ENVIRONMENTAL HEALTH SECTION

REVIEW AND ASSESSMENT OF AIR QUALITY IN THE BOROUGH OF ANTRIM

THE ENVIRONMENT (NORTHERN IRELAND) ORDER 2002
LOCAL AIR QUALITY MANAGEMENT

UPDATING AND SCREENING ASSESSMENT
JUNE 2006

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1 SUMMARY

Part III of the Environment (NI) Order 2002 requires each district council to periodically review air quality in its area and the Air Quality Regulations (NI) 2003 prescribe the air quality objectives to be achieved. The process of reviewing and assessing air quality represents a cornerstone in the system of local air quality management (LAQM).

The first round of review and assessment for Antrim Borough Council was completed in April 2004. This concluded that, based on available data, the risk of the air quality objectives in respect of carbon monoxide; benzene; 1,3-butadiene; lead; nitrogen dioxide and fine particulates (PM_{10}) not being met within the prescribed timescales was negligible.

The review and assessment predicted that the objectives for sulphur dioxide would be exceeded in parts of Antrim town as the result of domestic solid fuel burning, and consequently the Council declared an Air Quality Management Area (AQMA) in October 2004. The Council is currently working on an Air Quality Action Plan (AQAP), which will set out the measures to be introduced in pursuit of the air quality objectives within the AQMA. Measures pertinent to the AQAP are not considered further in this report.

This document is Antrim Borough Council's Updating and Screening Assessment and represents the first step of the next round of review and assessment for the area. It has looked primarily at those matters that have changed since the last review and assessment, which might lead to a risk of an air quality objective for one of the seven key pollutants referred to above, being exceeded. It has also looked at areas not fully considered in the first round of review and assessment.

Of the seven key pollutants updated, screened and assessed, the likelihood of the air quality objectives for carbon monoxide, benzene, 1,3 – butadiene, lead, sulphur dioxide (outside the AQMA) and fine particles (PM_{10}) being exceeded is negligible. There is therefore no requirement to proceed to a detailed assessment for any of these pollutants in Antrim Borough Council.

The updating and screening exercise for nitrogen dioxide has established that, when freight transport is taken into account, the total equivalent passenger numbers handled by Belfast International Airport has reached 5 million passengers per year. Emissions from aircraft have the potential to raise ambient concentrations of nitrogen dioxide so there is a need to monitor this pollutant at the nearest receptors to the airport to establish whether or not the air quality objectives are being exceeded.

The following actions are recommended:

(1) The Council will produce an action plan for the AQMA setting out the measures to be introduced in pursuit of the air quality objectives.

(2) The road networks within Antrim Borough Council should continue to be monitored for nitrogen dioxide using passive diffusion tubes.
(3) Nitrogen dioxide monitoring, using passive diffusion tubes, will be undertaken at selected sites in the vicinity of Belfast International Airport to assess the contribution of air traffic to ambient concentrations.

2 INTRODUCTION

2.1 The Air Quality Issue

Although air quality has been improving in recent years in Northern Ireland, the issue continues to be important due to concern about the environment and improved scientific knowledge about pollutants and their effect on health. Councils in Northern Ireland are under a statutory obligation to review and assess air quality from time to time. This is known as local air quality management (LAQM)

2.2 Phased Approach To LAQM

Councils in Northern Ireland have already completed the first round of review and assessment of local air quality, and are now undertaking the second round. A phased approach is used to review and assess air quality. The first stage of the review and assessment process is an updating and screening assessment. This identifies any changes that have occurred since the first round which may have an affect on air quality and which require a more detailed assessment. Where an updating and screening assessment has identified a risk that an air quality objective will be exceeded at a location with relevant public exposure then the council is required to undertake a detailed assessment.

2.3 The Environment (Northern Ireland) Order 2002

The Environment (Northern Ireland) Order 2002 introduced a statutory obligation on councils to carry out a review and assessment of their local air quality known as local air quality management (LAQM). The process requires the current and likely future quality of air to be assessed and compared against nationally prescribed air quality objectives. The process is set out in the Department of the Environment's Local Air Quality Management Technical Guidance LAQM. TG(03).

2.4 National Air Quality Strategy

The Environment Act 1995 – Part IV Section 80 required the Secretary of State to publish a strategy containing policies with respect to the assessment and management of the quality of air, i.e. a National Air Quality Strategy (NAQS). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland was published in January 2000. The primary objective of the strategy is to ensure that everyone is able to enjoy a level of ambient air quality in public places which poses no significant risk to health and quality of life. It sets out air quality objectives for eight pollutants, the date by which they should be achieved and the policy framework which is to be adopted to achieve the objectives. Pollutants covered by the strategy are: benzene, 1,3-butadiene, carbon monoxide, lead, oxides of nitrogen, particulate matter (as PM_{10}) and sulphur dioxide.

2.5 Air Quality Regulations (Northern Ireland) 2003

In Northern Ireland the air quality objectives contained in the strategy are incorporated into the Air Quality Regulations (Northern Ireland) 2003. This provides the statutory basis for the system of LAQM.

The Air Quality Regulations specify the following objectives

Pollutant	*Air Quality objective levels**	*Date to be achieved by*
(1)	*(2)*	*(3)*
Benzene	16.25µg/m^3 (5ppb) when expressed as a running annual mean	31 December 2003
	3.25µg/m^3 when expressed as a running annual mean	31 December 2010
1,3-butadiene	2.25µg/m^3 (1ppb) when expressed as a running annual mean	31 December 2003
Carbon monoxide	10mg/m^3 (8.6ppm) when expressed as a maximum daily running 8 hour mean	31 December 2003
Lead	0.5µg/m^3 when expressed as an annual mean	31 December 2004
	0.25mg/m3 when expressed as an annual mean	31 December 2008
Nitrogen dioxide	200µg/m^3 (105ppb) when expressed as a 1 hour mean, not to be exceeded more than 18 times a year	31 December 2005
	40µg/m^3 (21ppb) when expressed as an annual mean	31 December 2005
Sulphur dioxide	35µg/m^3 (132ppb) when expressed as a 1 hour mean, not to be exceeded more than 24 times a year	31 December 2004
	125µg/m^3 (47ppb) when expressed as a 24 hour mean, not to be exceeded more than 3 times a year	31 December 2004
	266µg/m^3 (100ppb) when expressed as a 15 minute mean, not to be exceeded more than 35 times a year	31 December 2005
Particles (PM_{10})	50µg/m^3 when expressed as a 24 hour mean, not to be exceeded more than 35 times a year	31 December 2004
	40µg/m^3 when expressed as an annual mean	31 December 2004

