

Environmental Noise Directive

Action Plan

**NOISE ACTION PLAN FOR THE
EDINBURGH AGGLOMERATION**

Prepared by the Edinburgh Agglomeration Working Group

1	<i>Introduction</i>	1
1.1	The Purpose of This Document	1
	Table 1: Key Tasks in the Scottish Legislation – Round 1	1
2	<i>Background and Context</i>	3
2.1	The European Directive on Environmental Noise	3
2.2	The Legal Context	3
2.3	Introduction to Strategic Noise Maps	5
2.4	Airport Maps	6
2.5	Data Reported to the European Commission	7
2.6	Description of the Agglomeration	7
2.7	Requirement For Action Plans	8
2.8	Health Effects	8
2.9	Public Consultations	9
3	<i>Noise Action Planning – Edinburgh</i>	11
3.1	Noise Action Planning	11
3.2	Competent Authorities and Key Partners	11
3.3	Steering and Working Groups for Action Planning	12
4	<i>Prioritisation Methodology and Matrix</i>	14
4.1	Need for and Development of Prioritisation Matrix	14
4.2	Industrial Noise	14
4.3	Development of Prioritisation Matrix	15
4.4	The Process of Determining Candidate Noise Management Areas	15
4.5	Identification of Candidate Noise Management Areas	16
4.6	Airports	18
4.7	Process of Assigning Noise Management Areas CNMA to NMA	18
5	<i>Quiet Areas</i>	20
5.1	Introduction to Agglomeration Quiet Areas	20
5.2	Current Research into Quiet Areas	20
5.3	Candidate Quiet Area (CQA) to Quiet Area (QA)	21
5.4	Protection of Quiet Areas	22
6	<i>Aligning Noise Action Planning</i>	23
6.1	Aligning Road and Rail Noise Initiatives	23
6.2	Planning and Noise	25
6.3	Noise Reduction Measures in Force and Projects in Preparation	25
6.4	Existing Local Initiatives Aimed at Reducing Noise	26

7	Next Steps	29
7.1	Preparing for Round Two Mapping and Action Planning	29
	Appendix 1 - Maps	30
	Appendix 2 – Prioritisation Matrix	31
A2.1	Purpose	31
A2.2	The Building Prioritisation Score (BPS)	31
A2.3	BPS Maps	32
A2.4	Source Prioritisation Score (SPS) for Roads and Rail	33
A2.5	Airport SPS Maps	34
A2.6	Prioritisation Matrix	35
A2.7	Source Prioritisation Score Example	36
	Appendix 3 - Actions	38
	Appendix 4 - Strategic Environmental Assessment	40
	Appendix 5 – Bibliography	42

1 Introduction

1.1 The Purpose of This Document

The purpose of this Edinburgh Agglomeration Noise Action Plan is to describe how The Scottish Government and its partners propose to deliver their obligations under the Environmental Noise Directive. This action plan for the Edinburgh agglomeration was the subject of a consultation exercise between May and July 2008 and has been amended where appropriate as a result of comments received during that consultation.

The European Parliament and Council Directive for Assessment and Management of Environmental Noise [2002/49/EC](#) ⁽¹⁾ more commonly referred to as the Environmental Noise Directive (END), was published in the Official Journal of the EU in July 2002. This directive deals with noise from road, rail, and air traffic, and from industrial noise in agglomerations. It focuses on the impact of such noise on individuals, complementing existing EU legislation, which sets standards for noise emissions from specific sources.

The three main objectives of the Directive are as follows:

- To determine the noise exposure of the population through noise mapping.
- To make information available on environmental noise to the public.
- To establish Action Plans based on the mapping results, to reduce noise levels where necessary, and to preserve environmental noise quality where it is good.

To embrace their devolved responsibility to deliver the requirements of the END legislation the Scottish Executive published the [Environmental Noise \(Scotland\) Regulations 2006](#) ⁽²⁾. The Scottish legislation describes a two round process to manage environmental noise. This is now complete as can be seen by reference to Table 1.

Table 1: Key Tasks in the Scottish Legislation – Round 1

Task	Detail	Due Completion Date	Completed
One	Produce strategic noise maps for major roads, rail, airports, and industry	June 30 2007	Yes (see www.scottishnoisemapping.org)
Two	Prepare guidance on the preparation and content of noise Action Plans	July 18 2007	Yes (see www.scottishnoisemapping.org)
Three	Competent Authorities to draw up Action Plans to manage noise	July 18 2008	Yes (see www.scottishnoisemapping.org)
Four	Submit summary of Action Plans to Commission	18 January 2009	Yes (see www.scottishnoisemapping.org)

The strategic noise maps referred to in Table 1 are the starting point for Action Planning. Their initial analysis, using a prioritisation matrix developed as noted in Section 4 of this document, provided a focus for deriving actions to manage noise where it is deemed there is a need. Where the prioritisation matrix has identified an area as being a possible noise

management area, that area has been put forward as a Candidate Noise Management Areas (CNMA), as described in Section 4. A methodology to determine whether or not the CNMA will actually become a noise Management Area (NMA) is described in Section 4.

A description of the European Directive on Environmental Noise is provided in Section 2 together with a brief outline of the Scottish Legislative framework relative to environmental noise. This section also provides an overview of the strategic noise maps and provides the rationale behind the selection of those areas and sources that have been mapped to date.

Section 3 provides an explanation of the Action Planning process and the infrastructure of the groups set up to assist in the delivery of Action Plans for Scotland. In reading the Action Plan it is important to bear in mind that Action Plans have been developed to manage noise issues and effects, including noise reduction if necessary. The Action Plans for the agglomerations of Glasgow and Edinburgh also aim to protect quiet areas against an increase in noise.

A methodology for the determination of Candidate Quiet Areas (CQA) has been described in Section 5. A methodology to determine whether or not the CQA will actually become a Quiet Area (QA) is described in Section 5.

Section 6 sets out and describes the alignment of existing initiatives that should be incorporated into the Action Planning process.

Finally Section 7 describes the next steps in the noise mapping process.

2 Background and Context

2.1 The European Directive on Environmental Noise

The European Union has estimated that around 20 percent of the EU's population, or close on 80 million people, suffer from noise levels that scientists and health experts consider unacceptable. They are annoyed, their sleep is disturbed and adverse health effects are expected. An additional 170 million people experience noise levels causing serious annoyance during daytime⁽³⁾.

With this background, there is a clear need to manage environmental noise on a national and local scale.

One of the first steps in embarking on a programme of noise management is to quantify the current noise climate. This provides a solid basis for formulating environmental noise management policy. To ensure parity for this across the European Union the European Parliament and Council adopted Directive 2002/49/EC. This Directive has since been transposed into the Environmental Noise (Scotland) Regulations 2006⁽²⁾.

The Directive requires competent authorities in Member States to draw up "strategic noise maps" for major roads, railways, airports and agglomerations, using harmonised noise indicators L_{den} (day-evening-night equivalent level) and L_{night} (night equivalent level).

The Directive requires that the public is informed and consulted about noise exposure, its effects, and the measures that are being considered in order to address noise, in line with the principles of the Aarhus Convention⁽⁴⁾. The Aarhus Convention established a number of rights of the public (individuals and their associations) with regard to the environment. The Parties to the Convention are required to make the necessary provisions so that public authorities (at national, regional or local level) will contribute to these rights so that they become effective.

The process of provision of information, consultation, and ultimate decision making that relate to the issues of noise management is known as the Action Planning Process and this document sets out the Action Plan for the Edinburgh Agglomeration following round 1 of the mapping process. The Action Plans are intended to manage environmental noise and will provide strategies for the reduction of environmental noise where it is deemed necessary. It is important to note that the Directive does not set any limit value, nor does it prescribe the measures to be used in the Action Plans, which remain at the discretion of the competent authorities.

2.2 The Legal Context

The Environmental Noise (Scotland) Regulations 2006⁽²⁾ came into force on 5th October 2006 and apply to the environmental noise to which humans are exposed to, in particular in built up areas, public parks or other quiet areas in an agglomeration, near schools, hospitals, and other noise sensitive buildings and areas. The regulations apply to noise from road railway and airport noise sources, as well as industrial noise. The regulations do not apply to noise that is caused by the person exposed to the noise, noise from domestic activities, noise

created by neighbours, noise at work places, or noise inside means of transport or due to military activities in military areas.

Noise from domestic activities or noise created by neighbours can be dealt with under the Environmental Protection Act 1990⁽⁵⁾ and Antisocial Behaviour etc. (Scotland) Act 2004⁽⁶⁾. Part 5 of the Antisocial Behaviour etc. (Scotland) Act 2004 contains provisions in relation to antisocial noise and in particular gives local authorities additional powers to tackle the problems of domestic noise in dwellings. Noise exposure at work is governed by the Control of Noise at Work Regulations 2005⁽⁷⁾ and the noise from construction sites is controlled by the Control of Pollution Act 1974⁽⁸⁾. Further information on the aforementioned legislation can be obtained in the research document “Noise Level Research Report”⁽⁹⁾ published by the Scottish Executive on 19 October 2004.

Details of the “Draft Noise Management Guide”; which provides guidance on the creation and maintenance of effective noise management policies and practices for local authorities and their officers in Scotland can be obtained from Scottish government website⁽¹⁰⁾

At present where noise from a new or altered road¹ exceeds a certain trigger level, and meets other qualifying criteria, the Land Compensation (Scotland) Act 1973⁽¹¹⁾ through the Noise Insulation (Scotland) Regulations 1975⁽¹²⁾ (NISR) provides for insulation work to be carried out or a grant to be made in respect of that insulation. Under the NISR, the Land Compensation (Scotland) Act 1973 also confers a right to compensation for depreciation in the value of land caused by public works. Public works do not include aerodromes.

Noise from lawful use of existing roads and railways cannot be construed as a noise nuisance in terms of the Environmental Protection Act. Noise from new roads and new railways may also be controlled by conditions attached as part of the Parliamentary Bill process.

The railway equivalent of the NISR is the Noise Insulation (Railways and other Guided Transport Systems) Regulations 1996⁽¹³⁾. However, the provisions of the 1996 Regulations, which came into force under the Land Compensation Act 1973, do not extend to Scotland. However, there is, in the Edinburgh Agglomeration a noise and vibration policy that covers the operation of the planned tram system. This policy is intended to provide a similar level of protection to the residents of Edinburgh as is available in the NISR.

Noise from aircraft in flight is not treated as nuisance. Ground noise, other than normal aircraft movements, at the airport may be controlled by the local authority.

