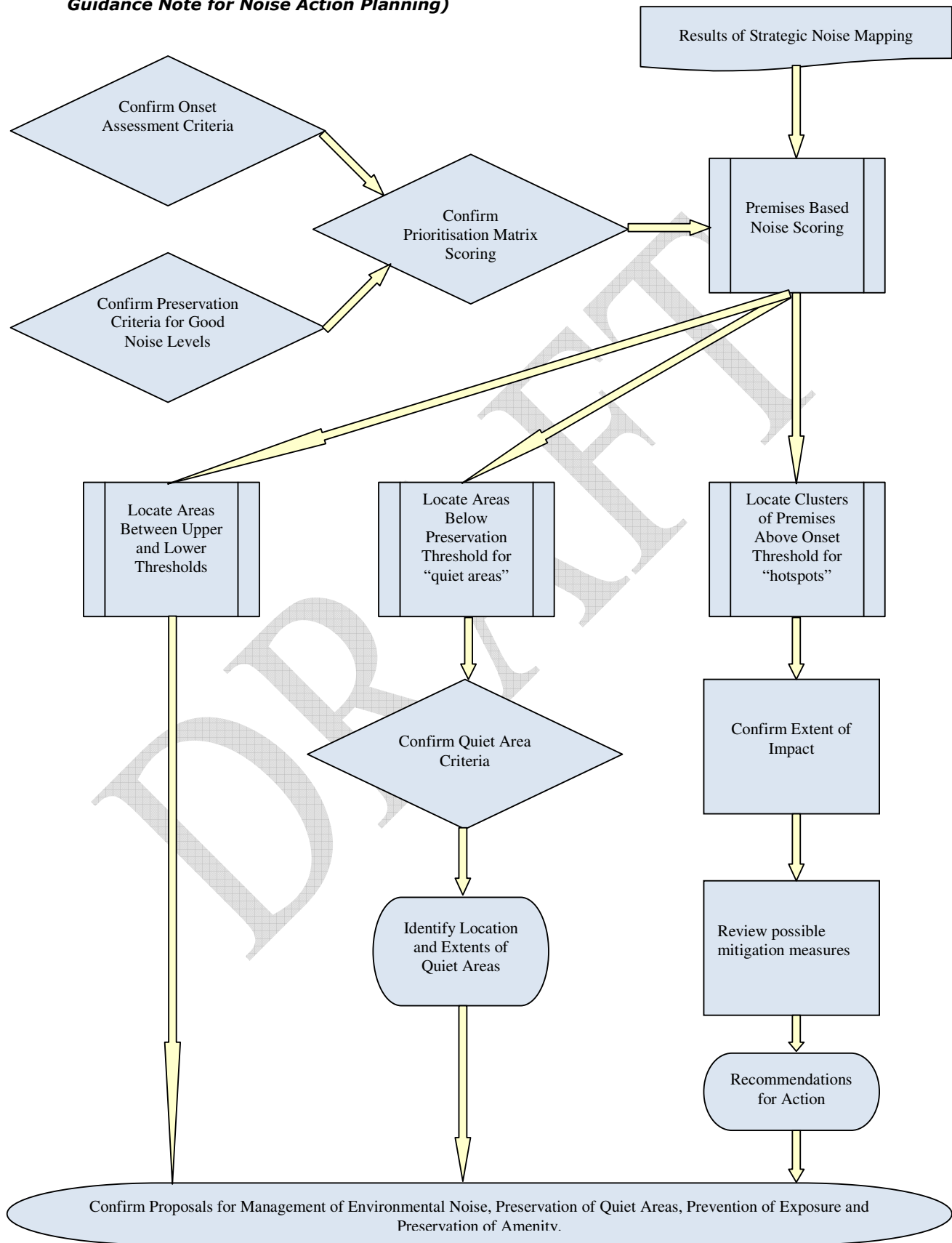
**9.4 Evaluation, Review and Corrective Action Programmes****9.4.1 Ongoing Review**

Progress will be reviewed against the programme of works on an annual basis. Highlight progress in implementation of action plan measures and also identify areas where corrective action is required or where the proposed measures must be modified for presently unforeseen reasons.

**9.4.2 End of programme review**

The revision of the action plan at the end of its five year life will form the end-of-programme review of the action plan. This revised plan will review progress in implementing measures, identify the extended noise mapping/action planning area, highlight aspects of the original action plan which were modified, giving reasons for the modification and recommend measures for future improvement.

**Overview of Recommended Approach to Determine Actions to be Undertaken (Ref. EPA Guidance Note for Noise Action Planning)**



## **10. Financial Provisions**

### **10.1 Budgetary Provisions.**

Financial provisions have not been made available at national level to fund any noise assessment measures, mitigation measures or additional noise mapping requirements resulting from implementation of this action plan. Staff resources have not been increased to assist in implementation of the plan. Because of the lack of these resources, any mitigation measures must be strictly prioritised. It is hoped that where mitigation measures are identified, their implementation will also be found to be of benefit to other local authority sections eg Environment, Planning & Development, Roads & Transportation, Housing.

### **10.2 Cost Benefit Analysis.**

Evaluation of the impact of noise nuisance is complicated because noise nuisance is subjective; it is largely related to the type of noise, the source of the noise and whether it is welcome or unwelcome, and background noise levels in the environment. Responses to noise from the different transport sources can vary considerably (ref 13). The impact of mitigating measures to address noise nuisance is further complicated because noise is measured on a logarithmic scale and human perception of loudness does not directly coincide with increased sound pressure levels (e.g. a 3dB increase in noise, which represents a doubling in sound pressure level, is the smallest statistically significant increase in loudness detectable by the human ear). To reduce the subjective "loudness" of a noise source by 50% would require a 10dB drop in noise level and may be very difficult to achieve without major investment in noise mitigation. Assigning a monetary cost to the noise nuisance can enable cost benefit analysis to be used as a decision support tool in determining what (if any) noise mitigation measure is to be implemented.

The position of the EC working group on health and socio-economic valuation of noise<sup>17</sup> (ref paper + DCC action plan) recommends the following in relation to road noise:

- *For road transport, the (interim) use of the median value change in noise perceived by households of €25 per dB ( $L_{den}$ ), per household per year. The validity range of this interim value is between 50/55  $L_{den}$  and 70/75  $L_{den}$  and it should be adjusted as new research on the value of noise becomes available.*
- *The estimate of the change should apply at all initial noise levels, and regardless of the size of any change brought about;*

As a preliminary step in carrying out cost benefit analysis on possible noise mitigation measures, Kerry Local Authorities propose to assign the monetary benefit to noise mitigation measures as recommended above (i.e. €25 per dB ( $L_{den}$ ) per household per year). The number of households in the immediate area that would potentially benefit from a particular mitigation measure will also be factored into the analysis.

## 11. SUMMARY AND CONCLUSIONS

The Kerry Local Authorities Action Plan addresses road noise from the national and non-national road network in Kerry. Lands adjacent to the road network are located within the action plan area if noise mapping has indicated that the environmental noise levels may be 55dB<sub>L<sub>den</sub></sub> or greater.

The aim of the action plan is to manage existing road noise within the plan area and to protect the future environmental noise environment within the plan area.

While no limits exist for environmental noise in Ireland, the EPA recommends that proposed onset levels for assessment of noise mitigation measures for noise due to road traffic are as follows:

- 70dB, L<sub>den</sub> and
- 57dB, L<sub>night</sub>

Noise maps were prepared for major roads in the county based on a road noise computation model run by the NRA. These maps present calculated environmental noise levels from major roads in coloured noise contour bands from 55dB L<sub>den</sub> and 50dB L<sub>night</sub> to greater than 75dB L<sub>den</sub> and greater than 70dB L<sub>night</sub>, in 5 dB bands.

The noise maps for Kerry were prepared based on the roads network in place in the county in 2012.

In terms of management of *existing* road noise, the first action proposed under the current plan is to use a decision matrix to identify areas for possible further assessment. The decision matrix carried out as part of this study concluded that the threshold levels recommended may have been exceeded based on a county wide approach.

The effective management of *future* road noise can be addressed to some extent through the planning process (acoustical planning). It is recommended that developers address the impact of road noise in assessment of new developments and design developments to minimise noise nuisance. For acoustical planning to be a useful tool, it can only be incorporated as a series of objectives into the Kerry County and Local Area Development Plans. Changes to supporting legislation will be required in order to effectively implement acoustical planning into the planning process.