*µg/m^3: micrograms per cubic metre

2.6 Outcomes Of First Round Of Review And Assessment

In March 2001 the First Stage Review and Assessment of Air Quality in Antrim Borough Council was completed. This concluded that of the seven key pollutants examined, no further action was required in respect of carbon monoxide, benzene, 1,3-butadiene and lead. It was determined that there was a risk of the air quality objectives for nitrogen dioxide, sulphur dioxide and fine particulates (PM_{10}) being exceeded.

These three pollutants were looked at more closely in the Second/Third Stage Review and Assessment which was completed in April 2004. This concluded that, based on the data gathered, the risk of the air quality objectives for nitrogen dioxide and fine particulates not being met could be discounted. It also concluded that within the Ballycraigy and Greystone housing estates in Antrim town, the air quality objectives for sulphur dioxide were likely to be exceeded, as a result of the high levels of solid fuel combustion within these areas.

In October 2004, based on the recommendations of the assessment report, the Council declared an Air Quality Management Area (AQMA) that took in the two estates identified as being at risk of exceeding the air quality objective and in line with government guidance began a further assessment of air quality within the AQMA. A map of the AQMA is shown in Appendix 1.

In accordance with Article 13(2) of the Environment (Northern Ireland) Order 2002, the Council is currently drafting an Air Quality Action Plan specifying the actions to be taken in pursuit of the achievement of the air quality standards and objectives within the AQMA. On completion the Air Quality Action Plan will be submitted to the Department of the Environment for approval.

Shortly after the declaration of the AQMA, the Council installed an automatic continuous sulphur dioxide monitoring station at a site within the AQMA with a view to obtaining local monitoring data to assist with action planning.

The Government has set out the timetable for reviews and assessments and this document represents the Updating and Screening Assessment which must be completed by the end of April 2006. The report reviews and assesses air quality in the Antrim Borough Council area with respect to the seven pollutants specified in the National Air Quality Strategy (district councils are not required to assess ozone) and considers new monitoring data, new sources or significant changes to existing sources, either locally or in neighbouring district councils and other local changes that may affect local air quality.

Air quality objectives are health-based, and therefore, as with the earlier round of review and assessment, public exposure remains the focus for this assessment. Relevant locations are considered for each pollutant and individual objective in turn.

2.7 Antrim Borough Council.

Situated north west of Belfast City and bordering the north and east shores of Lough Neagh, the borough of Antrim includes the towns of Antrim, Toomebridge, Crumlin, Randalstown, Parkgate and Templepatrick. Covering an area of 220 square miles – approximately 4.1% of the total area of Northern Ireland – the borough stretches from Toome in the west to Clady in the east and from Tardree in the north to Crumlin in the south.

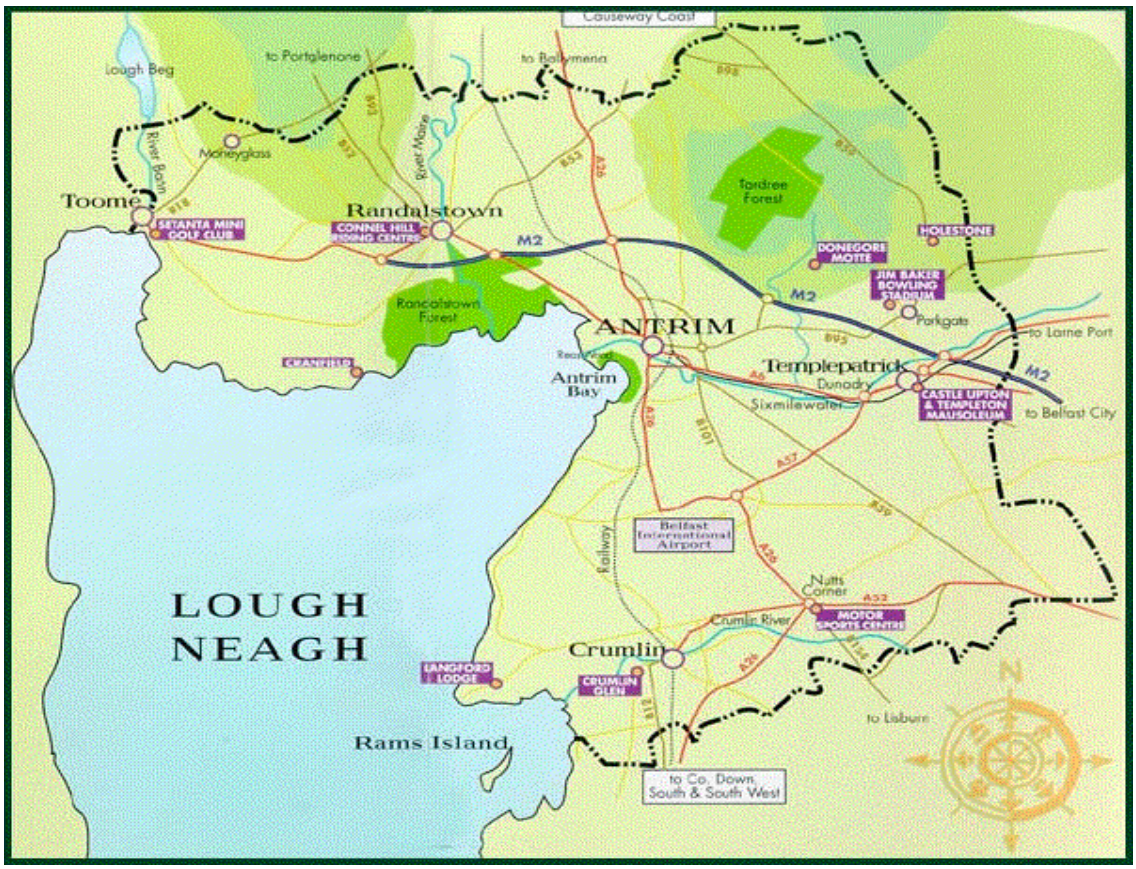
The Province's economic engines of growth have long been associated with the Historic Borough of Antrim. Its industrial history is based around a large and prosperous textile and agricultural base, whilst today's economic drivers revolve around construction, distribution, transport and hospitality. The area's principal strength literally revolves around a superbly developed transport infrastructure that provides easy access to all the main external gateways for Northern Ireland, as well as easy access to all parts of the Province. Antrim town lies on two of the main transport corridors, the Belfast – Derry corridor and the Southern corridor. Belfast International Airport is located within the borough, only 4 miles from the historic town of Antrim. The importance and benefit of the borough's central geographical location is emphasised by the strong interest shown by potential investors. Due to its location, businesses are able to access skilled labour from both inside and outside the borough.