The Scottish Government also issues planning guidance in respect of various noise related issues in the form of planning advice notes such as Planning Advice Note 56: "Planning and Noise"⁽¹⁴⁾ and Planning Advice Note 50: "Controlling the Environmental Effects of Surface Mineral Working, Annex A: The Control of Noise at Surface Mineral Working"⁽¹⁵⁾. In more general terms Planning Advice Note 51: “Planning, Environmental Protection and Regulation”⁽¹⁶⁾ supports the existing policy on the role of the planning system in relation to the environmental protection regimes. As part of the Action Plan, PAN 56 will be revised to align with the Action Planning process.

An environmental impact assessment is required for a large range of projects which are likely to have significant environmental effects. Noise emissions are one of the impacts which have

¹ An “altered” road is defined in NISR⁽¹²⁾

to be considered and, if relevant, measures to mitigate the effects of noise should be proposed. The implementation of the mitigation measures are a matter for the consenting procedure and the responsible authority.

Industrial noise for Part A process (as defined within the Pollution Prevention and Control (Scotland) Regulations 2000) is controlled through The Pollution Prevention and Control (Scotland) Regulations 2000⁽¹⁷⁾ (the PPC Regulations). These regulations designate the Scottish Environment Protection Agency⁽¹⁸⁾ (SEPA) as the 'Regulator' responsible for enforcing the regime.

As part of its role as regulator, SEPA produces guidance for use in enforcing the PPC Regulations. SEPA has produced guidance on the control of noise at PPC installations, which will be used when considering applications for, and inspections of PPC installations. For non Part A processes the control of noise is exercised by the relevant local authority.

From the above it is clear that there are existing controls in respect of operational industrial sources, but at present controls over operational transportation sources are limited to the Motor Vehicles (Construction and Use) Regulations⁽¹⁹⁾ and BS 362:1998⁽²⁰⁾ which although they provide a degree of control over excessive exhaust noise they do not always provide a very effective solution to the problem. The preparation of noise mapping and action plans affords an opportunity to inform policy on such matters.

It is important that the Action Planning process takes into account the existing legislative and guidance framework that exists within Scotland.

2.3 Introduction to Strategic Noise Maps

The maps have, in accordance with the requirements of the Regulations, been produced for the first round mapping for all roads (essentially motorways and A roads) which have more than 6 million passages per year, as well as all roads within the Edinburgh agglomeration which exceed the qualifying flow of 1000 vehicles or more per day. Similarly for rail the first round qualifying railways are those which have more than 60,000 train passages per year as well as all railways within the Edinburgh agglomeration.

A noise map is analogous to a weather map, but instead of showing a temperature or percentage cloud cover it shows noise levels in terms of coloured contour bands. Also the noise levels represent the noise to be experienced within a certain area over a given period of time. Therefore the level may vary throughout the day or even on a daily basis as the noise map will display levels based on annual averages.

It is important to appreciate that the produced maps show an average noise level for an average weekday in the year calculated on the basis of a 10m grid at a height of 4m above ground level as required by Directive 2002/49/EC. As was stated above the noise maps are based on predicted noise levels using a 10m grid spacing therefore the value of the "grid" is determined by the centre point of the grid and therefore in reality there may be some variation within the grid. Also, with a receptor point located at 4m above ground level compared with the average "ear" at about 1.2-1.5m above ground level, it should be clear that the strategic maps cannot be used to determine the level for any specific property. It would therefore be a mistake to try to categorise any site at ground floor level in terms of the Noise Exposure Categories given in the Scottish Government Planning Advice Note 56 (PAN 56) 'Planning and Noise'⁽¹⁴⁾. Once again it is important to remember that the noise maps are strategic and

they will be used accordingly. They should not be taken to be fully representative of all local circumstances for example, localised garden walls and fences are not taken into account in the production of strategic noise maps. It is likely that more detailed examination will be necessary in some of these situations as any required local Action Plans are developed.

The data required for the calculations of noise levels have been determined by consultation with various organisations including Transport Scotland, SEPA, Network Rail, BAA, Local Authorities, and others.

The maps are produced using computer based three dimensional noise models. This process requires the acquisition of information about the noise source and the path of noise propagation. The specialised noise modelling software does take account of physical features such as buildings and the ground contours. The noise level for each grid point is then calculated, which can be used to create noise contours bands as shown in the noise maps available at the Scottish Noise Mapping Internet Site⁽²¹⁾.

The END and Environmental Noise (Scotland) Regulations 2006 refer to noise descriptors, namely L_{den} , L_{day} and L_{night} .

The day-evening-night level L_{den} in decibels (dB) is defined by the following formula:

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

in which:

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

The default values for the day, evening and night time periods are 07:00 to 19:00, 19:00 to 23:00 and 23:00 to 07:00 respectively.

2.4 Airport Maps

There is sometimes confusion with the END airport noise contours and the noise contours presently produced by the airport operators for use in the planning process. The END requires the maps to represent the annual average values. This contrasts with the common UK practice required under the Aviation White Paper⁽²²⁾ that requires the production of aircraft noise contours for the average summer's day using $L_{eq,16hr}$ whilst END uses an annual average L_{den} . It must be remembered that the annual average L_{den} indicator is different from the summer average sixteen hour $L_{Aeq,16hr}$ indicator that has traditionally been used to describe the noise exposure from the airport. Thus the two sets of results are not comparable and should not be confused. Instead they should simply be seen as two methods of describing

average noise exposure around the airport. Airports will have to continue to provide both types of contours.

2.5 Data Reported to the European Commission

This Action Plan explains how the noise maps have been presented to the public and it also provides advice on understanding the maps. All member states were required to produce agglomeration strategic noise maps for major roads, rail, airports, and industry (including port area if appropriate) by the end of June 2007. The Scottish Government met this target and the data, as required under Article 10⁽²⁾ of the Environmental Noise Directive (2002/49/EC), was submitted by the Scottish Government on the 19th December 2007 to the European Commission.

As part of the Action Plan an analysis of the population exposure with respect to noise from both individual and, where appropriate, combined noise sources covered by the Environmental Noise Directive is presented below for the Edinburgh Agglomeration.

Table 2: Population Exposure for Noise Sources Mapped per the Environmental Noise Directive 2002/49/EC (END)

Noise Source /Noise Level	L _{den} ≥55 (dB)	L _{den} ≥65 (dB)	L _{den} ≥75 (dB)	L _{night} ≥50 (dB)	L _{night} ≥60 (dB)	L _{night} ≥ 70 (dB)
All Mapped Roads	220,300	111,600	2,400	172,100	53,000	200
Major Roads	54,700	25,400	800	37,500	14,500	0
All Mapped Railways	44,600	16,900	1,900	35,900	12,200	600
Major Railways	16,500	6,400	700	12,600	3,900	300
Industrial Edinburgh	100,800	5,800	0	91,500	5,400	0
Edinburgh Airport (Inside Agglomeration)	3,900	100	0	2,400	0	0
Edinburgh Airport (Outside Agglomeration)	8,500	400	0	900	0	0

2.6 Description of the Agglomeration

The agglomeration comprises approximately 261 km². The biggest local authority within the agglomeration is the City of Edinburgh Council. A small part of Midlothian Council and a small part of East Lothian Council fall within the agglomeration boundary. For the purposes of Strategic Noise mapping the agglomeration included a 2 km buffer to ensure that any environmental noise effects from just outside the boundary were taken into account within the agglomeration, and that noise generated within the agglomeration boundary is assessed to determine possible impacts inside the agglomeration. This area is included within the action plan study area, to ensure that any policies or plans affecting transportation or industrial noise from out with the agglomeration boundary are properly considered.

The city is bounded by Green Belt. It has an airport which lies outside the agglomeration boundary and a seaport at Leith.

Edinburgh is the Capital city of Scotland with a population of approximately 450,000. Edinburgh is a university city, the locus for much employment in the surrounding region and

a tourist centre. It is estimated that the non-residential population of Edinburgh increases by 55,000 commuters and during term time by 10,000 students. It is further estimated that at the peak of the tourist season the population is increased by some 400,000 tourists.

Census information estimates that there are 164,980 cars in the city. Of the 204,683 households, 80,891 do not own a car. There are approximately 1500km of roads and 400 bridges within the agglomeration.

The most significant imminent changes to the noise climate in the Edinburgh agglomeration both now and in the future are the development of the Edinburgh tram system and major housing developments, at Edinburgh waterfront, within the agglomeration and two housing developments at Shawfair and Wallyford which both lie just outside the boundary but within the study area. The new developments amount to a population increase of approximately 55,000.

2.7 Requirement For Action Plans

It is a requirement of END that an Action Plan be prepared. Action Planning is the process whereby environmental noise, as described in the Regulations, will be managed. Clearly the agglomeration Action Plans must cover the area of the agglomeration. Outside agglomerations Action Plans must be developed for places 'near' the designated major sources. The Scottish Government has defined the term "places near" in terms of levels of exposure that were reported to the Commission: i.e. out to the L_{den} 55 dB and L_{night} 50dB contour bands in a noise map (see Annex VI2 of the END⁽¹⁾). The distance noise propagates from linear sources such as major roads and railways, and depends on the surrounding features. To take account of this a buffer area of 2 km has been created around the agglomerations and the qualifying road and railway transportation sources during the mapping process. However, in the case of relevant airports the distance to the L_{den} 55dB and L_{night} 50dB contours may be greater and the mapped area extended to cover this, as required.

The need to manage noise implies a potential adverse impact on health. The relationship between exposure to noise and health effects at noise levels experienced in everyday environments is a complex one. The World Health Organisations guidance suggests that hearing loss does not occur in normal environmental noise situations below a $L_{Aeq,24hr}$ noise level of approximately 70dB. It should be noted that the effects of noise on hearing is a function of the level of noise and the length of exposure to that noise. Hence it is normal to consider only "non-auditory" health effects.

2.8 Health Effects

There are a wide range of non-auditory health effects that may be associated with exposure to environmental noise. Examples of non auditory health effects include:

- Annoyance;
- Sleep disturbance;
- Mental health;
- Cardiovascular effects, hypertension, heart disease etc;
- Cognitive performance of children.

Over the years, many reviews of the effects of noise on health have been conducted and published. Examples of which are included in the Bibliography in Appendix 5^(23; 24; 25; 26; 26; 27; 28; 29; 30; 31; 32)

Such reviews have considered the “strength of evidence” for each of the main areas of potential effect, in terms of the categories proposed by the International Agency of the Research on Cancer⁽³³⁾ (IARC) as ‘sufficient’, ‘limited’, ‘inadequate’ or ‘lacking’. The categories are defined as follows:

- Sufficient: a relationship has been observed between noise exposure and a specific health effect, where chance, bias, and confounding factors can be ruled out with reasonable confidence;
- Limited: an association has been observed between noise exposure and a specific health effect, where chance, bias, and confounding factors cannot be ruled out with reasonable confidence;
- Inadequate: the available studies are of insufficient quality, lack the consistency or statistical power to permit a conclusion regarding the presence of absence of a causal relationship;
- Lacking: several adequate studies are mutually consistent in not showing a positive association between exposure and health effect.