Future Road Schemes currently at Planning and Design Stage in the vicinity of the sections of the Roads identified in this report subject to the Noise Action Plan will further aid in the reduction of noise levels on these sections. These Schemes are namely the N22/N69 Tralee Bypass and the N22 Farranfore to Killarney Road Improvement Schemes.

The proposed N22/69 Tralee Bypass Road Improvement Scheme comprises an 8.0km Type 2 Dual Carriageway Eastern Bypass of Tralee Town and a 5.5km Standard Single Carriageway link to the N22 at Bealagrellagh. The proposed Scheme will reduce traffic in Tralee Town by approximately 25% (4 Regional Roads subject to the NAP) and by approximately 44% on the N21 between Tralee and Ballycarty (section of the N21 subject to NAP). In addition to the construction of the N22/N69 Tralee Bypass a number of areas within the N22/N69 Tralee Bypass Scheme are being provided with Noise attenuating barrier as recommended by the Environmental Impact Statement for the Scheme.

The Proposed N22 Farranfore to Killarney has an overall length of approximately 27.0km which comprises approximately 19.7km of mainline between Farranfore and Killarney with approximately 7.3km of link roads. The proposed mainline provides a bypass of the N22 between the Park Road Roundabout and the Woodford Bridge in Killarney which will reduce traffic volumes by an estimated 60% and upwards this section of the N22 identified by the NRA to be subject of NAP. This Bypass will also reduce the volumes of traffic on the R876 Cleeny Roundabout to Garda Station subject to the NAP.

The construction of the aforementioned proposed road schemes in accordance with NRA noise guidelines and standards combined with advancements in noise reduction road surfacing materials and with the incorporation of noise reduction mitigation measures will further aid in achieving lower noise levels on and in the vicinity of Kerry's Major Roads.

## **Appendix I**

### **Glossary of acoustic and technical terms**

DRAFT

## Glossary

**Acoustical Planning:** Controlling future noise by planned measures such as land-use planning, systems engineering for traffic, traffic planning, abatement by sound-insulation measures and control of noise sources.

**Agglomeration:** a dense urbanised area having a population of greater than 100,000 persons.

**Decibel (dB):** A unit of measurement of sound. When measuring environmental noise, an "A" weighting network is used (called dB(A)) which filters the frequency of the sound to mimic human hearing, which is most sensitive to frequencies between 500Hz and 5,000Hz. The decibel scale is logarithmic. If two noise sources emit the same sound level (eg 80dB(A)), the combined sound level from the two sources is 83dB(A) and not 160dB(A).

The human perception of "loudness" is that a 10dB increase in sound level is perceived as being twice as loud. A 3dB increase, which is a doubling of the sound level, is perceived as a barely perceptible change in loudness.

A decibel level of zero represents absolute silence. A level of 140dB(A) would cause ear pain.

The table below gives examples of the relationship between the subjective valuation of noise and the actual objective levels (taken from the END Briefing note of the 07/02/08<sup>16</sup>):

Noise Level dB (A)	Description
120	Threshold of Pain
95	Pneumatic drill (at 7m distance)
83	Heavy diesel lorry (40km/h at 7m distance)
81	Modern twin-engine jet (at take-off at 152m distance)
70	Passenger car (60km/h at 7m distance)
60	Office environment
50	Ordinary conversation
40	Library
35	Quiet bedroom
0	Threshold of hearing

**Daytime:** Between the hours of 7am and 7pm

**dB(Lin)<sub>max peak</sub>:** Instantaneous Maximum Peak sound pressure measured in decibels on a sound level meter, without the use of a frequency weighting system. Used to measure air overpressure levels from blasting.

**Evening time:** Between the hours of 7pm and 11pm

**Environmental Noise:** Shall mean unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic, and from sites of industrial activity such as integrated pollution prevention and control licensed industries.

**Hertz:** Unit of frequency of sound.

**IPPC Licence:** Integrated Pollution Prevention and Control Licence (obtained from EPA).

**L<sub>den</sub>:** (day-evening-night noise indicator) shall mean the noise indicator for overall annoyance. This comprises of adding the average value for the 12 hour day time period with the average value of the 4 hour evening period plus a 5 decibel weighting or penalty, and the average value for the 8 hour night time period with a 10 decibel weighting or penalty.

**L<sub>day</sub>:** (day-noise indicator) shall mean the noise indicator for annoyance during the day period. This is the average value in decibels for the daytime period

**L<sub>evening</sub>:** (evening-noise indicator) shall mean the noise indicator for annoyance during the evening period. This is the average value in decibels for the evening time period.

**L<sub>night</sub>:** (night-time noise indicator) shall mean the noise indicator for sleep disturbance. This is the average value in decibels for the nighttime period

**Major road:** a national or regional road with more than 3 million vehicles per annum.

**Major railway:** A railway line, which has more than 30,000 train passages per year.

**Major Airport:** A civil airport, which has more than 50,000 movements per year, excluding those movements purely for training purposes on light aircraft; in this context, a movement means a single take-off or landing of an aircraft.

**Night time:** Between the hours of 11pm and 7am

**Noise annoyance:** Noise annoyance is defined by the World Health Organisation (WHO) as 'a feeling of displeasure evoked by noise'. Ref UK DOT, Transport analysis guidance, Noise, TAG unit 3.3.2, November 2006.

**Peak Particle Velocity (ppv):** Peak particle velocity is a measure of vibration magnitude, which is the maximum rate of change of ground displacement with time, usually measured in mm/sec.

## **Appendix II**

### **Overview of NRA Noise Mapping Process**

## Overview of the preparation of the noise map

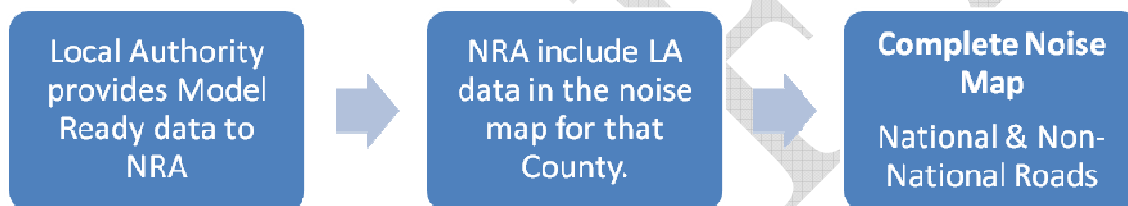
This section outlines the process involved in the development of the noise map, including the data sources, calculation methodology and authorities responsible.

### 1. Responsible Authorities

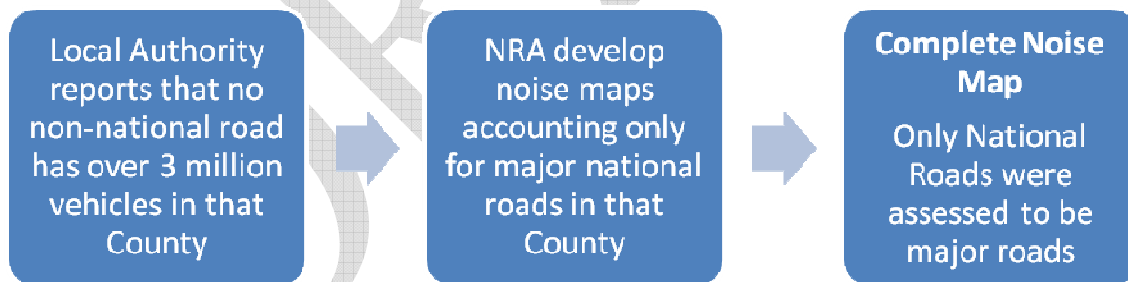
The Environmental Noise Regulations require the NRA to develop noise maps for every major road classified as a national road while the responsibility of mapping non-national roads rests with the relevant Local Authority within whose functional area the road lies.

In January 2012, a centralised approach to the noise mapping of major roads outside agglomerations was adopted. Through this centralised approach, one central body, the NRA, developed strategic noise maps for all major roads outside agglomerations, encompassing both national and non-national roads. Non-national roads were mapped by the NRA on the behalf of the relevant Local Authority *provided* that authority participated in the centralised approach and provided 'model-ready' data to the central body for calculations.

All Local Authorities with major roads within their jurisdiction participated in this centralised approach.