Originally a rural community, new industry, with associated expansion and development, has made the borough much more urban with the town of Antrim now the main populated centre. The borough has a strong and diverse industrial base, employment levels are among the best in the Province and the infrastructure already in place will complement economic development throughout the 21st century.

2.8 Population

According to the 2001 Census the population of Antrim Borough was 48,366. Over half of the borough's population live in the town of Antrim. The borough has a youthful face with one in three of the population (31.6%) within the 25-44 age group.

Figure 1. Map of Antrim Borough.



3 REVIEW AND ASSESSMENT FOR CARBON MONOXIDE

3.1 Introduction

Carbon monoxide (CO) is a pollutant gas generated by combustion sources. At very high concentrations (such as may occur inside a building with a faulty heating appliance), it can be a dangerous asphyxiant. Whilst outdoor concentrations do not generally reach dangerous levels, they may still have adverse health effects for vulnerable people.

3.2 Objective

Pollutant	Objective	To be achieved by
Carbon Monoxide	10mg/m^3 (8.6ppm) when expressed as a maximum daily running 8 hour mean	31 December 2003

The objective should apply to any location where any members of the public could be exposed to carbon monoxide over an 8-hour period. Thus it should apply to locations such as the building facades of residential properties, schools, hospitals, libraries, etc. and also well-used garden areas of residential properties.

3.3 Sources Of Carbon Monoxide

Road transport is the main source of carbon monoxide in the UK and the highest outdoor concentrations occur near busy roads. Annual emissions of CO have been falling steadily since the 1970s and are expected to continue to do so. The highest outdoor concentrations of CO occur near busy roads.

3.4 Conclusion From The First Round Of Review And Assessment

The First Stage Review and Assessment of Air Quality for Antrim Borough Council concluded that there were no significant sources of CO in or near to the Antrim area and that the objective for the pollutant was likely to be achieved throughout the Borough.

3.5 Updating And Screening Assessment; Background Concentrations

Data on background levels of carbon monoxide within Northern Ireland, based on 1 kilometre grid squares for the year 2001 is available at **www.airquality.co.uk**. Background levels for Antrim Borough Council range from 0.147 mg/m^3 to 0.302 mg/m^3.

3.6 Updating And Screening Assessment; Monitoring Data

The Council does not undertake any ambient carbon monoxide monitoring. Data available from the Environment and Heritage Service (EHS) show maximum 8-hour mean concentrations of between 2.7 and 5.5mg/m^3 over the six years up to and including 2004, the last year for which figures are

available, at Belfast Centre, which is the nearest automatic monitoring site to the district. It should be noted that this site has had no exceedences of the AQS objective since 1995. Results from this site are shown in table 1, below.

Table 1; CO Results from Belfast Centre Automatic Monitoring Site

Calander Year	Annual Mean Mg/m^3	Max running 8-hour Mean mg/m^3	Number of exceedences of AQS objective
1999	0.5	4.3	0
2000	0.4	3.5	0
2001	0.4	5.5	0
2002	0.3	3.6	0
2003	0.2	2.7	0
2004	0.2	2.8	0

3.7 Updating And Screening Assessment; Very Busy Roads Or Junctions In Built Up Areas

There are no roads or junctions which meet the criteria of 'very busy' given in the Technical Guidance LAQM.TG(03) (i.e. single carriageway roads with daily average traffic flows which exceed 80,000 per day, dual carriageways with daily average traffic flows which exceed 120,000 per day or motorways with daily average traffic flows which exceed 140,000 per day). Road traffic flows for 2005 on the major road within the borough are shown in Appendix 2. In addition there are no areas where the background level is above $1mg/m^3$.

3.8 Updating And Screening Assessment; Sources Outside Antrim Borough Council

There are no new sources within neighbouring council areas that will give rise to levels of carbon monoxide likely to significantly affect the air quality of Antrim Borough Council.

3.9 Conclusion

The carbon monoxide objective is unlikely to be exceeded in any location in the district and there is no need to proceed to a detailed assessment in Antrim Borough Council.

4 REVIEW AND ASSESSMENT FOR BENZENE

4.1 Introduction

Benzene is a known human carcinogen (cancer causing substance), and also contributes to the formation of ground-level ozone (summer smog). The main sources of benzene emissions in the UK are petrol vehicles, petrol refining, and the fuel distribution from petrol stations without vapour recovery systems. National benzene concentrations have declined in recent years, mainly due to the increasing use of three-way catalytic converters and the introduction of vapour recovery systems in petrol stations.

Since January 2000, EU legislation has reduced the maximum benzene content of petrol to1%, from a previous upper limit of 5%. The European Auto-Oil programme will further reduce emissions for cars and light-duty vehicles, and emissions of benzene from the storage and distribution of petrol (LAQM.TG (03)).