When one considers the overall picture provided by these various reviews, and the issue of availability of reliable quantitative relationships between noise exposure and effects (also sometimes called Dose-effect relationships), then three health effects remain which might be used in Action Plans:

- Annoyance;
- Sleep disturbance; and
- Cognitive effects on schoolchildren.

Following some lengthy consideration, the Scottish Government have at this stage in the work included the “Annoyance” health effect in the development of the prioritisation matrix. However, as research work progresses and further information becomes available from authoritative sources on the remaining two health effects the input data to the prioritisation matrix can be augmented over time. The development of the prioritisation matrix is explained in Section 4.

2.9 Public Consultations

This Edinburgh Agglomeration Action Plan is one of 6 plans which have all been the subject of consultation under the Environmental Noise Directive. The Transportation Action Plan, the Glasgow Agglomeration Plan and the Plans for Edinburgh Aberdeen and Glasgow Airports are also published on the Scottish Noise mapping website. Consultations relating to the Directive are summarised below;

16 November 2005; Publication of research by Consultants Hamilton & McGregor Acoustics Division to inform the strategic noise mapping process required under the terms of the Directive. This research identified where the process of data handling can be automated with minimal manual intervention.

9 March - 1 June 2005; A consultation, supported by a partial Regulatory Impact Assessment, sought views from all stakeholders with an interest in environmental noise issues on proposals to transpose and implement Directive 2002/49/EC on the assessment and management of environmental noise.

September 2006; Series of workshops and brainstorming sessions held, with interested stakeholders, to inform Action Planning process.

24 August -12 October 2007; Consultation on Noise Action Planning Guidance, sought views from all stakeholders on our approach to Noise Action planning and responses to this document were generally supportive. It is considered that the Action Plans follow the Guidance issued.

September 2007; Noise Conference held to discuss noise maps and Action Planning process.

25 May - 21 July 2008; draft plans were the subject of a public consultation.

22 October - 19 December 2008; The plans were subject to a Strategic Environmental Assessment which also covered the airport plans.

Consultation exercises have been accompanied by press releases and media interviews by the Scottish Government, its partners and its consultants in order to raise awareness of the issues.

3 Noise Action Planning – Edinburgh

3.1 Noise Action Planning

This Edinburgh Agglomeration Action Plan addresses the minimum requirements for noise Action Plans, as set out in Annex V of the END as follows;

Table 3: Environmental Noise Directive Minimum Action Plan Contents, and Location in this Document

No	Description	Location in this Document
1	A description of the agglomeration, the major roads and major railways taken into account.	Section 2.5
2	The authority responsible.	Section 3.2
3	The legal context.	Section 2.2
4	Any limit values in place in accordance with Article 5.	None
5	A summary of the results of the noise mapping.	Section 2.4
6	An evaluation of the estimated number of people exposed to noise.	Section 2.4 and 4.3
7	Identification of problems and situations that need to be improved.	Section 4.5
8	A record of the public consultations organised in accordance with Article 8(7).	Section 2.9
9	Any noise-reduction measures already in force and any projects in preparation.	Section 6.3
10	Actions which the competent authorities intend to take in the next five years, including any measures to preserve quiet areas.	Section 5.4 Appendix 3
11	Long-term strategy.	Appendix 7
12	Financial information (if available): budgets, cost-effectiveness assessment, cost-benefit assessment.	Appendix 3
13	Estimates in terms of the reduction of the number of people affected (annoyed, sleep, disturbed, or other).	Section 6.3
14	Provisions envisaged for evaluating the implementation and the results of the action plan.	Section 7

3.2 Competent Authorities and Key Partners

The Scottish Government is the Competent Authority for END and is responsible for drawing up Noise Action Plans. Whilst for Airports it is the Airport operator who is the Competent Authority. In the development and preparation of the Noise Action Plans, the Scottish Government has worked with key partners involved in END.

The key stakeholders/partners who were involved in this Action Plan are as follows:

- The Scottish Environment Protection Agency (SEPA)
- City of Edinburgh Council
- East Lothian Council
- Midlothian Council
- BAA, Edinburgh
- Transport Scotland

BAA have worked very closely with the Scottish Governments' consultants to produce the required noise maps and have been fully involved in the Action Planning process in terms of both producing Action Plans for Edinburgh Airport and the Edinburgh Agglomeration Noise Action Plan.

3.3 Steering and Working Groups for Action Planning

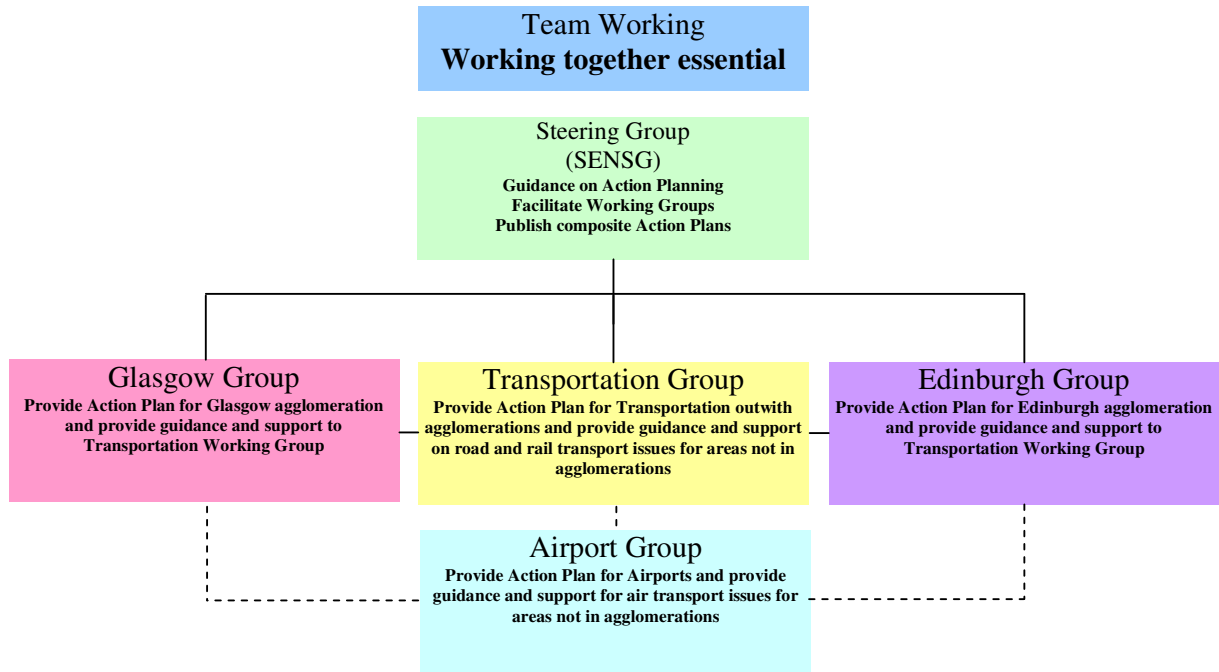
The Scottish Environmental Noise Steering Group (SENSG) is a group with representation from all parties involved in environmental noise. The group comprises representatives from the Scottish Government, local authorities, SEPA, BAA, Transport Scotland, Network Rail and Hamilton & McGregor consultants. The primary aim of SENSG has been to provide a forum for all key partners to review the development and progress of Action Plans and to determine the prioritisation of management measures.

SENSG acts as the core group to oversee the consistent development and implementation of all Action Plans. SENSG established three working groups to assist in the preparation of Action Plans and these groups feedback on a regular basis to the core group and this process will continue through the Action Planning process. There is a Glasgow agglomeration working group, an Edinburgh agglomeration working group and a Transportation Action Planning working group. All three groups have representation on the core steering group.

Airport operators have a key role to play in Action Planning and have been able to input to all working groups. The Scottish Government's nominated noise mapping consultants, Hamilton & McGregor, assisted in the development of noise maps for the four major airports in Scotland with the raw noise data prepared by the Civil Aviation Authority (CAA) for Glasgow, Edinburgh and Aberdeen Airports and Bickerdyke Allan noise consultants for Prestwick airport. This data was then transferred to Hamilton & McGregor who assisted the airport operators in the preparation of their respective maps.

BAA operate and represent Glasgow, Edinburgh and Aberdeen airports. It should be noted that while Glasgow Prestwick Airport met the criteria to qualify as a major airport for noise mapping, the number of qualifying aircraft movements has dropped and so no action plan has been prepared.

The diagram below illustrates the reporting structure for Action Planning and also clarifies the responsibilities for delivering the Action Plans.



The Action Plan process is comprised of four key stages, which are detailed below:

1. Analysis of the strategic noise maps;
2. Further investigation and analysis;
3. An evaluation of existing UK, Scottish and Local Policies, Plans and Programmes;
4. An evaluation of potential mitigation measures.

4 Prioritisation Methodology and Matrix

4.1 Need for and Development of Prioritisation Matrix

The Scottish END noise maps at the Scottish Noise Mapping⁽²¹⁾ internet site present the noise data in terms of 5 dB noise contours. There is a need to examine the contour maps to determine where the highest noise levels actually correlate with noise exposure at residential buildings. Furthermore, an examination of the consolidated noise maps does not reveal sufficient information in relation to where the noise contours result from road, rail aircraft or industrial noise sources. Article 1 of the END states that “The aim of this Directive shall be 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.”, and END defines ‘environmental noise’ as unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic, and from sites of industrial activity such as those defined in Annex I to Council Directive 96/61/EC⁽³⁷⁾ of 24 September 1996 concerning integrated pollution prevention and control. Environmental noise can therefore be split into three main categories; 1) industrial noise, 2) road and rail transportation noise sources and 3) aircraft noise.

4.2 Industrial Noise

The approach to the calculation of industrial noise was based on the Good Practice Guide⁽³⁸⁾. The computational method used is that detailed in ISO 9613-2 Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: General Method of Calculation (1996). As has been explained in Section 2.2 there are at present adequate provisions in the Scottish legislative framework for the control of noise from industrial sources. In view of this and following consultation with SEPA and the local authorities it was agreed that industrial noise sources or areas would not be included in the prioritisation matrix and that any prioritisation of such areas/source would be at the request of the regulatory authority.