**CASE 1:** Non-national roads are deemed to be a major road when carrying in excess of 3 million vehicles per year



**CASE 2:** No non-national road deemed to be a major road.

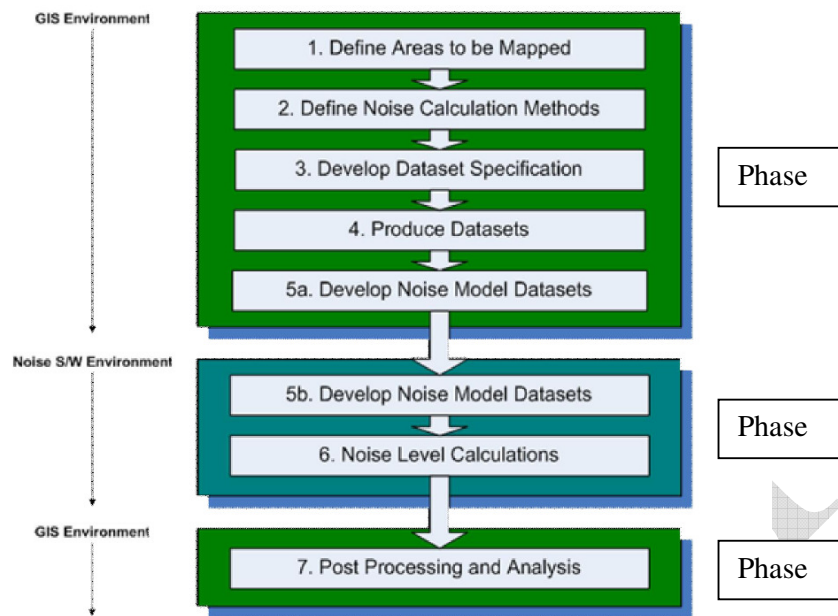
### 2. Noise Mapping Process

Figure 1 displays the overview of the noise mapping process as presented in the EPA's Guidance Note for Strategic Noise mapping<sup>1</sup>. There are three main phases to the process:

- 1) Preparation of datasets in the GIS Environment;
- 2) Noise calculations; and
- 3) Post Processing and Analysis.

<sup>1</sup> EPA Guidance Note for Strategic Noise Mapping (Version 2)

Phase 1 was conducted separately for national and non-national roads while Phase 2 and Phase 3 merged datasets from national and non-national roads to form one complete model.



**Figure 1:** Overview of the noise mapping process

Population exposure assessments were then performed on a County by County basis.

### 3. Review of First Round (2007) Noise Maps

The EPA Guidance Note for Strategic Noise Mapping notes:

*The Regulations introduce a continuing obligation on noise mapping bodies to review and, where necessary, revise each strategic noise map every 5 years, or sooner, as requested by the EPA, or when a material change in environmental noise in the area concerned triggers a revision of the relevant noise action plan. The EPA "Guidance Note for Noise Action Planning", July 2009, suggests that a noise action plan should be revised due to a material change if "it is known, or thought likely, that greater than 10% of the exposed population within the area of an action plan have experienced a change in the prevailing noise situation of greater than 3dB  $L_{den}$  or  $L_{night}$ .*

*Therefore, Noise Mapping Bodies who undertook strategic noise mapping for the first round in 2007 have an obligation to undertake a review of the strategic noise maps and, where necessary, revise them. For the basis of this review of Round 1 strategic noise maps ahead of Round 2, the NMBs should consider that a revision of the strategic noise maps is required if it is known, or thought likely, that greater than 10% of the exposed population within the area of an action plan have experienced a change in the prevailing noise situation of greater than 1dB(A)  $L_{den}$  or  $L_{night}$ .*

Under the requirements of the second round of the Directive (2012), the flow thresholds for major roads have been reduced in comparison to the first round (2007), i.e. for the first round all roads with an AADT in excess of approximately 16,000 vehicles had to be mapped, for the second phase this threshold was reduced to approximately 8,000 vehicles. This has resulted in a requirement to undertake strategic noise mapping for sections or roads and railways which were not included within the first round in 2007.

For the second phase, and irrespective of the approach to the first phase, the Regulations designate the Local Authorities as the Noise Mapping Bodies for non-national major roads, and each Local Authority has a statutory responsibility to ensure that strategic noise mapping of non-national major roads within their area is undertaken.

Due to the significant change in extents of roads to be mapped for the second phase, the NRA decided the best course of action was to revise all noise maps developed during the first phase for the second phase of noise mapping.

#### **4. Calculation Methodology**

The second schedule of the Regulations sets out the recommended interim computation methods which may be used for the assessment of noise. The methods are referred to as interim methods as they are to be used until such time as a common method of noise assessment is adopted across Europe. The recommended interim methods of assessment set out in the second schedule of the Regulations contain the four EC Recommended Interim Methods set out in Annex II of the Directive. The Directive also provides for Member States to use either the EC Recommended Interim Methods or methods based upon those laid down in their own legislation. As it is common practise for environmental impact assessments to be undertaken in Ireland for roads and railways using the UK national calculation methods, the second schedule of the Regulations also sets out the UK methods CRTN and CRN.

The UK national computation method 'Calculation of Road Traffic Noise' (CRTN) adapted for use under the Regulations is described within the following documents:

- Department of Transport publication, 'Calculation of Road Traffic Noise', HMSO, 1988
- Converting the UK Traffic Noise Index L<sub>10,18h</sub> to EU Noise Indices for Noise Mapping, TRL Project report PR/SE/451/02, 2002; and
- Defra, Method for Converting the UK Road Traffic Noise Index LA<sub>10,18h</sub> to the EU Noise Indices for Road Noise Mapping, st/05/91/AGG04442, 24<sup>th</sup> January 2006.

In their Guidance Note for Strategic Noise Mapping the EPA recommended that the UK CRTN methodology be used for the assessment of road traffic noise levels for the second round of strategic noise mapping. It notes that the method should be used with particular reference to the following:

- The NANR 93 project report;
- DMRB Volume 11 Section 3 Part 7 HD 213/11 Annex 4,
- Additional advice to CRTN procedures;
- TRL Project report PR/SE/451/02, Converting the UK Traffic Noise Index L<sub>10,18h</sub> to EU Noise Indices for Noise Mapping, 2002; using traffic count information, particularly for the night period, wherever practicable.

Thus CRTN, taking cognisance of the supplemental reports identified above, was used for all noise mapping calculations

#### **5. Data Sources**

In order to develop strategic noise maps the following data sources were utilised.

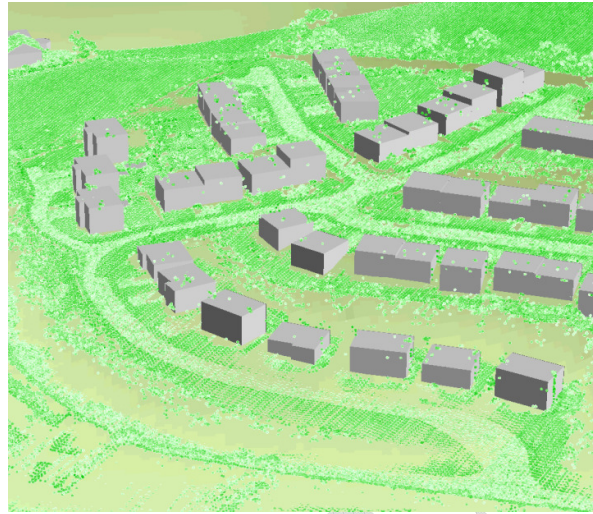
##### ***NRA Traffic Model***

The NRA maintains a National Transport Model to support transport investment decisions, and facilitate good forecasts of traffic volumes on the road network for different future years, and economic conditions. The National Transport Model provides a comprehensive representation of base demand on the transport network, in addition to a series of future year transport forecasts. The Traffic Model was used to determine traffic quantities and composition.

##### ***Aerial LiDAR***

In 2009, the NRA published a notice for tender for an aerial LiDAR survey of approximately 3,019km of the Irish national road network. The survey corridor was 1,200m in width. The survey was

completed in early 2011 and outputs included 1 metre contours for the entire survey area, building height information for buildings within the survey corridor and a digital terrain model (Figure 2).



**Figure 2:** Sample Point Cloud from Aerial LiDAR Survey

### ***GeoDirectory***

The GeoDirectory data products are developed by OSi and An Post to provide a single point location object for each building in Ireland. The GeoDirectory dataset provides the definitive address database for the country and is an essential component in calculating the population exposed to the various noise bands, information that is required to be submitted to the EU as part of this work.