Pollutant	Objective	To be achieved by
Benzene	16.25µg/m^3 (5ppb) when expressed as a running annual mean	31 December 2003
Benzene	3.25µg/m^3 when expressed as a running annual mean	31 December 2010

4.2 Conclusions From The First Round of Review And Assessment

The First Stage Review and Assessment of Air Quality in Antrim Borough Council (2001) concluded that the risk of the air quality objective for benzene being exceeded was negligible.

4.3 Updating And Screening Assessment; Background Concentrations

The highest background concentration for any 1km grid square in the Antrim area, taken from www.airquality.co.uk, is 0.597 µg/m^3 for 2003 and 0.531 µg/m^3 for 2010.

4.4 Updating And Screening Assessment; Monitoring Data

Benzene is not monitored locally within the Antrim area. There are two national monitoring network sites in Belfast and Table 2 shows calendar year mean concentrations of benzene at these sites for 2004.

Table 2; Concentrations of Benzene, 2004

Site	Grid Ref.	Data Capture, %	Calendar Year 2004 Mean Concentration µg/m^3
Belfast Centre	J 339 744	93	1.18
Belfast Roadside	J 379 739	93	2.69

The annual means for 2004, means of 1.18µg/m^3 and 2.69µg/m^3 for the two sites respectively, are within the 2003 Air Quality Strategy objective and also the 2010 objective for this pollutant.

4.5 Updating And Screening Assessment; Very Busy Roads And Junctions In Built Up Areas

There are no roads or junctions which meet the criteria of 'very busy' given in the Technical Guidance LAQM.TG(03) (i.e. single carriageway roads where the daily average traffic flows exceed 80,000, or dual carriageways where the daily average traffic flows exceed 120,000 or motorways where daily average traffic flows exceed 140,000), where the 2010 background is expected to be above 2 µg/m^3.

4.6 Updating And Screening Assessment; Industrial Sources

There are no industrial sources within, or close to, the Antrim area which need further consideration regarding benzene.

4.7 Updating And Screening Assessment; Petrol Stations

There are 10 petrol filling stations within the Antrim Borough Council area that have been issued with permits under the Pollution Prevention and Control Regulations (Northern Ireland) 2003 with an annual throughput in excess of 1000m^3 of petrol. Only one of these, Tannaghmore Filling Station, is located close to a road with more than 30,000 vehicles per day (A26 Lisnevenagh Road) but this filling station does not have any relevant locations within 10 metres of the pumps.

4.8 Updating And Screening Assessment; Major Fuel Storage Depots

There are no major fuel depots within the borough.

4.9 Conclusion

The assessment has indicated that the benzene objectives are unlikely to be exceeded at any location within the borough, and therefore a detailed assessment will not be required.

5 REVIEW AND ASSESSMENT FOR 1, 3-BUTADIENE

5.1 Introduction

1,3-Butadiene is a suspected human carcinogen. The major source of 1,3-butadiene nationally is motor vehicle emissions, with other major sources being industrial processes (such as petrochemical and rubber processes). As with benzene, the fitting of catalytic converters to petrol vehicles reduces their emissions of 1,3-butadiene. Recently agreed reductions in vehicle emissions and improvements to fuel quality (in the framework of the Auto-Oil programme), are expected to further reduce emissions of 1,3-butadiene from vehicle exhausts (LAQM.TG03).

Concentrations of 1,3-Butadiene measured at all urban background and roadside locations across the UK already experience concentrations less than 2.25µg/m^3, and the objective is not expected to cause a problem for local authorities.

Pollutant	Objective	To be achieved by
1, 3-Butadiene	2.25µg/m^3 (1ppb) when expressed as a running annual mean	31 December 2003

5.2 Conclusions From The First Round Of Review And Assessment

1,3-Butadiene was screened out at the first stage of the previous review and assessment because there were no significant sources of 1,3-Butadiene in the Antrim Borough Council area or close to it and there were no proposals for development likely to emit this pollutant.

It was concluded that the objective for 1,3-Butadiene is likely to be achieved at all locations within the Antrim Borough Council area.

5.3 Updating And Screening Assessment; Background Concentrations

Throughout the Antrim Borough Council area the highest background concentration of 1,3-Butadiene is 0.121 µg/m^3 (2003) (www.airquality.co.uk.) .

5.4 Updating And Screening Assessment; Monitoring Data

1,3-Butadiene is not monitored locally within the Antrim area. There are two national monitoring network sites in Belfast and Table 3 shows calendar year mean concentrations of benzene at these sites for 2004.

Table 3. Monitoring results for Benzene for 2004

Site	Data Capture, %	Calendar Year Mean Concentrations 2004, µg/m^3
Belfast Centre	90	0.057
Belfast Upper Newtownards Road	86	0.073

Annual mean levels of this pollutant at both sites are well within the applicable Air Quality Objective of 2.25µg/m^3.

5.5 Updating And Screening Assessment; New Industrial Sources

There are no new industrial sources of the types identified in Annex 2 of the guidance (LAQM.TG(03)) for 1,3-Butadiene within or close to the Antrim Borough Council area.

5.6 Updating And Screening Assessment; Existing Industrial Sources With Substantially Increased Emissions

There are no industrial sources with substantially increased emissions to consider for the purpose of this assessment.

5.7 Conclusion

The assessment has indicated that the 1,3-Butadiene objective is unlikely to be exceeded at any location within the borough, and therefore a detailed assessment will not be required.

6 REVIEW AND ASSESSMENT FOR LEAD

6.1 Introduction

Lead has been identified as causing acute and chronic damage to the nervous system, effects on the kidneys, joints and reproductive system. Historically, the major source of lead has been motor vehicle emissions, with other major sources being metal industries and power generation. The agreement reached between the European Parliament and the Environment Council on the Directive on the Quality of Petrol and Diesel Fuels has led to the ban on sales of leaded petrol in the United Kingdom with effect from 1 January 2000. Emissions of lead are now restricted to a variety of industrial activities, such as battery manufacture, pigments in paints and glazes, alloys, radiation shielding, tank lining and piping (LAQM.TG (03)).