No attempt has been made to identify Candidate Noise Management Areas in relation to industrial noise. This is because this type of noise is, as previously mentioned, dealt with through an existing enforcement regime. Enforcement offers a faster and more specific response to noise problems than is possible through noise mapping. The enforcement service is available through the Environmental Health Service departments of each local authorities that form part of the agglomeration. The service will investigate complaints against most commercial premises that operate within their boundaries. However, there are some for whom the enforcement authority is the Scottish Environmental Protection Agency (SEPA). It would improve access to the relevant services if this distinction was made clearer to the public. It is a recommended action of this report that the Scottish Noise Mapping Website be expanded to include clear guidance as to when members of the public affected by noise should contact their Local Authority and when they should contact SEPA. In addition, the Environmental Health Service, in all three Edinburgh Agglomeration Local Authorities, input in to the development management process in an effort to anticipate and avoid noise problems arising.

4.3 Development of Prioritisation Matrix

The purpose of the matrix is to identify areas that may require noise intervention or management, in what order and by what process. In line with the aim of Article 1 as reproduced in Section 4.1 above, the prioritisation matrix has been developed to evaluate strategic noise levels determined from the first round noise maps for the road and railway and aircraft noise sources in areas most likely to cause annoyance to people potentially affected. The prioritisation will enable appropriate actions to be taken at locations selected on the basis of noise levels, the number of people potentially affected and the annoyance response to the particular noise source: road, railway or aircraft noise.

The developed matrix is straightforward, transparent, and consistent. Although the matrix provides a focus for action planning, a reality check on the strategic noise levels, all matrix input data and any proposed interventions prior to the implementation of any suggested actions is essential. This reality check will in essence be the first step in the action planning process.

The derivation of the Prioritisation Matrix is fully explained in Appendix 2. However, in summary, each building is assigned a Building Prioritisation Score (BPS), which takes into account the predicted noise level at the building, the number of people assumed to live in the building and the annoyance response of that exposed population relative to the transportation noise source in question. The Source Prioritisation Scores (SPS) is then determined by first segmenting the road or rail network into 100m sections; for aircraft noise the SPS are based on postcode areas. Each road/rail segment is then given a unique ID and for each building with a noise level greater than or equal to L_{den} 55 dB the ID of the road/rail segment that is closest to it is assigned to that building. The logarithmic sum of BPS values for all buildings with the same nearest road/rail segment ID is then assigned to the relevant road segment to give the Source Prioritisation Score for that road/rail segment.

All of the SPSs then require to be prioritised in a manageable list for consideration in the action planning process. Whilst it is clearly desirable to start with the sources areas which have the highest SPS the question of “how high does the SPS have to be before consideration is given in the first round of actions?” arose. Therefore a basic statistical analysis of the SPSs was undertaken and it was found that the top one percent of SPSs (normally distributed) corresponded to the mean SPS plus two standard deviations. Consequently, following a statistical analysis and consultation with END working groups it was decided to indentify the top 3% of road and railway network together with the aircraft postcodes areas in terms of the top three one percent bands with the top one percent being colour coded red, the next one percent colour coded amber, the next one percent colour coded green and the rest colour coded as grey/black.

4.4 The Process of Determining Candidate Noise Management Areas

It is important to appreciate that the determination of a CNMA is simply a means of highlighting that a geographical area should be considered further in terms of a potential need for noise management. It does not mean, for example, that the potential CNMA necessarily corresponds to the start and end of any distinct 100m section of road. Using the procedure as detailed in Appendix 2 the top one percent of each of road segments and the top 1% of each

of the road and rail segments within each of the agglomeration have been identified as CNMAs. Out with the agglomerations the top one percent of each of the major road and rail segments have been assigned as CNMA's. The identified CNMA's are presented in section 4.5.

4.5 Identification of Candidate Noise Management Areas

Following the process previously described, 25 Candidate Noise Management Areas (CNMAs) have been identified within the Edinburgh agglomeration. 19 of these are associated with road traffic and 6 with railway noise. A list of these 25 CNMA locations is provided below (in addition The Candidate Noise Management Areas can be seen on the accompanying maps).

All roads are the responsibility of The City of Edinburgh Council:

- Granton
- Abbey Hill
- Leith 1
- Leith 2
- Leith3
- Docks
- Roseburn
- Gorgie
- Slateford
- Grassmarket
- Tollcross 1
- Tollcross 2
- Bridges
- Southside
- Old Town 1
- Old Town 2
- Broughton
- Calton 1
- Calton 2

Candidate Noise Management Areas Railways

- Morningside
- Grange
- Blackford
- Abbeyhill1
- Abbeyhill 2
- Meadowbank

It should be noted that the CNMA are deliberately defined imprecisely. This is because the manner in which CNMAs have been identified is based upon the strategic noise contours and other data, such as population figures, which is less certain at a local level. Additionally, some data can only be gathered from an on site investigation. Any actions that may be taken,

in the event that a CNMA is promoted to a Noise Management area, may extend beyond a specific contour line.

Further detailed examination of each CNMA will occur prior to any decision as to whether or not a particular CNMA will be promoted to a Noise Management Area (NMA). Consideration will be given to a number of factors that may affect these candidate areas including, but not necessarily limited to, the following:

- An evaluation of the data input into the model e.g. traffic volumes, traffic types, road gradient.
- The road surface.
- The condition of the road surface
- Any noise reduction mechanisms already in place and that have not been taken account of in the calculation methodology e.g. local barriers, acoustic double glazing, single aspect construction.
- Building profile.
- Traffic calming measures e.g. recently reduced speed limits, speed bumps.
- Rail corrugation

It should also be remembered that these areas are based on strategic noise maps which show an average weekday noise level. It is anticipated that certain areas will not become Noise Management Areas for various reasons. It was however decided to include all the areas identified at this stage for the sake of completeness and transparency.

During implementation of the Action Plan, a review process will be applied to each CNMA to determine whether it should become a Noise Management Area (NMA). To support this review process, separate Technical Guidance will be provided. The Technical Guidance will also assist the key organisations and their stakeholders in addressing the technical detail of the Noise Action Planning process.

Regulation 18 of the Environmental Noise (Scotland) Regulations 2006 states inter alia that the competent authority, in this case the Scottish Government, shall ensure that the public is consulted in the preparation of action plans. Part of the process in preparing the action plans for the agglomerations and the transport network in Scotland has therefore involved consulting the public in line with Regulation 18. Beyond this, the public should be informed of any conclusions that an area, included in any of the noise action plans, is a NMA or not, after following the assessment outlined in the technical guidance, in line with regulation 18 (d) of the 2006 Regulations. This will be done by updating the relevant action plans on the web which can be found at scottishnoisemapping.org

When using the SPSs to identify CNMAs it was observed that some of the SPSs lay in very close proximity to each other. Where it appeared that future examination of such SPSs and potential consequent actions within a CNMA were likely to be linked it was decided to join the SPSs together in one CNMA. This not only had the advantage of simplifying the description of the CNMAs but it also ensured that future examination of the CNMA will be required to consider these links. In making this decision consideration was given to the SPSs being on the same road, the same bus route or that they were linked by a junction. This decision does not preclude the possibility of disaggregating the SPSs when further examination is made. At this stage in the process all CNMAs and the Candidate Quiet Areas that have been identified within the agglomeration lie within the City of Edinburgh.

4.6 Airports

BAA, the operator of Edinburgh Airport is the competent authority under the Environmental Noise (Scotland) Regulations 2006 for the production of the relevant Edinburgh airport noise maps and Action Plan.

Edinburgh Airport, whilst part of the City of Edinburgh, does not form part of the Edinburgh Agglomeration. Despite this, the flight path of arriving and departing aircraft is such that aircraft do fly over part of the Edinburgh agglomeration. For this reason, consideration has been given to that part of the Airport maps that encroach on the Edinburgh Agglomeration. The area mapped around the Airport shows that only the 55-60 dB and the 60-65 dB contours are coincident with the Edinburgh Agglomeration, which is not a level that would result in Candidate Noise Management Areas. This area has also been examined for the combined effects of aircraft noise with other mapped noise sources.

The airport Action plan addresses the issue of noise from aircraft affecting residents in the agglomeration. It identifies Cramond and in particular Fair-a-far, within the agglomeration as higher priority compared to elsewhere. However, any measures taken to reduce aircraft noise will impact the total area within the noise contours, benefiting a wider audience than any targeted priorities. Therefore Edinburgh Airport will adopt a generic approach in aiming to reduce aircraft noise.

In addition, the close working relationship developed as part of the Edinburgh Action Planning working group, between the Airport operator, Environmental Health officers and Planning Officers within the local Authorities has resulted in mechanisms having been put in place to allow all parties to work together to address noise issues from the airport. It is recommended that these mechanisms be continued and these closer working relationships be continued.

4.7 Process of Assigning Noise Management Areas CNMA to NMA

Prior to any CNMA being promoted to a NMA it will be subject to detailed scrutiny. In so far as is reasonably practical efforts will be made to ensure that noise contours are accurate and the numbers of people believed to be affected are correct. Where the CNMA status appears to be inaccurate either as a result of erroneous data or where local topography and design have reduced the number of people affected then the area will not be promoted to a NMA. The potential remedial actions will be the subject of a cost benefit analysis. A list of possible considerations is listed below:

- Evaluation of the data input into the Noise Mapping Model
- Local circumstances not reflected in the noise contours, including the presence of other noise sensitive uses such as schools or hospitals.
- The noise affects people in significant numbers
- The noise is significant
- The noise can be reduced e.g. quieter vehicles
- The noise can be blocked e.g. barrier
- The source can be reduced e.g. fewer cars - action possible
- The source can be redirected / removed e.g. ban vehicles
- The receiver can be protected e.g. sound insulation
- The receiver can be removed e.g. change of use from residential over time
- The actions are achievable

- The impact of any action(s) is (are) significant / measureable
- The possible actions are affordable
- The longevity of any action
- The maintenance requirements & costs of any action
- The actions are not themselves undesirable
- The actions do not hinder other policy objectives
- The actions complement other policy objectives
- There are no undesirable side effects

These considerations are not to be considered as absolute, but should be used with appropriate care.

As stated earlier, during implementation of the Action Plan, a review process will be applied to each CNMA to determine whether it should become a Noise Management Area (NMA). To support this review process, separate Technical Guidance will be provided. The Technical Guidance will also assist the key organisations and their stakeholders in addressing the technical detail of the Noise Action Planning process.