### ***Corine Database***

The European Environment Agency's (EEA) CORINE Land Cover 2000 dataset is a European-wide vector land parcel product derived from satellite imagery R2V processing. The CORINE dataset was developed in the framework of the CORINE programme to establish a computerised inventory on land cover. The dataset was used for making environmental policy as well as for others such as regional development and agriculture policies. For noise calculation, the dataset can be used to provide information on the land cover distribution.

### ***Ordnance Survey of Ireland (OSI)***

OSI maintain a wide range of mapping products that are available for use within strategic noise mapping. Some datasets required additional licensing to be taken out. Some datasets included for analysis

- OSI Large Scale vector mapping:
  - 1:1,000 scale in urban areas;
  - 1:2,500 in suburban areas; and
  - 1:5,000 in rural areas.
- OSI Boundaries:
  - County, ED and Townlands boundaries.
  - OSI High Resolution Ortho Photography:

### ***Central Statistics Office (CSO)***

The CSO publish statistical information on population based upon Census returns. The most recent Census was held on 10 April 2011, and some of this information is now publically available. The information available on population is issued according to various political boundaries, namely Province or County, Province County or City, Regional Authority, Constituency or Electoral Division.

### ***Roads Database***

The NRA's Roads Database is a GIS repository that contains much of the data required to successfully undertake this noise modelling project. The Roads Database contains information on carriageway types, road widths, noise barriers, surface types, texture depths and speed limits. These datasets where relevant were used in developing noise models along with any supplementary data available.

### ***As-Built Drawings***

When new roads or road upgrades are complete the Contractor is required to submit as-built documentation including as-built drawings to the NRA. These drawings indicate the position, type and height of noise barriers along the road scheme.

## **6. Software and Hardware**

All datasets were prepared and collated in a GIS Environment prior to importing them to the noise mapping programme. All attributes were consistent through the datasets thus ensuring an efficient export.

Details of the noise mapping system are presented in Tables 1 - 3.

Modelling Hardware
Microsoft Windows Server 2003 R2
Standard x64 Edition
Intel Xeon CPU, X550 @2.67GHz with 15.9 GB of RAM

**Table 1:** Hardware Specifications

Modelling Software
Predictor V8.11
Predictor Calculation Client V8.10
Predictor Analyst V3.22

**Table 2:** Software Specifications

Calculation Settings
Fetching Radius 1,500m
Standard Tile Size 10km x 10km
Standard Tile Buffer 2,000m

**Table 3:** Calculation Settings

## **7. Population Exposure Estimates**

Annex VI of the END requires that the estimated number of people living in dwellings exposed to various noise levels on the most exposed façade. In order to derive these results the following datasets were used

- population data from the CSO
- address data from the geo-directory
- façade points output by the noise model (describing the noise level at the facade of every building),
- building polygons, used by the noise model

The population data used was from Census 2011 and is using the '*small areas*' geographies which are areas of between 50 and 200 dwellings, downloaded from the CSO website, as well as ED's, and Administrative counties. The address data used was Geo-Directory from quarter 2 2011 (Q2 2011). Façade points were the outputs of noise modelling. For the noise mapping 2012 project a noise model was created with a 2km buffer on each county. By analysing all these datasets together it was possible to estimate the average number of people for each residence in the test area (the small area) and assign a noise level to that building. These estimates were collated to derive an overall exposure level for the County.

*Full details of this process are presented in Chapter 10 of the EPA's Guidance Note for Strategic Noise Mapping.*

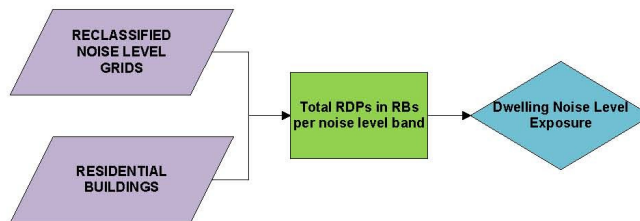


Figure 10.5: Summary of dwelling analysis

The PERSONS\_PER\_BUILDING = 0 (zero) buildings can then be filtered out of the dataset, and the total number of persons per building summed per noise level band, using the highest noise level per building, to determine the total number of people exposed within each noise level band.

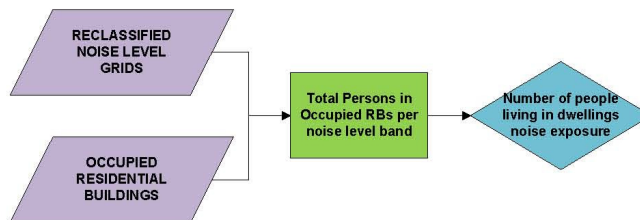


Figure 10.6: Summary of persons in dwellings analysis

The 5dB bands to be used are:

- L<sub>den</sub> <55, 55 – 59, 60 – 64, 65 – 69, 70 – 74, >=75
- L<sub>night</sub> <50, 50 – 54, 55 – 59, 60 – 64, 65 – 69, >=70

**Note:** all class boundaries are .00, i.e. 55-59 is actually 55.00 to 59.99. This is in line with the approach of a number of the commercial noise mapping software packages. This may require the use of a database program such as MS Access, MS SQL or MySQL where class boundaries can be programmed. The default behaviour in MS Excel should not be used for this analysis as it rounds at .49 and .50, however the ROUNDDOWN function may be used to apply the class boundaries.

## 10 Stage 7 – Post Processing and Analysis

After the completion of the noise calculations the noise level results are available as derived datasets from the noise modelling process.

The noise results generated can now be mapped, presented graphically, and used as the basis for supplementary analysis in order to derive the required information for reporting to the Commission.

### 10.1 Reporting Requirements

As mentioned within the EPA Guidance the precise content of the reports to be submitted to the EC and EEA are not yet finalised. The EPA is awaiting publication of the Handbook for the revised EEA Reportnet Reporting Mechanism which is expected in May 2012, prior to finalising the reporting requirements for the noise mapping bodies.

### 10.2 Requirements of the Directive

Annex VI of the END requires that “the estimated number of **people** living in dwellings” exposed to various noise levels “4 m above the ground on the **most exposed façade**” is provided for various scenarios.

For this reason it is necessary to more clearly define the terms “people”, “dwellings”, and “most exposed façade”.

For the purposes of the statistics required by Annex VI, persons (or people) can be defined as “human” beings, thus being consistent with the scope of the END defined in Article 2, paragraph 1. They are members of “the public” as defined in Article 3 (v) as “one or more natural or legal persons and, in accordance with national legislation or practice, their associations, organisations or groups”.

The term “population” is not referred to in the END, and is only a convenient means of referring to the exposure assessment, which as noted above is for “the estimated number of people living in dwellings”. It should be noted that the estimation of the number of people living in dwellings does not directly assess the exposure of people, as individuals move around; rather the exposure assessment is carried out upon the building/dwelling in which people normally reside. In the assessment there is no attempt to reflect the temporal dimension of the movement of population in this exposure assessment.

The CSO defines dwellings as “any building or structure, permanent or temporary created or used for private or communal human habitation or part of such a structure (e.g an apartment)”. CSO divides dwellings into “Private Dwellings” which can include houses, bungalows, flats, apartments, bedsits, houseboats, mobile homes and caravans; and “Non-private Dwellings” which can include educational establishments, prisons, hotels, boarding houses, hospice, campsite, hostel and civilian ships.

Importantly, the use of “dwellings” within the END indicates that vacant or unoccupied dwellings should be included within the assessment of exposure of dwellings, but not within the assessment of exposure of people if the dwellings are known to be vacant, as this is contra to the phrasing used, e.g. “how many persons in the above categories live in dwellings that have” and “The estimated total number of people (in hundreds) living in dwellings”. For this reason the revised approach set out below will provide two approaches to identifying dwellings, one including vacant

dwelling, to be used in the dwelling exposure assessment, and the other which excludes them, for use in the assessment of numbers of people living in dwellings.

The term "building" as used by CSO is not referred to directly in the context of the exposure assessments required by Annex VI. A building may contain zero, one or more individual dwellings. Residential buildings can therefore be considered to be those buildings containing one or more individual "Private dwellings". Noise-sensitive buildings may be considered those buildings which contain "Non-private dwellings", or which have uses which the competent authority deems to be noise sensitive, such as libraries etc.