Pollutant	Objective	To be achieved by
Lead	0.5µg/m^3 when expressed as an annual mean	31 December 2004
Lead	0.25µg/m^3 when expressed as an annual mean	31 December 2008

6.2 Conclusions From Previous Review And Assessment

Lead was screened out at the first stage of the previous review and assessment because there were no significant sources of lead in the Antrim Area or close to it and no proposals for developments likely to emit this pollutant.

It was concluded that the objectives for lead were likely to be achieved at all locations within the Antrim Borough Council area.

6.3 Updating And Screening Assessment; Monitoring Data

Lead is not monitored locally within the Antrim Borough Council area or in any surrounding Council area and there are therefore no monitoring data available.

6.4 Updating And Screening Assessment; New Industrial Sources

There are no industrial processes within the area or in neighbouring authorities, to consider for the purposes of this assessment.

6.5 Updating And Screening Assessment; Industrial Processes With Substantially Increased Emissions

There are no industrial sources with substantially increased emissions to consider for this assessment.

6.6 Conclusions

This assessment has indicated that there are no industrial sources of lead emissions within or close to the district and consequently the lead objectives are unlikely to be exceeded at any location, and therefore a detailed assessment will not be required.

7 REVIEW AND ASSESSMENT FOR NITROGEN DIOXIDE

7.1 Introduction

Nitrogen dioxide is a respiratory irritant associated with both acute (short-term) and chronic (long-term) effects on human health, particularly in people with asthma. Nitrogen dioxide (NO_2) and nitric oxide (NO) are both oxides of nitrogen, and are collectively referred to as nitrogen oxides (NOx). All combustion processes produce NOx emissions, largely in the form of nitric oxide, which is then converted to nitrogen dioxide, following a reaction with ozone in the atmosphere. It is nitrogen dioxide that is associated with adverse effects upon human health.

The principal source of nitrogen oxides emissions is road transport, which accounted for about 49% of total UK emissions in 2000 (LAQM.TG (03)). Major roads carrying large volumes of high-speed traffic are a predominant source, as are conurbations and city centres with congested traffic. The contribution of road transport to nitrogen oxides emissions has declined significantly in recent years as a result of various policy measures. At a national level, urban traffic nitrogen oxides emissions were estimated to fall by about 20% between 2000 and 2005, and by 46% between 2000 and 2010 (Stedman et al, 2001). Other significant sources of nitrogen oxides emissions include the electricity supply industry and other industrial and commercial sectors. Emissions from both sources have also declined dramatically, due to the fitting of low nitrogen oxides burners, and the increased use of natural gas. Industrial sources make only a very small contribution to annual mean nitrogen dioxide levels.

Pollutant	Objective	To be achieved by
Nitrogen Dioxide	200µg/m^3 (105ppb) when expressed as a 1 hour mean, not to be exceeded more than 18 times a year	31 December 2005
Nitrogen Dioxide	40µg/m^3 (21ppb) when expressed as an annual mean	31 December 2005

7.2 Conclusions From Previous Review And Assessment

The First Stage Review and Assessment of Air Quality in Antrim Borough Council (2001) concluded that the risk of the air quality objective for nitrogen dioxide being exceeded was not negligible and recommended further consideration in a second stage review and assessment. This Second Stage Review and Assessment, completed in April 2004, looked at busy roads and road junctions and concluded that there was no risk of the air quality objectives being exceeded and that there was no need to undertake a third stage review and assessment for nitrogen dioxide.

7.3 Updating And Screening Assessment; Background Concentrations

General backgrounds in the area are reasonably low. The background annual mean concentrations for nitrogen dioxide in 2005 do not exceed 11µg/m^3 anywhere and in 2010 are not predicted to exceed 9 µg/m^3 at the worst areas. (www.airquality.co.uk/archive/).

7.4 Updating And Screening Assessment; Monitoring Data

Antrim Borough Council has been using passive diffusion tubes to monitor nitrogen dioxide levels throughout the district for a number of years. The tubes used are supplied, prepared and analysed by Casella CRE Air. The preparation method used is 10% Triethanolamine (TEA) in Water. Quality assurance and quality control measures for the diffusion tubes are set out in Appendix 3.

All the monitoring sites are chosen to represent kerbside locations. Site locations focus on areas of relevant exposure close to busy road junctions and road networks with high annual average daily traffic flows (AADT).

Results obtained from diffusion tubes need to be corrected by applying an adjustment factor which takes into account the tendency for diffusion tubes from particular suppliers to over or under read concentrations when compared to real-time monitoring. As Antrim Borough Council has no means of automatically monitoring nitrogen dioxide concentrations, and has not carried out a diffusion tube co-location study, the bias adjustment factor for Casella CRE Air has been taken from www.ewe.ac.uk/aqm/review. For the year 2005 the bias adjustment factor is 0.81. Multiplying the measured annual concentration by the adjustment factor carries out correction for bias.

Monitoring results for the calendar year 2005 are shown in Table 4.