5 Quiet Areas

5.1 Introduction to Agglomeration Quiet Areas

The Environmental Noise (Scotland) Regulations 2006 regulations require that Quiet Areas within agglomerations are included in maps. What does quiet mean? The Transport Research Laboratories (TRL) undertook research for Defra into the subject of Quiet Areas (39). The research reported that defining, identifying and appreciating the benefits of preserving quiet or relatively Quiet Areas in urban conurbations cuts across many different fields including health, physical and psycho-acoustics, and environmental psychology. An important aspect of the research carried out into Quiet Areas has been to establish the positive effect natural sounds have on health and well-being.

5.2 Current Research into Quiet Areas

Research carried out in Sweden⁽⁴⁰⁾ has examined how the adverse health effects of noise are related to individual exposure and perceived soundscapes in residential areas with and without access to Quiet Areas. Their results show that access to a quiet façade of a dwelling reduces annoyance to noise by 10-20 percent, depending on the sound level from the road traffic at the most exposed side. Results suggest⁽⁴¹⁾ that a good urban outdoor soundscape should (a) be dominated by positive sounds from nature, and (b) have an overall equivalent sound level below 50 dB(A) during the daytime.

Research carried out in Norway has examined the relationship between localised areas of noise and quiet within a neighbourhood on residential noise annoyance in Oslo⁽⁴²⁾.

In the Netherlands, reviews of current research have concluded that the percentage of time during which a disturbance is present (or the length of time during which a 'level of quiet' is regarded as acceptable) is generally more important than the actual noise level⁽⁴³⁾. Alongside these acoustic criteria additional criteria about the sounds heard which convey positive or negative feelings, with regard to appropriateness for a given context, are also important.

Research carried out in Italy to identify indicators to describe perceived soundscapes is following a similar approach to that found in the Netherlands in that it is related to temporal variations in noise although the method is more complex⁽⁴⁴⁾.

Research in the UK into Quiet Areas has primarily been carried out to assist in the implementation of END⁽⁴⁵⁾. The TRL research⁽³⁹⁾ recommended that public and open spaces in the UK, should fall within the L_{day} noise band <55 dB (as determined from the first round of noise mapping) and a minimum area (the candidate area must be at least 9 hectares). The specifications for the filter definitions and the candidate list of Quiet Areas should be reviewed and, where necessary, revised by the relevant authorities before the list is finalised.

The following filter specifications have been used:

- Noise Level filter: The specification of a L_{day} 55 dB limit is seen as an appropriate compromise, based on the mapping requirements of the END and definitions for Quiet Areas used elsewhere in Europe;
- Minimum Area filter: The specification of a minimum area of 9 hectares is based

upon consideration of both the minimum area that should lie within the defined noise limit to warrant preservation (75%) and the minimum area required to achieve L_{day} 55 dB, based on the presence of at least one major road at the boundary.

- Minimum Area 'of Quiet' filter: This required that at least 75% of a candidate area be quiet, i.e., have a noise level less than L_{day} 55 dB.

The Candidate Quiet Areas within the agglomeration of Edinburgh are presented in Appendix 1. It will be noted that the candidate quiet areas have changed following responses to the first consultation. The quiet areas are now based on source data set that is consistent across all the local authorities involved and consistent with the Glasgow Agglomeration. The source data set comprises Historic Parks and Gardens, Metropolitan Open Land taken from the Land Use constraints dataset as well as relevant Scottish Natural Heritage designations. The TRL filters described above were then applied to these data sources.

5.3 Candidate Quiet Area (CQA) to Quiet Area (QA)

As with Candidate Noise Management Areas, during implementation of the Action Plan, a review process will be applied to each CQA to determine whether it should become a Quiet Area (QA). To support this review process, separate Technical Guidance will be provided. The Technical Guidance will also assist the key organisations and their stakeholders in addressing the technical detail of the Noise Action Planning process.

Regulation 18 of the Environmental Noise (Scotland) Regulations 2006 states inter alia that the competent authority, in this case the Scottish Government, shall ensure that the public is consulted in the preparation of action plans. Part of the process in preparing the action plans for the agglomerations and the transport network in Scotland has therefore involved consulting the public in line with Regulation 18. Beyond this, the public should be informed of any conclusions that an area, included in any of the noise action plans, is a QA or not, after following the assessment outlined in the technical guidance, in line with regulation 18 (d) of the 2006 Regulations. This will be done by updating the relevant action plans on the web which can be found at scottishnoisemapping.org

Prior to any CQA being promoted to a QA it will be subject to detailed scrutiny. In so far as is reasonably practical efforts will be made to ensure that noise contours are accurate. Where the CQA status appears to be inaccurate either as a result of erroneous data or some other identified reason then the area will not be promoted to a QA. Where the CQA status is considered to be warranted the area will only be promoted if there are no conflicts in within existing local development plans. Consideration will also be given to the likely impacts of protecting an area and whether or not they are affordable or desirable. A list of possible considerations is listed below. These considerations are not to be considered as absolute, but should be used with appropriate care:

- Is the area already identified for an alternate use within the local plan?
- Are alternate uses for the area currently being developed for a future local plan?
- Are there any developments planned in close proximity to the area that would be compromised?
- Are any significant changes to nearby roads proposed which would impact upon the area?

5.4 Protection of Quiet Areas

The designation and protection of quiet areas is a proactive measure. It aims to ensure that changes do not happen within and to a certain extent out with the quiet area which will result in an increase of the noise level or a reduction in the size of the area. However, although quiet areas are significant because they are quiet, they remain an integral part of an agglomeration and should not necessarily be viewed in isolation. For this reason it is considered that once identified, though a noise action plan, quiet areas should only be incorporated into the local authority's local plan where appropriate. Thereafter, they should be protected via the development management process and through traffic management with the assistance and advice of Environmental Health.

6 Aligning Noise Action Planning

6.1 Aligning Road and Rail Noise Initiatives

The Transportation Action Plan addresses the issue of noise from road and rail which will have an affect on the agglomeration in more detail. The relevant strategic policies are summarized below.

At a national level Scotland's National Transport Strategy⁽⁴⁶⁾, published in December 2006 by the Scottish Government, recognised transport provides a significant and positive contribution to economic growth, and to the prosperity and quality of life of Scottish people. This document was developed on the background of a range of documents including Scotland's Transport Future – Transport White Paper 2004⁽⁴⁷⁾ and Choosing our future: Scotland's sustainable development strategy⁽⁴⁸⁾, which recognised a need to work in partnership with local authorities, regional transport partnerships and transport operators to achieve the objectives.

The Scotland's National Transport Strategy (SNTS) document recognised three key issues that will make a fundamental difference towards delivering a world class public transport system. These are as follows.

- Improved journey times and connections - making it quicker, easier and more reliable for passengers to travel between our towns and cities and across our global markets.
- Reduced emissions - making sure that Scotland takes a lead in the future of sustainable transport.
- Improved quality, accessibility and affordability - ensuring everyone across Scotland has high quality public transport choices.

The SNTS document also recognised transport users do not pay the full costs they impose on society in terms of emissions, noise and air quality, and committed to working closely with the UK Government on this issue.

This SNTS is a key document, setting the context for transport policy making and informing decision making for the next 20 years for the then Scottish Executive and key partners, has provided direction to a series of related policies and strategies.

Transport Scotland has begun the Strategic Transport Projects Review (STPR)⁽⁴⁹⁾, a nationwide study for Scotland, which will recommend a programme of interventions for implementation between 2012 and 2022. The STPR will focus on identifying those interventions that most effectively contribute towards the Government's purpose of promoting sustainable economic growth. Work on the STPR started in summer 2006 and the study will report to Ministers in the summer of 2008. The STPR will make recommendations on a portfolio of land-based transport interventions to be taken forward between 2012 and 2022. This will establish the basis for the ongoing development of Scotland's transport infrastructure to meet the demands of the 21st Century. Environmental Assessment, including the assessment of transport noise emissions, will be a significant component of this review.

To provide clarity on nationally significant transport priorities two major projects, the Forth Replacement Crossing and the Edinburgh Glasgow Rail Improvements Study have been fast tracked. The Edinburgh Glasgow Improvement Project will electrify over 350 track kilometres of railway, covering the core Edinburgh to Glasgow route, the Cumbernauld Line and the Dunblane/Stirling line to Edinburgh and Glasgow. The project will also assess the benefit in electrifying the remainder of the Shotts Line.

In December 2006, Scotland's Railways ⁽⁵⁰⁾ was published, setting out Scottish Ministers vision for the rail network over the next 20 years. Scotland's Railways accompanies the National Transport Strategy, showing how rail can contribute to achieving the three strategic outcomes for transport of improving journey times and connections, reducing emissions and improving quality, accessibility and affordability. Leading on from this, the High Level Output Specification (HLOS) ⁽⁵¹⁾ is the next step in firming up medium-term requirements, setting out the detail of what Scottish Ministers want the rail industry to deliver between 2009 and 2014 on behalf of Scottish rail passengers and freight users. The HLOS confirmed the Scottish Ministers' aspiration for the rail network to include the delivery of services that minimise the impact on the environment and ensure that rail is a real alternative to road and air travel for passenger and freight travel and environmentally superior both within Scotland and for cross-border journeys. Therefore the Noise Action Plans have a clear cross cutting role with this aspiration.

With respect to roads, the Road Asset Management Plan for Scottish Trunk Roads April 2007 to March 2009 ⁽⁵²⁾ sets out how Transport Scotland currently manages, or intends to manage, the trunk road network and the service this will deliver for road users. In addition the Transport Scotland Development Management Guidance ⁽⁵³⁾ sets out the approach to be adopted by Transport Scotland in regard to their Development Management and Development Plan responsibilities when engaging with the development community in Scotland. This guidance is intended to assist everyone involved in the planning/development process in Scotland but particularly Local Authorities, Consultants and major developers.

With regard to future road projects, the M74 for example will include low noise road surfacing, suitable noise barriers, and appropriate landscaping. With these measures, overall, the indications are that more properties and a larger population would experience decreases in noise levels than increases, and there would be an overall net benefit from the scheme.

At a regional level the Seven Regional Transport Partnerships have, or are in the process of developing their Regional Transport Strategies. These will address environmental issues including noise. This should result in reduced traffic levels, cutting air pollution and traffic noise.

At a local level, The Local Authorities Transport Strategies have a very important role to play in reducing noise. The strategies will help, for example, secure modal shift to sustainable modes such as walking, cycling and public transport. This should result in reduced traffic levels, cutting air pollution and traffic noise

The Transportation Noise Action Plan forms policy which can be taken account of in the next round of Local and Regional transport strategies, in approximately 3 to 5 years.