The façades of a dwelling shall consist of all externally facing walls. Annex I, 1 defines the  $L_{den}$  using the stated formula, and in which: "the incident sound is considered, which means that no account is taken of the sound that is reflected at the façade of the dwelling under consideration". This indicates that the subsequent references to façade indicate **the façade of the dwelling under consideration**. Which would be consistent with Annex III regarding dose-response relationships: "dwellings with a quiet façade as defined in Annex VI".

Regarding the most exposed façade Annex I, 1 states: "the most exposed façade; for this purpose, the most exposed façade will be the external wall facing onto and nearest to the specific noise source; for other purposes other choices may be made". Subsequent practical experience has demonstrated that selection of the most exposed façade based upon distance may lead to contradictory situations. For this reason a revised definition is proposed: "the most exposed façade will be the external wall of the dwelling exposed to the highest value of  $L_{den}/L_{night}$  from the specific noise source under consideration (e.g. road traffic)." The proposed definition is also more consistent with the existing definition of quiet façade.

Regarding quiet façade, Annex VI, 1.5 states: "a quiet façade, meaning the façade of a dwelling at which the value of  $L_{den}$  four metres above the ground and two metres in front of the façade, for the noise emitted from a specific source, is more than 20 dB lower than at the façade having the highest value of  $L_{den}$ ." This makes determination of the presence of a quiet façade more complex as it necessary to determine the noise exposure at a different distance from the façade of the dwelling than for the most exposed façade. As the reporting of quiet facades is optional, it is not currently proposed to determine the presence of quiet facades.

### 10.3 Relevant Input Datasets

Given the above definitions the input datasets required to undertake the required assessments may be identified.

#### *Central Statistics Office*

CSO publish statistical information on population based upon Census returns. The most recent Census was held on 10 April 2011, and the preliminary information is currently available, with the final information currently expected to be available at the end of March 2012. The information available on population is issued according to various political boundaries, namely Province or County, Province County or City, Regional Authority, Constituency or Electoral Division. Data is not made available at Census Output Area level; rather these are merged up to the Electoral Division (ED) level which provides for the highest level of resolution available to the location of the population. There are approximately 3750 ED covering Ireland.

In order to provide an accurate spatial location for the population within each ED it is necessary to have an up to date map of ED areas which matches the ED codes within the population exposure statistics report. At present the readily available ED

boundary dataset does not match the population statistics spreadsheet, which will introduce errors into the geocoding of the population statistics. CSO have provided the EPA with an ED dataset which has the population data already assigned with the PERSONS\_2011 attribute containing the total number of people per ED.

**Proposal:** When the 2011 Census data is finalised by CSO, the EPA will request a finalised dataset for ED areas with the population data already assigned by CSO. This will provide the most detailed population distribution data direct from source, assigned to a consistent ED dataset and provide a reference for the exposure assessment.

With the number of people per ED area provided by CSO, it is now necessary to establish which buildings contain dwellings, and the total number of people living within those dwellings.

#### ***GeoDirectory***

The GeoDirectory data products are developed by OSi and An Post to provide a single point location object for each building in Ireland. The complete dataset is available with the "GeoAddress Locator" product, and each point location has a number of attributes which may be useful in identifying both vacant and occupied dwellings, for both CSO style private and non-private use categories.

GeoDirectory is updated quarterly. The most recent updates were published as:

- Q4 2010 on 27th Jan 2011;
- Q1 2011 on 8th April 2011;
- Q2 2011 on 25th July 2011;
- Q3 2011 on 24th October 2011;
- Q4 2011 during January 2012; and
- Q1 2012 is expected during April 2012.

Ideally, all the source datasets used as the basis of the assessment would be related to the same date in time, with all data correct and relevant as of that date, in order to minimise temporal mismatches between the datasets.

**Proposal:** Discussions with GeoDirectory have led to the conclusion that the dataset released from Q2 2011 release from 25th July 2011 provides the closest match to the Census date of 10th April 2011, it is therefore proposed to use this version of the dataset for the assessment of exposure.

As GeoDirectory provides a location point for each building, it is necessary to undertake a filter procedure in order to identify the two location datasets required for the assessment, namely:

- Point locations for buildings containing dwellings, and
- Point locations for buildings containing occupied dwellings.

The highest level of resolution within GeoDirectory is within the ADDRESS\_POINTS table, which has a many-to-one link to the BUILDINGS table i.e. there can be many address points within one building, and one building may contain one or many address delivery points.

The number of linked address points is provided by the RESIDENTIAL\_DELIVERY\_POINTS and COMMERCIAL\_DELIVERY\_POINTS attributes within the BUILDINGS table. The RESIDENTIAL\_DELIVERY\_POINTS have a blank entry in the ORGANISATION attribute within the ADDRESS\_POINTS

table, whereas the COMMERCIAL\_DELIVERY\_POINTS have an entry in the ORGANISATION attribute within the ADDRESS\_POINTS table. The ADDRESS\_POINTS table also has a VACANT attribute for each of the entries, whether they are commercial or residential.

As the noise level assessment is undertaken at the façade of the building object, it is appropriate to work from the BUILDINGS table as it provides the information relevant for the assessment, i.e. the number of residential delivery points within the building, and has the advantage that there should only be one single BUILDINGS\_ID per building in OSi Large Scale.

In order to produce a location dataset of "RESIDENTIAL\_BUILDINGS", the following filters should be applied to the GeoDirectory BUILDINGS table:

- BUILDING\_USE – filter out all C (commercial) and U (unknown);
- DERELICT – filter out all Y (yes);
- INVALID – filter out all Y (yes);
- UNDER\_CONSTRUCTION – filter out all Y (yes) entries; and
- RESIDENTIAL\_DELIVERY\_POINTS – filter out all 0 (zero) entries, as they do not have any residential delivery points.

The resultant dataset contains the location points for all residential buildings, whilst the RESIDENTIAL\_DELIVERY\_POINTS attribute provides the total number of residential dwellings within each building.

In order to create a location dataset of "OCCUPIED\_RESIDENTIAL\_BUILDINGS" a two step process needs to be undertaken. First it is necessary to determine the number of occupied residential delivery points within each building. For each BUILDING\_ID within the "RESIDENTIAL\_BUILDINGS" dataset, the ADDRESS\_POINTS table should be queried, and the entries with blank ORGANISATION attributes and N in the VACANT attribute summed per building and the total value per BUILDING\_ID assigned to the new OCCUPIED\_RESIDENTIAL\_DELIVERY\_POINTS attribute within the "RESIDENTIAL\_BUILDINGS" dataset.

The "OCCUPIED\_RESIDENTIAL\_BUILDINGS" dataset should then be created by running the following filter on the "RESIDENTIAL\_BUILDINGS" dataset:

- OCCUPIED\_RESIDENTIAL\_DELIVERY\_POINTS > 0 (zero)

The resultant dataset contains the location points for all occupied residential buildings, whilst the OCCUPIED\_RESIDENTIAL\_DELIVERY\_POINTS attribute provides the total number of occupied residential dwellings within each building.

**Proposal:** GeoDirectory BUILDINGS and ADDRESS\_POINTS tables are to be processed as described to produce two location datasets of "RESIDENTIAL\_BUILDINGS" and OCCUPIED\_RESIDENTIAL\_BUILDINGS".

#### ***OSi Large Scale***

The GeoDirectory data product is stated as being sourced initially from the OSi Large Scale Map Database, with geocoding validated against OSi Large Scale maps by An Post staff.

OSi Large Scale is made up of three data products which have different scales and update cycles, but the same object layers. OSi Large Scale is produced in three different scales:

- 1:1,000 scale in urban areas;
- 1:2,500 scale in suburban and periurban areas; and
- 1:5,000 scale in rural areas.

Licensees are delivered updates on a rolling cycle:

- 1:1,000 scale is updated annually for each licensee
- 1:2,500 scale is updated every 3 years for each licensee
- 1:5,000 scale is updated every 5 yearly for each licensee

In addition to these aspects, the process of polygonising the Large Scale vector datasets is currently incomplete. In some areas Large Scale is made up of polygon objects, in other areas the vector product continues to be a CAD-style line dataset.

Within the areas of noise mapping it is necessary to have building polygon objects in order to successfully undertake the noise calculations. Detached, semi-detached and terrace properties should have each unit described as a separate polygon i.e. a semi-detached building is two adjoining polygon objects, a row of terrace properties is a series of adjoining polygon objects. The areas of noise mapping may encompass urban, suburban, periurban and rural locations, therefore it may be necessary to use a collection of different Large Scale data products at 1:1000, 1:2500 and 1:5000 to cover the entire mapping area.