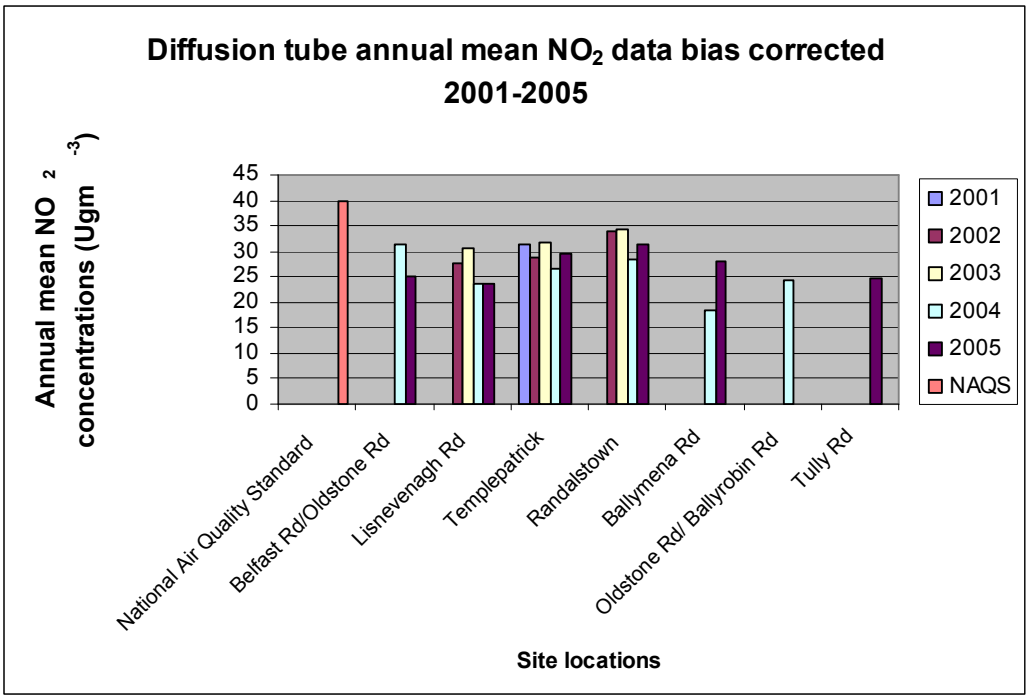
Table 4; Nitrogen Dioxide Monitoring Results for 2004

Location	Measured annual mean concentration (µg/m^3)	Corrected annual mean Concentration (µg/m^3)
Belfast Rd/Oldstone Rd	31.18	25.26
Lisnevenagh Rd	29.36	23.78
Templepatrick Village	36.25	29.36
Randalstown, Main St	38.75	31.39
Tully Road	30.58	24.77
Ballymena Rd	34.45	27.90

All of the above locations were specifically chosen to reflect the findings of the last review and assessment of air quality in Antrim Borough Council and represent those road networks with the highest AADTs. Traffic information for 2005 was obtained from the Department of Regional Development's Roads Service and is shown in Appendix 2.

Monitoring sites are selected to provide data on locations that appear to be representative of likely residential exposure and, where possible, are close to the nearest receptor to the road or road junction of interest. In all cases the site is nearer or at least as near to the roadway as the nearest receptor. Monitoring sites are reviewed annually and where it is considered that sufficient data has been gathered sites are closed down and diffusion tubes relocated.

Annual mean concentrations for 2005 and, where they are available, for preceding years are shown below.



Using these data we can be confident that the monitoring sites, which represent “relevant locations” all meet the annual mean objective.

Antrim Borough Council will continue to monitor at sites where relatively high (over 30 µg/m^3) annual mean concentrations are being measured and where appropriate will relocate sites to monitor other road junctions with high traffic flows in order to cover the requirements of future assessments.

7.5 Updating and Screening Assessment; Monitoring Data Within An Air Quality Management Area (AQMA)

There is no AQMA for nitrogen dioxide within the Antrim district.

7.6 Updating And Screening Assessment; Narrow Congested Streets With Residential Properties Close To The Kerb

The only such street which meets all the screening criteria given in the guidance LAQM.TG(03) and where the 'street canyon' effect could be a factor is Main Street, Randalstown.

Diffusion tube monitoring has been ongoing at a 'relevant location' in this street since 2001 and results from this site are shown above.

The monitoring results indicate that the air quality standard is consistently being met at this location and consequently no further assessment is necessary.

7.7 Updating And Screening Assessment; Road Junctions

There are no busy junctions with relevant exposure within 10m of the kerb within the Antrim Borough Council area that were not assessed during the last review and assessment of air quality.

7.8 Updating And Screening Assessment; Busy Streets Where People May Spend 1 Hour Or More Close To Traffic

Within the Antrim area there are no streets with more than 10,000 vehicles per day at which members of the public may be exposed within 5 metres of the kerb for 1-hour or more.

7.9 Updating And Screening Assessment; Roads With High Flow Of Buses And/Or HGVs

Within the Antrim area there are no roads with particularly high proportions (greater than 25%) of buses and/or HGVs.

7.10 Updating And Screening Assessment; New Roads Constructed Or Proposed Since First Round Of Review And Assessment

There have been no significant new roads constructed or proposed since the first round of review and assessment.

7.11 Updating And Screening Assessment; Roads Close To The Objective During The First Round Of Review And Assessment

The first round assessment identified a relevant location at the junction of the Oldstone Road and Ballyrobin Road which, when modelled on DMRB, showed potential nitrogen dioxide concentrations close to the objective at 38.5 $\mu g/m^3$.

A diffusion tube monitoring site was maintained at this location throughout 2004. The corrected annual mean concentration measured at this site was 24.5µg/m^3 and did not show any exceedance of the air quality objective.

As the monitoring site was close enough to the only receptor in proximity to the road junction to represent relevant exposure and the measured annual concentration was well below the relevant objective, it is considered that there is no need for any further assessment of this junction.

7.12 Updating And Screening Assessment; Roads With Significantly Changed Traffic Flows

There are no roads of 10,000 AADT that have experienced more than a 25% increase in traffic flow.

7.13 Updating and Screening Assessment; Bus Stations

There are no bus stations within the Antrim Borough Council area with a flow of buses of more than 1000 per day. There is no relevant exposure within 10m of any bus station.

7.14 Updating And Screening Assessment; New Industrial Sources

There are no new industrial processes within Antrim Borough Council or neighbouring authorities, to consider for the purposes of this assessment.

7.15 Updating And Screening Assessment; Aircraft

Northern Ireland's premier airport, Belfast International Airport, lies within the borough, approximately 4 miles from the town of Antrim.

In 2005 the airport recorded a record 4.8 million passengers, and in addition handled approximately 50,000 tonnes of freight. Although a proportion of the freight was taken in passenger planes, using the assessment criteria set out in LAQM. TG(03), it is likely that the freight component takes the total equivalent passenger numbers to over 5 million passengers per year (mppa).