At a UK level CIRIA are currently taking forward a Noise and Vibration Issues in Urban Development ⁽⁵⁴⁾ project. This project will aim to provide practical advice on noise and

Vibration issues for those involved in undertaking developments next to infrastructure. It will look at how to address these issues and come to sensible decisions.

The Department for Transport (DFT) is leading on reserved transport matters for the UK. They are committed to a transport system which balances the needs of the economy, the environment and society. They have conducted research on the Assessment of the existing and proposed tyre noise limits⁽⁵⁵⁾ and an Examination of Vehicle Noise Test Procedures⁽⁵⁶⁾, two areas where a reduction in transport noise could be achieved.

The UK rail industry is at the forefront of international railway noise and research and maintains close involvement with European developments such as Silent Freight and Silent Track⁽⁵⁷⁾.

6.2 Planning and Noise

The relationship between the planning system and noise was highlighted in section 1.2. in the Scottish Executive Planning and Advice Note 56 (PAN 56)⁽¹⁴⁾ builds on principles set out in SODD Circular 10/1999⁽⁵⁸⁾ Planning and Noise and takes account of the recommendations of the Noise Review Working Party (HMSO, 1990)⁽⁵⁹⁾. It broad general terms PAN 56:

- indicates how noise issues should be handled in development plans and development management;
- outlines ways of mitigating the adverse impact of noise;
- provides specific guidance on noisy and noise-sensitive development; and
- gives guidance on the use of planning conditions relating to noise.

The transposition of the END into the Environmental Noise (Scotland) Regulations 2006 clearly alters the backdrop on which noise should be considered in terms of planning. NMAs and Quiet Areas may be shown in development plans. Furthermore, the very strategic nature of the published noise contour maps and their potential use for land use planning must be clarified in any future planning guidance. As has been previously stated (see Section 2.3) it is important to appreciate that the END noise contour maps represent average noise level for an average weekday in the year calculated on the basis of a 10m grid, at a height of 4m above ground level and, therefore, cannot be used to determine the noise level for any specific property. It would therefore be a mistake to try to categorise any site at ground floor level in terms of the Noise Exposure Categories given in PAN56 using the END noise contour maps.

6.3 Noise Reduction Measures in Force and Projects in Preparation

The City of Edinburgh Council and the adjoining local authorities have been proactive in managing noise for many years and current good practice has been established over the past 30 to 40 years. In particular, Environmental Health Officers responsible for the enforcement of noise and nuisance legislation have developed good working relationships with both planning and transport professions within the local authorities in order that Environmental Noise issues are addressed through:

- the Planning and Development Management process;
- the design and maintenance of transport infrastructure, road and rail;

- Air Quality Action Plans; and
- Regional Transport Strategies and Local Plans.

6.4 Existing Local Initiatives Aimed at Reducing Noise

6.3.1 Transport

There are obvious links between traffic and noise pollution. At a national level legislation places a responsibility on the highway authority to provide a compensation package, normally sound insulation, to residents who are adversely affected by a newly constructed road or by significant changes to an existing road e.g. the addition of an additional carriageway. This is taken into account at the design stage.

6.3.2 The City of Edinburgh’s Local Transport Strategy (LTS)

The Street Management Hierarchy set out in the LTS can help reduce the impact of noise and vibration, as will managing the potential noise impacts associated with lorry and bus diversions, required because of weak bridges and other restrictions on the road network.

The Local Transport Strategy has a very important role to play here and should have a positive impact upon human health. This is because the LTS policies to secure modal shift to sustainable modes of transport, such as, walking, cycling and public transport should result in reduced traffic levels and thus cut air pollution and traffic noise.

Consequently, increases in levels of physically active trips on foot and by bicycle can be expected.

Edinburgh is connected by a number of trunk roads (including motorways, such as, the M8 and M9) and A roads which are heavily used by commuter and resident traffic. Highway generated traffic noise has two main causal factors; engine noise and noise generated by tyre contact with the road surface. Therefore the noise generated by traffic experienced by residents in Edinburgh is dependant on traffic flows, speed, vehicle mix and the designation of local roads. Thus traffic noise varies across Edinburgh depending on these connected factors.

Over the period between the 1st April 2005 to 24th January 2006 the City of Edinburgh Council received 11 complaints regarding aircraft noise and 16 regarding road traffic noise. However, this may not reflect the real level of public concern as the Council have no authority over either of the sources of noise and, moreover, in the case of aircraft, the public can complain directly to the Civic Aviation Authority (CAA) or to Edinburgh Airports directly using their 24-hour freephone noise line on 0800 731 3397.

The LTS can potentially significantly affect levels of traffic related ambient noise. The Strategic Environmental Assessment process in the LTS addresses noise as follows.

Table 5: SEA and Noise

SEA issue; noise	Potential performance indicators
To reduce the negative impact of noise associated with the transport infrastructure	a) number of transport-related noise complaints b) Proportion of Council area where transport related noise levels exceed WHO limits.

6.3.3 Regional Transport Strategy

The regional transport strategy for the South East Scotland (currently under review) is produced by SEStran which includes representatives from Fife, Clackmannanshire, Falkirk, Borders, West Lothian, East Lothian, Midlothian and Edinburgh Councils.

The objectives of the strategy include:

- addressing barriers to the use of public transport, including cost.
- ‘Environment’ – to ensure that development is achieved in an environmentally sustainable manner:
- enabling sustainable travel / reduce car dependency.
- tackling local air quality and transport related noise.

Current policy states that “in the development of new infrastructure, appropriate measures will be taken to minimise the adverse impacts of transport noise”. It also states that as a stakeholder, SEStran will engage with the Scottish Government’s Noise Mapping team to influence, where possible, the programme of interventions arising from the action plan.

6.3.4 Planning

All three Planning Authorities within the Edinburgh Agglomeration study area are bringing forward replacement local plans to comply with the Edinburgh and Lothians Structure Plan 2015. The Finalised Edinburgh City Local Plan will be subject to a Public Local Inquiry before, its anticipated adoption in 2009. The Finalised Midlothian Local Plan was subject to a Public Inquiry in 2007. The Report of the Inquiry was received in spring 2008, and Midlothian Council would expect to adopt this plan before the end of 2008. The Finalised East Lothian Local Plan was subject to a Public Inquiry and is expected to be adopted later this year.

Local plans include policies that either directly or indirectly impact on Environmental Noise, for example:

- Policies designed to ensure that new development will not be permitted where there will be significant adverse effects for health, the environment and amenity unless appropriate mitigation to minimise any adverse effects can be provided.
- Developments, including changes of use, which would have a materially detrimental effect on the living conditions of nearby residents will not be permitted.
- Policies that provide a framework to put in place conditions of development that would mitigate adverse environmental effects of traffic generation.
- Policies which seek to protect areas from adverse affects of particular classes of development such as Surface Mineral Extraction and Renewable Energy.
- Development will not be permitted in built-up areas which detracts materially from amenity of area (noise could be such a factor)

A full description of the Local Plan Policies can be found online for each authority: [Edinburgh](#)⁽⁶⁰⁾, [Mid Lothian](#)⁽⁶¹⁾, and [East Lothian](#)⁽⁶²⁾.

6.3.5 Local Air Quality Action Plans

Air quality is monitored both nationally and locally. The City of Edinburgh Council and Midlothian Council, along with all other local authorities in Scotland, are required to regularly review and assess air quality in their areas against objectives for a number of air pollutants of particular concern for human health. If this work indicates that any objective is unlikely to be achieved by the due date, the authority concerned must declare an Air Quality Management Area and produce an action plan outlining how it intends to tackle the issues identified.

Air Quality Action Plans will be taken into account as part of the Strategic Environmental Assessment. In addition, any proposed mitigation measures should be cross referenced to the Air Quality Action Plans. It is also proposed that the Air Quality Action Plans should be examined for any measures that affect the noise climate.

6.3.6 Estimates in Terms of the Number of People Affected

There are a number of strategic policies that have the potential to affect the whole agglomeration and consequently the whole population. However, within the Candidate Noise Management Areas it is estimated that approximately 15,100 people will be affected by any measures that may be taken to manage environmental noise

7 Next Steps

7.1 Preparing for Round Two Mapping and Action Planning

The current working group system has proved effective in developing this action plan. Consideration will be given to the form in which the group will continue in order to facilitate implementation and the development of future plans following the required 5 yearly review of the noise maps.

Appendix 1 - Maps

- **CNMA Map for Edinburgh Agglomeration Roads**
http://www.scottishnoisemapping.org/downloads/sea/Edinburgh_Action_Plan_Maps_Roads.pdf
- **Key for Edinburgh Agglomeration Road CNMA**
http://www.scottishnoisemapping.org/downloads/sea/Edinburgh_Roads_CNMA_Text.pdf
- **CNMA Map for Edinburgh Agglomeration Railways**
http://www.scottishnoisemapping.org/downloads/sea/Edinburgh_Action_Plan_Appendix_1_Maps_B_Rail.pdf
- **Key for Edinburgh Agglomeration Railway CNMA**
http://www.scottishnoisemapping.org/downloads/sea/Edinburgh_Rail_CNMA_Text.pdf
- **CQA Map for Edinburgh Agglomeration**
http://www.scottishnoisemapping.org/downloads/sea/CQA_Edin_TRL_75_SNH_V3r1_Maps_All.pdf
- **Key for Edinburgh Agglomeration CQA**
http://www.scottishnoisemapping.org/downloads/sea/CQA_Edin_TRL_75_SNH_V3r1_Text.pdf

Appendix 2 – Prioritisation Matrix

A2.1 Purpose

The purpose of the prioritisation matrix is to evaluate strategic noise levels within the first round noise maps in terms of the road, rail and air noise sources most likely to cause annoyance to people potentially affected. The prioritisation will enable appropriate actions, required to be determined, based on a consideration of noise levels, the number of people potentially affected and the annoyance response to the noise source.

It is important, in broad terms, to ensure the developed methodology can be used consistently for all three action planning working groups (Edinburgh, Glasgow, and Transportation). It is also, however, important to bear in mind organisational needs and responsibilities.

The matrix must be straightforward, transparent, and consistent. Although the matrix will provide a strategic focus for action planning, a check on the strategic noise levels, all matrix input data and any proposed interventions, will be required prior to the implementation of any suggested actions. In this regard, the matrix will be subject to regular review during the Action Planning process.

The prioritisation matrix, and the related graphics, will be based on Building and Noise Source evaluations as described below. The Source Prioritisation Score being derived from the Building Prioritisation Score.