Ideally all the building footprints would be available as individual building polygons, and spatial GIS processing tools could then connect the GeoDirectory building points to the Large Scale building footprints. At present it is thought that to achieve a building footprint dataset of this type of national coverage would require significant processing and data preparation along with an appropriate quality assurance procedure.

Within Large Scale the building footprints are thought to be described within the following layers:

- INN\_WALLS – Inner walls of buildings
- SOLID – Outline of solid buildings
- PECK – Outline of pecked buildings
- DW\_HOUSE – Outline of dwellings
- BLD\_ANTIQ
- BLD\_COASTL
- BUILDINGS
- MBARRACKS
- MBUILDINGS

For consistency with Census and GeoDirectory it is recommended that the most recent OSi Large Scale datasets should be used:

- 1:1,000 data should be less than 12 months old as of 31<sup>st</sup> March 2012;
- 1:2,500 data should be less than 3 years old as of 31<sup>st</sup> March 2012; and
- 1:5,000 data should be less than 5 years old as of 31<sup>st</sup> March 2012.

**Note:** the 31<sup>st</sup> March was chosen to relate to the expected publication data of 2011 Census data.

From the source datasets the above layers should be extracted from Large Scale and merged into a LARGE\_SCALE\_BUILDINGS dataset. This dataset may then be clipped to the mapping extents, and should be checked and processed to ensure that all building objects are polygons.

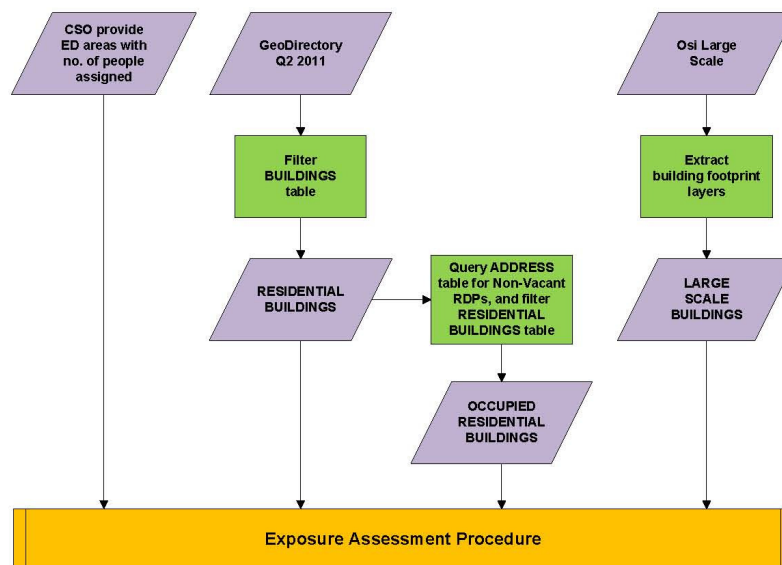


Figure 10.1: Summary of input dataset processing

#### 10.4 Noise Grid Processing

The grids of noise assessment results delivered from the noise mapping software may have a number of aspects which require attention prior to the processing of the various stages of statistical analysis.

Noise results grids may contain:

- Empty grid points or default data values for grid points located inside buildings where an assessment of noise level is not considered appropriate;
- Default data values for grid points located outside the boundary of the area to be mapped; and
- Result values to more than two decimal places.

To prepare the grids of noise results, it is recommended that the results files are verified, and relevant pre-processing undertaken:

- Interpolation of grid values to assign indicated noise levels to points with blank or default values to produce a "seamless" results grid;
- Rounding of the results to two decimal places; and
- Masking of the seamless results grids to the extent of the area to be mapped.

These processed noise results grid files may then be used for the following:

- Production of 5dB noise contour bands for graphical mapping of results; and
- Production of reclassified grids into a set of 5dB categories.
  - The reclassified grids are produced by assigning each point to a classification based upon the 5dB band in which the noise level resides.

The 5dB bands are:

- $L_{den}$  <55, 55 – 59, 60 – 64, 65 – 69, 70 – 74,  $\geq 75$
- $L_{night}$  <50, 50 – 54, 55 – 59, 60 – 64, 65 – 69,  $\geq 70$

**Note:** all class boundaries are .00, i.e. 55-59 is actually 55.00 to 59.99. This is in line with the approach of a number of the commercial noise mapping software packages. This may require the use of a database program such as MS Access, MS SQL or MySQL where class boundaries can be programmed. The default behaviour in MS Excel should not be used for this analysis as it rounds at .49 and .50, however the ROUNDDOWN function may be used to apply the class boundaries.

### 10.5 Area Analysis

The EC recommended reporting mechanism, ENDRM 2012 DF8, requires information on the total area, inside and outside agglomerations, (in  $\text{km}^2$ ) exposed to  $L_{den}$  higher than 55, 65 and 75dB for major roads, major railways and major airports.

The reclassified grid files may be used to calculate these areas as each 10m interval grid point is at the centre of an area 10m by 10m, therefore each grid point represents  $100 \text{ m}^2$ . This approach avoids the secondary processing required to produce equal noise level contours based upon an interpolation between the grid points, and therefore avoid introducing any further uncertainty into the results.

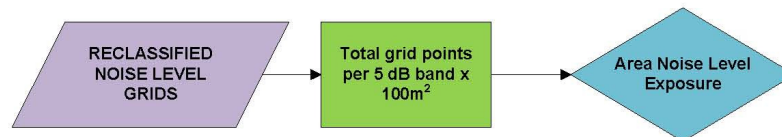


Figure 10.2: Summary of area analysis

### 10.6 Assessment Datasets

With the relevant input datasets prepared, they can be processed together to produce the datasets required for the assessment.

#### 1) Average number of people per residential delivery point, per ED

The CSO ED boundary polygon dataset with 2011 Census data assigned to each ED area, should be loaded in GIS with the OCCUPIED\_RESIDENTIAL\_BUILDINGS point data derived from GeoDirectory.

A spatial query should be run to count the total number of OCCUPIED\_RESIDENTIAL\_DELIVERY\_POINTS assigned to building points inside each ED area polygon. This total should be assigned as an attribute to the ED area polygon.

For each ED area polygon the average number of people per residential delivery point is then calculated by dividing the total PERSONS\_2011 for the ED, by the

total OCCUPIED\_RESIDENTIAL\_DELIVERY\_POINTS for the ED. This average is then assigned as a new AVERAGE\_PERSONS\_PER\_ORDP attribute on the ED area polygon.

#### **2) Number of people per occupied residential building**

For each of the OCCUPIED\_RESIDENTIAL\_BUILDINGS points the total number of people per building can be calculated from the AVERAGE\_PERSONS\_PER\_ORDP assigned to the ED area, within which the building is located, multiplied by the total number of OCCUPIED\_RESIDENTIAL\_DELIVERY\_POINTS for the building point. This total can then be assigned as a new PERSONS\_PER\_BUILDING attribute to the building point.

#### **3) Finalising “RESIDENTIAL\_BUILDINGS” dataset**

The OCCUPIED\_RESIDENTIAL\_BUILDINGS dataset now contains an attribute for the total number of persons per building. It is a subset of the RESIDENTIAL\_BUILDINGS dataset.

The PERSONS\_PER\_BUILDING attribute should be copied across to the equivalent building point within the RESIDENTIAL\_BUILDINGS dataset. All RESIDENTIAL\_BUILDINGS with a blank PERSONS\_PER\_BUILDING attribute should have it set to 0 (zero).

The RESIDENTIAL\_BUILDINGS dataset is then ready to use in the remainder of the assessment.

#### **4) Noise exposure level per building**

##### ***Façade noise level calculations***

Where noise level calculations have been carried out for façade receptors around buildings, they should be used as the source dataset for noise exposure for each building.

If the façade receptor points are at a distance of 0.1m from the building façade (as recommended by WG-AEN GPG v2) then the building polygon may be buffered by 0.2m and a spatial search undertaken inside the resulting polygon to find the highest and lowest noise level figures from the calculation point. These highest and lowest noise levels may then be assigned to the building polygon as attributes.

##### ***Grid noise level calculations***

Where only 10m grids of noise levels have been calculated, or where buildings were absent from the noise assessment model but are available within the OSi Large Scale data, it will be necessary to generate building façade receptor locations, and assign noise levels to these points based upon interpolation from the grid of noise levels.