There are several receptors with relevant exposure within 1000 metres of the airport boundary, the closest being a domestic property, approximately 500 metres away. It is considered that this property would represent worst-case exposure because; in addition to being the closest property to the airport it is also the closest property to the main airport road, the A57 Ballyrobin Road.

For screening purposes it was decided to run DMRB for this property, using data provided by DRD Roads Service (see Appendix 2), to assess the contribution from road traffic before considering the additional impact from the airport. The results of the DMRB run are shown in Table 5, below.

Table 5; DMRB results for A57 Ballyrobin Road

Pollutant	Annual mean				For comparison with Air Quality Standards		
	Background concentration	Road traffic component	Total	Units	Metric	Value	Units
NO_x	8.2	11.5	19.6	µg/m^3	Not applicable		
NO_2	6.4	3.7	10.1	µg/m^3	Annual mean	10.1	µg/m^3

The technical guidance, LAQM.TG(03), states that an airport with a throughput of 5 mppa may contribute up to about 25 µg/m^3 NOx at the nearest receptor location. If it is assumed, in the worst case, that this maximum contribution is received at this location, and that the total NO_x manifests as NO_2, then total NO_2 concentration at this receptor will be 10.1 + 25 or 35.1 µg/m^3.

It should be noted that the screening exercise has used some very conservative assumptions and is likely to have arrived at an overestimation of the pollutant concentrations.

Passenger numbers at the airport have increased by 10% year on year and in the White Paper on the Future of Air Transport, published in December it is envisaged that the airport will be handling 12.9 mppa, by 2030.

Increasing passenger throughput is likely to mean increasing NO_2 emissions and, and in view of the screening results, Antrim Borough Council will establish a diffusion tube monitoring site at the nearest receptor. The Council will also look for other suitable monitoring sites in the vicinity of the airport.

7.16 Conclusions

The assessment has indicated that the NO_2 annual mean objective is unlikely to be exceeded within the Antrim Borough Council as a result of road traffic or industrial activities.

Increased passenger throughput at Belfast International Airport has seen the total equivalent passenger numbers hit 5 million per annum for the first time. Increasing passenger numbers combined with the contribution from road traffic will impact upon receptors in the vicinity of the airport. There is uncertainty over the scale of this impact so the Council will monitor nitrogen dioxide levels at the nearest receptor and at a minimum of one other receptor to quantify this.

8 REVIEW AND ASSESSMENT FOR SULPHUR DIOXIDE

8.1 Introduction

Sulphur dioxide is an acute respiratory irritant, hence the short averaging time for its objective. The main source of sulphur dioxide in the UK is power generation, which accounted for more than 71% of emissions in 2000. There are also significant emissions from other industrial combustion sources. Domestic sources now only account for 4% of emissions, but can be locally much more significant. Road transport currently accounts for less than 1% of emissions (LAQM.TG(03)).

Pollutant	Objective	To be achieved by
Sulphur Dioxide	35µg/m^3 (132ppb) when expressed as a 1 hour mean, not to be exceeded more than 24 times a year	31 December 2004
Sulphur Dioxide	125µg/m^3 (47ppb) when expressed as a 24 hour mean, not to be exceeded more than 3 times a year	31 December 2004
Sulphur Dioxide	266µg/m^3 (100ppb) when expressed as a 15 minute mean, not to be exceeded more than 35 times a year	31 December 2005

The objectives should apply at any location where the public might reasonably be exposed for the relevant period. Thus the 24-hour mean should be applied to building facades and to well-used gardens of residential properties as well as facades of schools, hospitals, etc. The 1-hour and 15-minute means should be applied to the above and to any outdoor locations in which the public might spend an hour or longer, or 15 minutes respectively.

8.2 Results Of Previous Review And Assessment

In the first round of review and assessment Antrim Borough Council considered the impact of domestic and industrial sources on concentrations of sulphur dioxide.

The Stage 2 study modelled emissions from two >5 MW industrial combustion systems and concluded that these were unlikely to cause the objectives to be exceeded.

There are still pockets of coal and solid fuel fired homes within the borough, particularly within the town of Antrim. As part of the Stage 3 assessment, the Council appointed environmental consultants, NETCEN, to carry out detailed air quality dispersion modelling for the largest areas of domestic solid fuel burning. The modelling predicted that the 15-minute mean objective was likely to be exceeded in parts of the Greystone and Ballycraigy housing estates.

Based on the findings of the review and assessment the Council declared an Air Quality Management Area (AQMA), taking in the two estates, which came into force in October 2004.

Subsequent to the declaration of the AQMA the Council commissioned NETCEN to undertake a Stage 4 study to further assess sulphur dioxide concentrations. This study concentrated on the area designated as the AQMA.

The Stage 4 study, which built on previous assessments, employed a technique that allowed a more detailed level of modelling. The study made use of enhanced fuel use information and updated emissions factors and was completed in April 2005.

Contrary to the Stage 3 findings, this study predicted that sulphur dioxide concentrations within the AQMA would not in fact exceed the regulated objectives.

The Stage 4 report concluded that the Council could consider revocation of the AQMA. However, because our own real time sulphur dioxide had not been in operation long enough to provide sufficient data, the Stage 4 modelling had been scaled using monitoring data from a neighbouring district council. It was therefore recommended that revocation did not take place until the modelling results could be verified using local monitoring data.

As discussed in Section 8.2 below, the modelling results have now been corrected using a 12-month data set from our real time analyser and this has again shown a probable exceedence of the objective.

In view of these findings the Council has commenced work on developing an Air Quality Action Plan for the AQMA.

8.3 Updating And Screening Assessment; Monitoring Data Within An Air Quality Management Area (AQMA)

Antrim Borough Council has monitored sulphur dioxide on an automatic continuous basis since November 2004. The site is located within the curtilage of a house in the Greystone housing estate and therefore represents a site with relevant public exposure.