A2.2 The Building Prioritisation Score (BPS)

The Building Prioritisation Score (BPS) is an individual value assigned to each building. The input factors for the BPS are as follows:

- Building use (only residential considered at this stage, although other building types may be considered in later phases)
- Appropriate strategic noise level at building (for the particular noise metric being assessed).
- The number of properties within each building³
- The population density⁴
- The Annoyance response⁵

The BPS for each building is then calculated as follows:

$$\text{BPS} = (\text{Noise level at building} + 10 \times \log_{10}(\text{number of people annoyed}))$$

where:

$$\text{Noise Level at building} = L_{\text{den}}$$

$$\text{Number of people annoyed} = (N_A \times P_A \times A) / 100$$

³ All address points that lie within a building are used

⁴ using a multiplication factor of 2.36 for each Address Point. From Scot-Tag

⁵ Miedema and Oudshoorn "Annoyance from Transportation Noise: Relationship with Exposure Metric DNL and DENL and Their Confidence Intervals. Environmental Health Perspectives Vol 109 No 4 April 2001

where:

N_A = Number of address points within building

P_A = Population per address

A = % people annoyed

For Example:

Property 1 Berkeley Street (Adjacent to M8 in Glasgow)

Noise level at building L_{den} 80.9 dB

No. of Address Points within building (N_A) 16

Population per Address (P_A) 2.36

% people likely to be annoyed by road traffic noise (A) 79.7

BPS $80.9 + (10 \times \log_{10}((16 \times 2.36 \times 79.7)/100)) = 95.7$

Property 2 309 Great Western Road, Glasgow

Noise level at building L_{den} 72.1 dB

No. of Address Points within building (N_A) 6

Population per Address (P_A) 2.36

% people likely to be annoyed by road traffic noise (A) 52.3

BPS $72.1 + (10 \times \log_{10}((6 \times 2.36 \times 52.3)/100)) = 80.7$

A2.3 BPS Maps

To facilitate an understanding of the distribution of BPS values for a particular noise source these have been represented visually in map format. The BPS maps were prepared by assigning each building a score as calculated above. The resultant scores were then divided into 5 point bands, each represented by a different coloured circle. The diameter of each circle is a function of the BPS (the bigger the coloured circle the greater the BPS). The resultant mapped pattern of coloured circles provides a visual representation of where the greatest noise annoyance is likely to occur. As part of the action planning process the maps can, if required, be cross referenced with received noise complaints for particular noise sources. In this way the maps can, if required, be developed for future action planning.

It should be noted that the BPS is an absolute value, and individual properties in Glasgow, Edinburgh, and elsewhere can be directly compared. The colours used in the BPS maps are also absolute, and identify the same BPS values in all areas.

A2.4 Source Prioritisation Score (SPS) for Roads and Rail

Once the BPS is calculated for each building the Source Prioritisation Score (SPS), for sections of source line, is calculated as follows.

- Firstly the road network is rationalised so that there is a single centreline to represent motorways, and dual carriageways. Previously these were represented by two separate lines representing opposing carriageways. In addition, junctions are simplified in a similar manner. Similarly, the rail network is reduced to a series of single centrelines that represent railway lines that consist of multiple tracks.
- Road and rail source lines are split into 100m sections (some will necessarily be less than 100m, and these sections have a weighting applied to compensate for the decreased segment length. These shorter sections, in general, occur at junctions and the ends of road/rail sections).
- Each road/rail segment is then given a unique ID.
- For each building with a noise level greater than or equal to L_{den} 55 dB the ID of the road/rail segment that is closest to it is assigned to that building.
- The logarithmic sum of BPS values for all buildings with the same nearest road/rail segment ID is then assigned to the relevant road segment. For n Building Prioritisation Scores the logarithmic sum is given by the follow equation:

$$SPS = 10 \log_{10} \left(\sum_{i=1}^n 10^{\left(\frac{x_i}{10}\right)} \right)$$

Where x_i is the i^{th} Building Prioritisation Score.

- Since some segments are shorter than 100m, a weighting has been applied to each segment that has a length between 50m and 100m. The following weighting was applied, $SPS \times 10 \times \log_{10} (100 \div (\text{segment length}))$. Hence the maximum correction is 3 and, basically, assumes that if the section was in fact 100m long the distribution of buildings and BPS values would remain constant along the additional length. For lengths less than 50m the correction is not applied due to the large error in summed BPS for such short lengths. However, since these shorter lengths occur at road ends, lengths of less than 50m are deemed insignificant. Furthermore, in general, they represent less than 0.5% of all source segments. For example, there are 12664 major road sections of which 51 are less than 50m in length. The total length of major roads is approx 1,267km of which the sections with lengths less than 50m sum to approximately 1.5km.

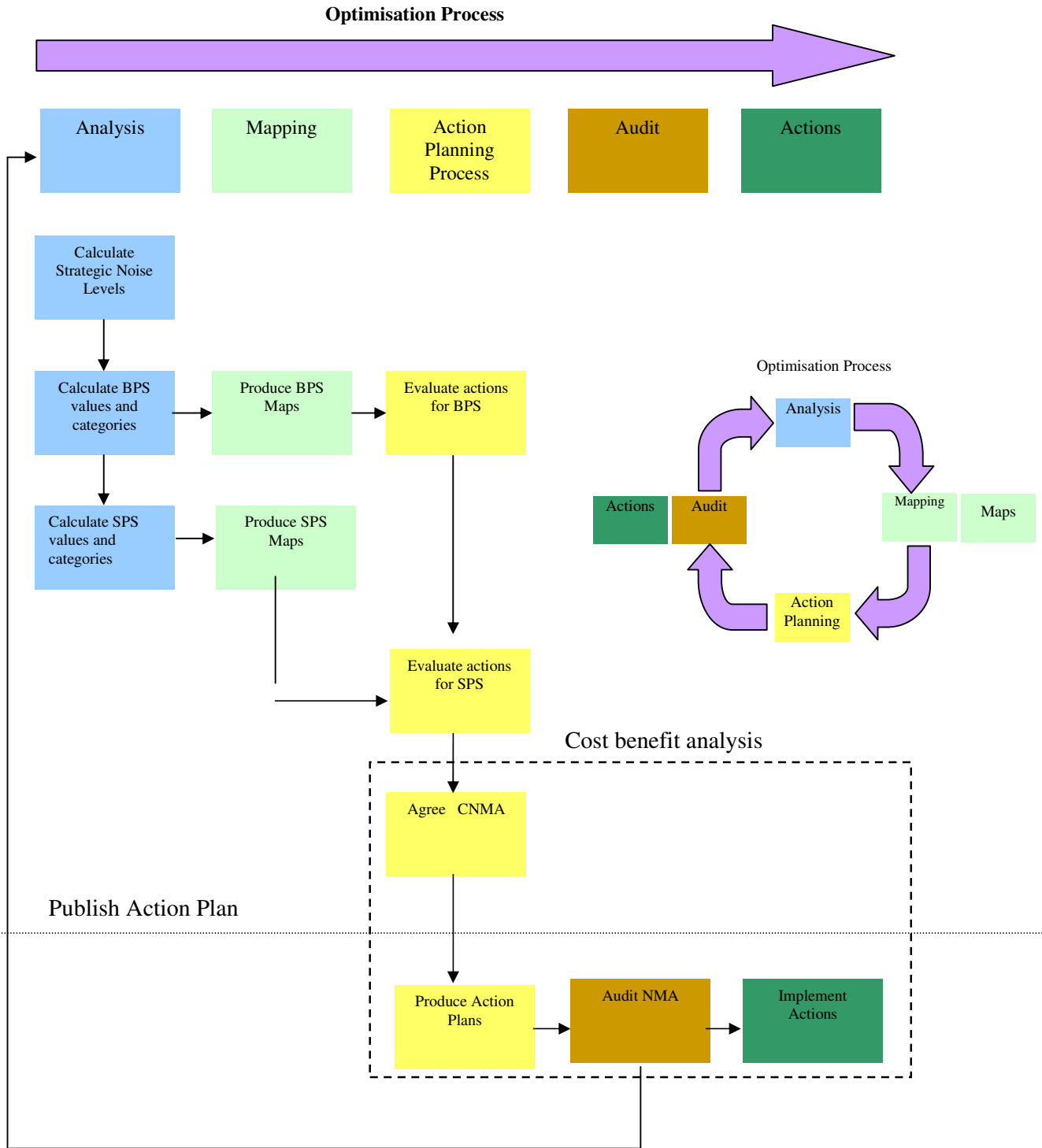
An example of the SPS calculation methodology is presented in Section A2.7 of this Appendix.

Once calculated, the road and rail network with assigned SPS values are ranked into four categories, based on each section's SPS. To initiate the prioritisation process for each noise source the initial categorisation used is as follows: 1%, 1%, 1%, 97%, from highest to lowest.

A2.5 Airport SPS Maps

The airport source prioritisation maps are based on areas rather than line segments (road and rail). The area SPS values are determined by the logarithmic summation of the building prioritisation scores for all residential buildings that lie within postcode area boundaries. The airport area SPS values are then categorised into four bands as follows: 1%, 1% 1%, 97%. If deemed necessary, the size of the top three airport area SPS bands can be increased.