The façade receptor point should be created on the external building facades in the following manner:

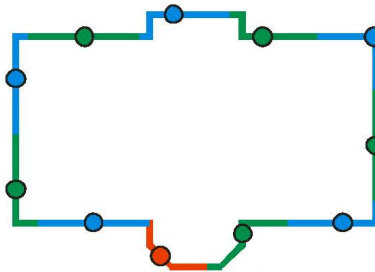


Figure 10.3: Assignment of receptor points to building facades

- Façades are split up every 5 m from start position on with a receiver position placed at half distance (blue/green).
- The remaining section gets its receiver point in its middle (red).

**Note:** there are other means of generating façade receptor points which may be acceptable. This approach is presented one being straightforward to implement in GIS.

At each façade receptor point the noise level should be determined by interpolation from the 10m grid noise levels nearby. The highest and lowest noise levels for each building polygon may then be identified and assigned to the building polygon as attributes.

#### 5) Linking “RESIDENTIAL\_BUILDINGS” datasets to building footprints

The RESIDENTIAL\_BUILDINGS datasets and the LARGE\_SCALE\_BUILDINGS footprints can be linked using a spatial query to identify the “RESIDENTIAL\_BUILDINGS” points within each of the footprint feature of the “LARGE\_SCALE\_BUILDINGS” dataset. The GeoDirectory “BUILDING\_ID” table can then be assigned to the footprint polygons within dataset “LARGE\_SCALE\_BUILDINGS”.

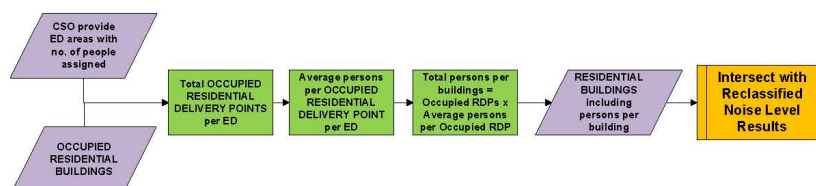


Figure 10.4: Distribution of persons in dwellings

### 10.7 Assessment of Noise level Exposure

After joining the dataset “RESIDENTIAL\_BUILDINGS” with the footprints dataset “LARGE\_SCALE\_BUILDINGS”, the highest and lowest noise levels assigned to each of the Large Scale footprint polygons may be copied across an attribute tables onto the dataset “RESIDENTIAL\_BUILDINGS\_POINTS”.

The total number of features within dataset “RESIDENTIAL\_DELIVERY\_POINTS” per noise level band then be calculated using the highest noise level per building to determine the total number of dwellings within each noise level band.

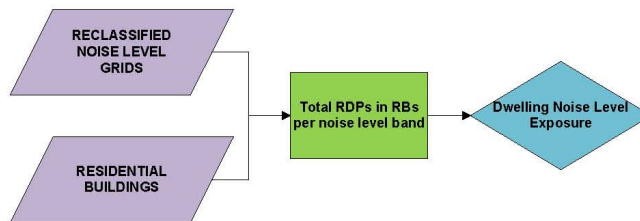


Figure 10.5: Summary of dwelling analysis

The PERSONS\_PER\_BUILDING = 0 (zero) buildings can then be filtered out of the dataset, and the total number of persons per building summed per noise level band, using the highest noise level per building, to determine the total number of people exposed within each noise level band.

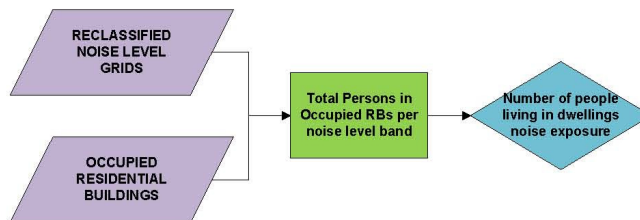


Figure 10.6: Summary of persons in dwellings analysis

The 5dB bands to be used are:

- L<sub>den</sub> <55, 55 – 59, 60 – 64, 65 – 69, 70 – 74, >=75
- L<sub>night</sub> <50, 50 – 54, 55 – 59, 60 – 64, 65 – 69, >=70

**Note:** all class boundaries are .00, i.e. 55-59 is actually 55.00 to 59.99. This is in line with the approach of a number of the commercial noise mapping software packages. This may require the use of a database program such as MS Access, MS SQL or MySQL where class boundaries can be programmed. The default behaviour in MS Excel should not be used for this analysis as it rounds at .49 and .50, however the ROUNDDOWN function may be used to apply the class boundaries.

## **Appendix III**

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## **Bibliography and References**

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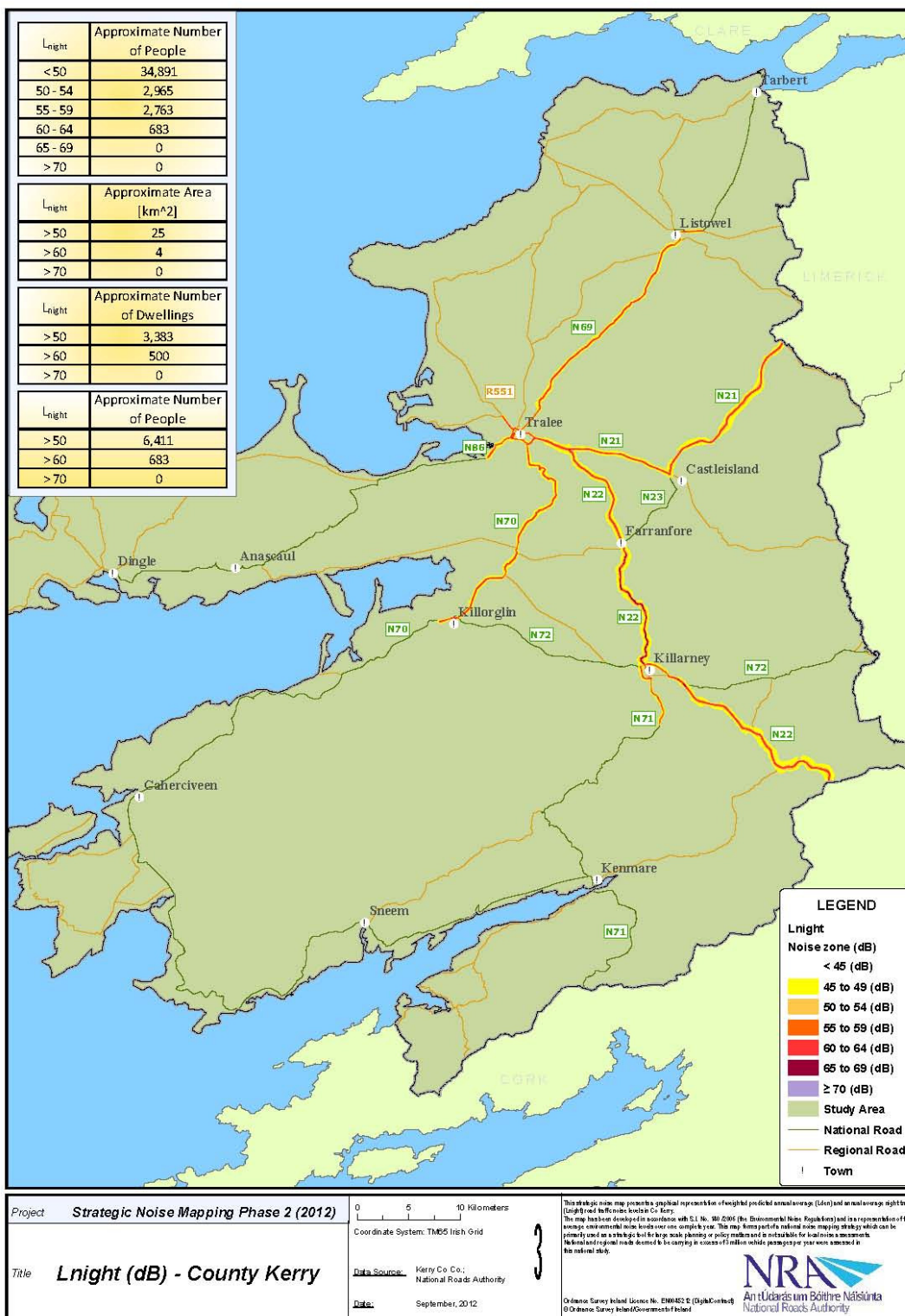
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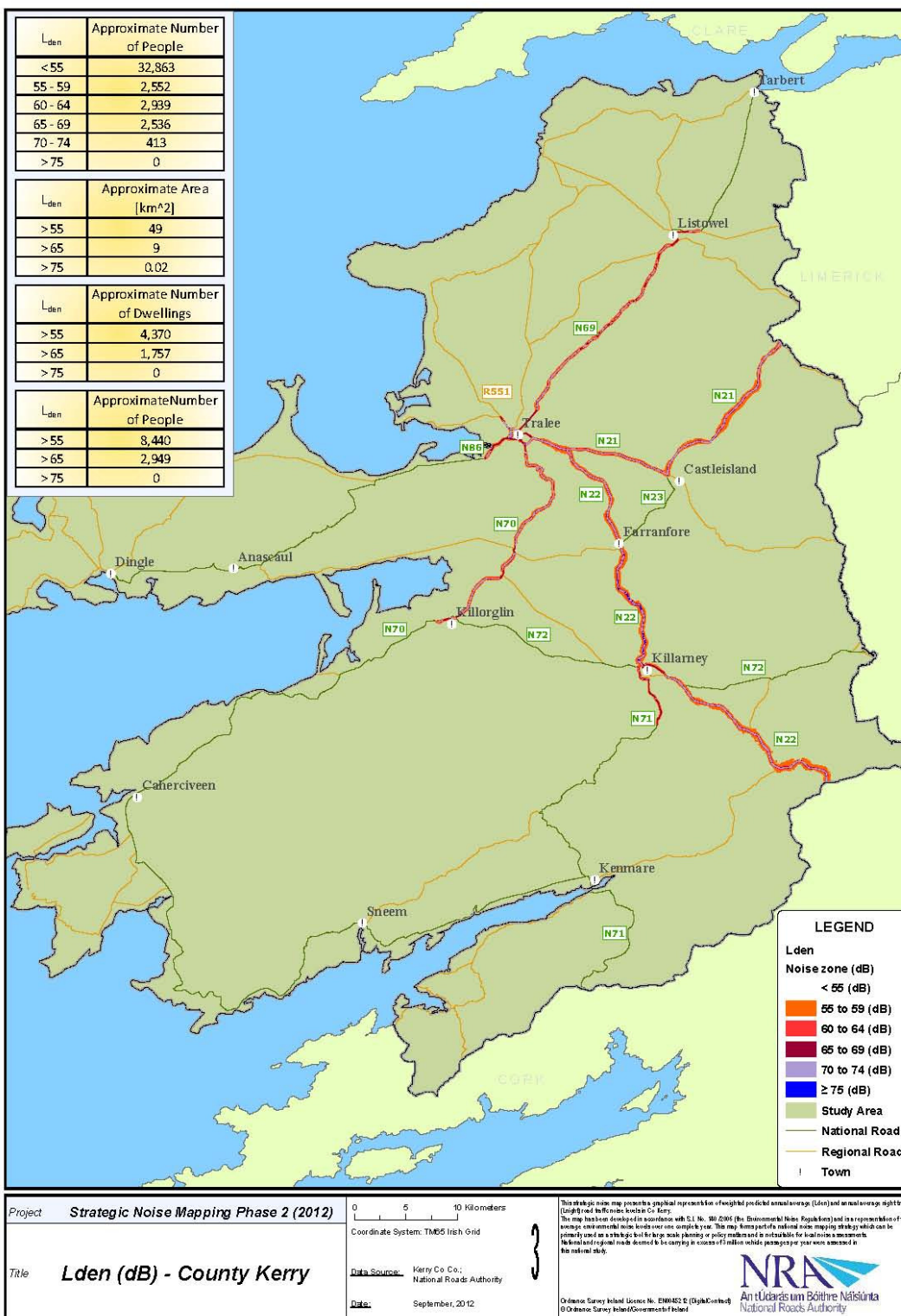
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## **Appendix IV**

### **Strategic Noise Maps**





## **Appendix V**

### **Details of Public Consultation Submissions/Observations received**

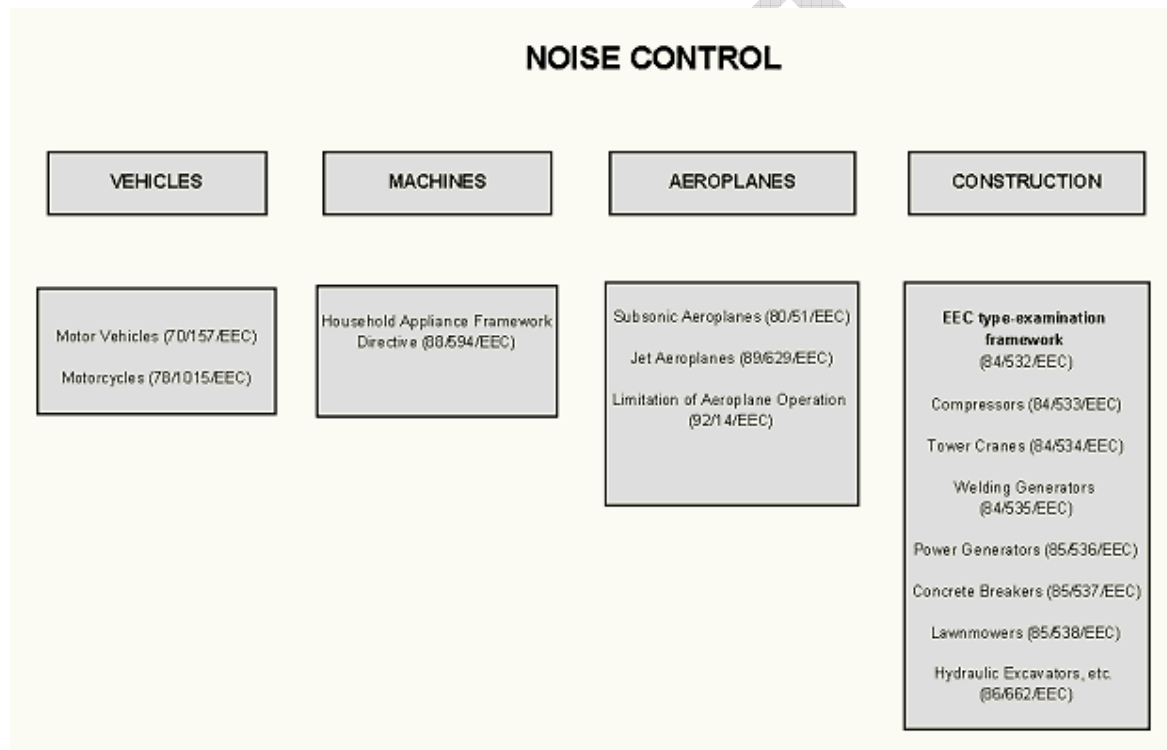
## **Appendix VI**

### **EU Noise Emission Limits for Road Vehicles**

## Overview of EU environmental legislation

### H. Noise From Vehicles and Machinery

Existing noise control legislation can be divided into four categories. The noise emissions from **motor vehicles** are covered by two directives introducing sound level limits. Three directives limit noise emissions from **aeroplanes** by reference to the Convention on international Civil Aviation. Noise emission from **household appliances** has been the object of a framework directive on household appliances. The last sector, **construction equipment**, is based in the EEC conformity assessment procedure framework directive which led to the adoption of seven daughter directives on particular types of equipment.



#### H.1 Motor Vehicles, Motorcycles

##### Motor Vehicles

Directive 70/157/EEC introduces limits on the sound levels of noise for road vehicle and gives requirements for measuring sound levels and exhaust systems and silencers. Several amendments, the latest by Directive 96/20/EC, have reduced these permissible sound levels. Limit values for eight types of passenger and goods vehicles range from 74 dB(A) to 80 dB(A). It applies a system of optional harmonisation to the approval of motor vehicles and exhaust system. The Member States may not refuse to grant EEC or national type-approval to vehicles which meet the requirements of the directive.

##### Motorcycles

Directive 78/1015/EEC on motorcycles establishes limits for the permissible sound level of motorcycles and requirements for exhaust or intake silencer. It introduces a harmonised testing procedure before issuance of the sound level measurement certificate. A system of optional harmonisation is applied to the checks carried out by the Member States which may not refuse to grant EEC or national type-approvals, although they are not required to adopt these standards for domestic producers. Limit values are given for three categories of motorcycles and range from 75 dB(A) to 80 dB(A). Member are required to respect the validity of each other's certificates.

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