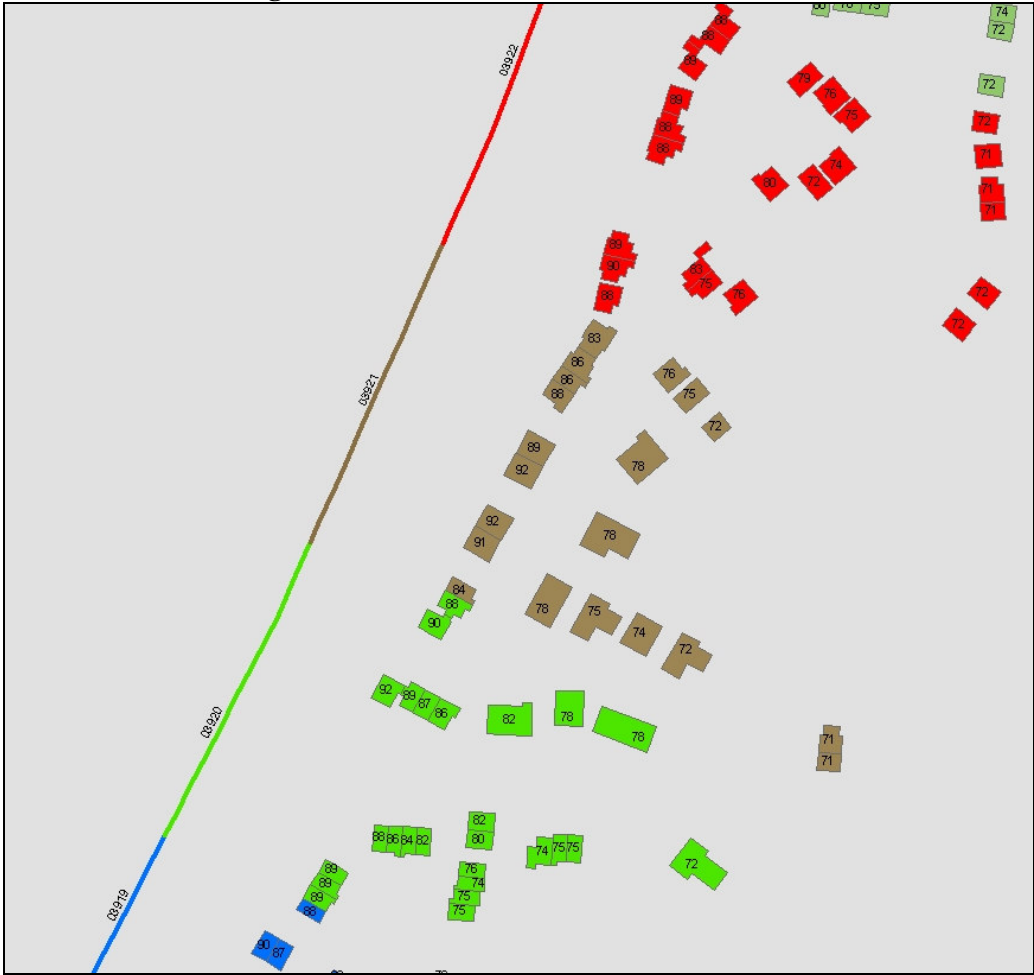
A2.6 Prioritisation Matrix



A2.7 Source Prioritisation Score Example

The following graphic shows a section of the major road network with buildings that have had their Building Prioritisation Scores (BPS) determined. Each of the road sections shown in the graphic equates to a 100 metre length of the major road network, each with a unique ID. In the graphic the road section ID is shown (03919 to 03922) for each road segment. Each line segment and their nearest buildings have been uniquely coloured.

Figure A2.1: Noise Source Segments (With IDs) and Buildings with Associated BPS. The source segments have been uniquely coloured. All buildings have been assigned the ID of the road segment closest to it and then coloured using the same colour as the road segment.



The sequence of events for determining SPS values for segments of source line is as follows.

- Segment line source into 100m lengths.
- Assign Unique ID to each line source segment.
- Assign to each building the ID of the nearest source line segment.
- Logarithmically sum all the building prioritisation scores that have the

same unique source segment ID.

- Each unique line source segment is then assigned the logarithmically summed BPS for that particular segment.

For Example:

In Figure A2.1, above, each 100m source segment has a unique ID. For illustrative purposes, each segment has been uniquely coloured. The ID of the nearest source segment to each building is then assigned to each building and, for illustration purposes, each building has been assigned the same colour as its nearest source segment.

Taking road segment 03921 (Brown) as an example, the Source Prioritisation Score for this segment is equal to the logarithmic sum of the BPS scores for all properties for which this segment is the closest (i.e. all of the brown coloured buildings). These buildings have the following BPS: 83, 86, 86, 88, 89, 92, 92, 91, 84, 76, 75, 78, 78, 78, 75, 72, 75, 74, 72, 71, 71 and, as such, the Source Prioritisation Score is given by:

$$\begin{aligned}
 SPS &= 10 \log_{10} \left(\sum_{i=1}^n 10^{\left(\frac{x_i}{10}\right)} \right) \\
 &= 10 \log_{10} \left(10^{\left(\frac{83}{10}\right)} + 10^{\left(\frac{86}{10}\right)} + 10^{\left(\frac{86}{10}\right)} + 10^{\left(\frac{88}{10}\right)} + 10^{\left(\frac{89}{10}\right)} \right. \\
 &\quad \left. + 10^{\left(\frac{92}{10}\right)} + 10^{\left(\frac{91}{10}\right)} + 10^{\left(\frac{84}{10}\right)} + 10^{\left(\frac{76}{10}\right)} + 10^{\left(\frac{75}{10}\right)} + 10^{\left(\frac{78}{10}\right)} \right. \\
 &\quad \left. + 10^{\left(\frac{78}{10}\right)} + 10^{\left(\frac{75}{10}\right)} + 10^{\left(\frac{72}{10}\right)} + 10^{\left(\frac{75}{10}\right)} + 10^{\left(\frac{74}{10}\right)} + 10^{\left(\frac{72}{10}\right)} \right. \\
 &\quad \left. + 10^{\left(\frac{71}{10}\right)} + 10^{\left(\frac{71}{10}\right)} \right) \\
 &= 98.8
 \end{aligned}$$

Please note that in this example integer BPS values have been used. However, when determining SPS values for all source segments BPS values to one decimal place have been used.

Appendix 3 - Actions

1 Potential Actions

It is important to note that the potential actions listed below are relevant to the Transportation Action Plan and, indeed, the potential actions contained in the Transportation Action Plan are equally relevant to this plan.

Consideration should be given to the benefits of replacing the road surface with a low noise surface when the road is next due for resurfacing. Further research should be encouraged into the comparative benefits of different surfaces.

Consider asking EU/ Defra to carry out further annoyance research

Consideration should be given to the possibility of reducing the number of vehicles / HGVs using sections of the road network.

Consideration should be given to the possibility of reducing the speed limit on sections of the road network.

Consideration should be given to the construction of a barrier adjacent to sections of the road network.

Any further construction of noise sensitive developments CNMAs / alongside sections of the road network should be afforded protection from noise using a noise reduction technique appropriate to the design.

Consideration should be given to updating the Local Transport Policy to include transport noise and noise reduction as explicit and integral objectives in the design and development of the transport strategy.

Consider how the objectives of the Strategic Noise Action Plan may need to be reflected in development plans and/or relevant supplementary planning guidance.

Consideration should be given to expanding the Scottish Noise Mapping Website to include clear guidance as to when members of the Public affected by noise should contact their Local Authority and when they should contact SEPA in relation to noise from industrial and port areas.

Keep in place the working group so that it can co-ordinate the taking forward of the Action Planning Process.

Air Quality Action Plans should take into account noise e.g. when redirecting traffic.

2 The Noise Model

The following recommendations concern possible improvements to the noise model. Any potential improvements to the model will have to be evaluated in conjunction with the Scottish Governments noise mapping contractors to establish if they are practical, feasible and worthwhile. For example some data requirements can push the limits of available technology and have implications for processing time.

Consideration should be given to how the data used in the model can be improved in ways that will increase the accuracy of the maps in future years. This should be consistent with any developments on noise mapping developed within the EU.

Consideration should be given to improving the data available on road surfaces within the agglomeration in order to improve the accuracy of the model.

Consideration should be given to improving the data available on night time noise in order to give a more accurate L_{night} and therefore L_{den} .

Intervention Types

Reduce speed limits

Limit numbers of vehicles

Limit time of day vehicles have access

Restrict certain types of vehicles

Redirect vehicles

Use low noise road surface

Introduce speed control measures e.g. chicanes, narrow roads, road markings, bends, Changing vehicle priority.

Introduce an acoustic barrier

Require the use of low noise tyres (national / international support & research needed)

Variable speed limits (related to time of day)

Through the European Commission press for quieter vehicle requirements e.g. exhaust noise limits, quieter tyres, further research into low noise road surface

Consider locating taxi ranks / bus stops away from residential property

Consider location of pedestrian crossings, with due regard to road safety

Appendix 4 - Strategic Environmental Assessment

A Strategic Environmental Assessment (SEA) is a systematic process for identifying, predicting and where possible avoiding significant adverse environmental impacts of implementing public strategies, plans and programmes. In Scotland, the Environmental Assessment (Scotland) Act 2005 ensures that all public strategies, plans and programmes that are likely to result in significant environmental effects, adverse or positive, are assessed.

Section 15 of the Environmental Assessment (Scotland) Act 2005 ('the Act') requires a Responsible Authority to consider, in conjunction with the Consultation Authorities, the scope and level of detail of the environmental assessment. The purpose of the scoping report is to identify the environmental issues to be taken into consideration during decision-making. The scope of the SEA depends on:

- what is being proposed, i.e. the remit of the plan, programme or strategy (PPS);
- the geographical and temporal coverage of the PPS; and
- the nature of the receiving environment.

The END Action Plans fall within the scope of Section 5(3) of the Environmental Assessment (Scotland) Act 2005 and, given their potential for significant environmental effects, require an SEA. Accordingly a full SEA consultation of the overall noise action plan, as is required by the Act, is being undertaken on the basis of a full Environmental Report.

The SEA Act requires that the Noise Action Plan (NAP) is assessed against a range of criteria as set out in Schedule 3. Table A4.1, below, explains what has been scoped in/out and provided a brief justification for that scoping. A full Scoping Report covering each of the Edinburgh, Glasgow and Transportation Working Groups together with that for the airports is available on the Scottish Noise Mapping web site.

Table A4.1 Scoping in/out for NAP SEA

Environmental Characteristic	Key Potential Environmental Effect of NAP	Scoped In/Scoped Out	Justification
Population & Human Health	Changes to the environment can influence this category. Such changes may include: air quality; accessibility of open space, services and facilities; noise levels; accident levels.	In	Management of noise may lead to reduction in noise levels with consequent reduction in the number of people annoyed, or extent of any annoyance and therefore may have health benefits
Biodiversity, Flora, Fauna	Changes to levels of biodiversity; wildlife corridors; stepping stones; valuable habitats and species; levels of fragmentation of habitats.	In	Designation of Quiet Areas may lead to enhancement of habitats

Environmental Characteristic	Key Potential Environmental Effect of NAP	Scoped In/Scoped Out	Justification
Soil	Changes to quality of soil; quantity of soil; amount of contaminated land; amount of prime quality agricultural land.	Out	Changes in noise levels have no impact on soil quality
Water	Changes to water quality from construction or other access; changes to the water environment; areas of flood risk.	Out	Changes in noise levels have no impact on water quality
Air, Climatic Factors	Changes in air quality; greenhouse gas emissions; dust levels; flooding; prevalent modes of transport.	In	Possible traffic management may result in decrease/increase in emissions such as PM10, No2 etc
Cultural Heritage, Material Assets	Changes to the settings of and access to listed buildings, scheduled ancient monuments, archaeological sites; conservation areas; townscape protection areas; historic gardens and designed landscapes.	In	Designation of Quiet Areas may enhance existing designated landscapes etc
Landscape	Changes to landscape character; landscape quality; landscape features; Regional Scenic Area.	In	Designation of Quiet Areas may enhance landscape quality

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