Data obtained from our real time sulphur dioxide monitor and ratified by NETCEN for 2005 is shown in Appendix 3

The data capture rate for the sulphur dioxide analyser at Greystone exceeds 90%. The data collated for the period does not show any exceedence of the objectives at the monitoring site, however, when used by NETCEN to correct modelling carried out for the Stage 4 assessment, exceedences of the 15-minute objective are predicted elsewhere in the AQMA.

The Council will continue to monitor at this site. Data obtained will demonstrate progress towards meeting the air quality objective through implementation of the air quality action plan for the area.

8.4 Updating And Screening Assessment; Monitoring Data Outside An Air Quality Management Area (AQMA)

Sulphur dioxide is not monitored locally outside of the AQMA.

8.5 Updating And Screening Assessment; New Industrial Sources

There are no new industrial sources of sulphur dioxide in or close to the borders of the Antrim area.

8.6 Updating And Screening Assessment; Industrial Sources With Substantially Increased Emissions

There are no industrial sources with substantially increased emissions in or close to the Antrim Borough Council area.

8.7 Updating And Screening Assessment; Small Boilers >5MW (Thermal)

All the boiler plants with an output greater than 5MW thermal within the Antrim area were assessed at Stage 2 and were not found to be a problem.

8.8 Updating And Screening Assessment; Areas Of Domestic Coal Burning

Emissions from domestic sources within the largest solid fuel burning areas in the borough were considered in the first round with much of Antrim town being modelled for the Stage 3 Review and Assessment.

As stated in Section 8.1, Antrim Borough Council has found it necessary to declare an AQMA, which takes in two housing estates in Antrim town. This was as a result of predicted exceedences of the 15-minute mean objective. Antrim Borough Council is currently developing an action plan to reduce emissions of sulphur dioxide within this area.

Outside of the AQMA there are other, smaller, pockets of coal and solid fuel fired homes, particularly within the town of Antrim, but also within the outlying villages.

Whilst it is considered that the first round review and assessment findings are still relevant, professional judgement was used to identify two 500 x 500m areas that had not previously been assessed and where solid fuel burning might be a problem.

These were the Springfarm housing estate in Antrim, and the Church Road area of Randalstown. For the purposes of this report these areas were assessed against the screening criteria set out in LAQM. TG(03).

Data from the Northern Ireland Housing Executive was used in conjunction with a fuel use survey to establish the number of houses within these areas relying on solid fuel as the primary source of space heating. For the Springfarm area 86 houses were found to be burning solid fuel, and in the Church Road area it was 56 houses. In both cases therefore, there are less than 100 houses in the 500m x 500m area likely to be burning coal or solid fuel in any quantities so there is no need to proceed to a detailed assessment on this issue.

8.9 Updating And Screening Assessment; Shipping

Antrim Borough Council has no coastline and therefore no significant shipping to consider.

8.10 Updating And Screening Assessment; Railway Locomotives

The only locations at which diesel locomotives may be stationary for periods of 15 minutes or more and where there could conceivably be relevant exposure are at Antrim and Crumlin railway stations. However, it is not at all likely that there will be more than two occasions per day on which this could happen as these are mid point stations on single line tracks with no trains starting or terminating their journeys there.

8.11 Conclusion

The first round of review and assessment established that areas of Antrim town were at risk of exceeding the air quality objective for sulphur dioxide as the result of domestic solid fuel burning and led to the declaration of an AQMA. The Council is currently working on an Air Quality Action Plan for the AQMA.

This updating and screening assessment has indicated that, with the exception of the locations covered by the AQMA, the sulphur dioxide objectives are unlikely to be exceeded and therefore a detailed assessment will not be required.

9 REVIEW AND ASSESSMENT FOR PARTICULATES (PM_{10})

Particulate matter is of major health concern, as it has been linked with both increased morbidity and premature mortality. A wide range of emission sources contributes to PM_{10} concentrations in the UK. Research studies have confirmed that these sources can be divided into 3 main categories (APEG, 1999):

I) *Primary particle* emissions are derived directly from combustion sources, including road traffic, power generation, industrial processes etc.

II) *Secondary particles* are formed by chemical reactions in the atmosphere, and comprise principally of sulphates and nitrates.

III) *Coarse particles* comprise of emissions from a wide range of sources, including re-suspended dusts from road traffic, construction works, mineral extraction processes, wind-blown dusts and soils, sea salt and biological particles.

The expected reduction in national particle emissions in future years is different for each source type. For example, emissions from road transport will be governed by legislation on vehicle emission standards; emissions of secondary particles will be largely governed by controls on power generation, industrial and transport SO_2 and NOx emissions, both in the UK and in Europe; emissions of coarse particles are largely uncontrolled, and in general are not expected to decline in future years (LAQM.TG (03)).

Pollutant	Objective	To be achieved by
Particulate Matter	50µg/m^3 when expressed as a 24 hour mean, not to be exceeded more than 35 times a year	31 December 2004
Particulate Matter	40µg/m^3 when expressed as an annual mean	31 December 2004

9.1 Results Of Previous Review And Assessment

In the previous round of review and assessment PM_{10} concentrations at locations close to busy roads and road junctions were assessed using DMRB and concentrations arising from domestic coal and solid fuel burning were modelled by NETCEN as part of the Stage 3 study using the dispersion model ADMS 3.1.

The review and assessment concluded that, in all areas, exceedences of the objectives were unlikely.

The Stage 4 modelling that was undertaken for sulphur dioxide was also run for PM_{10}. This confirmed that the 2004 objectives were not likely to be exceeded and also concluded that the provisional annual PM_{10} objective for 2010 of 20µg/m^3 would also be met within the modelled areas.

9.2 Updating And Screening Assessment; Monitoring Data Outside An Air Quality Management Area (AQMA)

Antrim Borough Council has no monitoring data for PM_{10}. The nearest automatic monitoring sites to the borough are in Belfast and Lisburn and results for these sites for year 2004 are shown in Table 6 below. Figures in **bold** indicate more than the permitted number of exceedences of the relevant objective.

Table 6; Results from PM10 monitoring sites for year 2004.

Site	2004 Data Capture %	Annual Mean µg/m^3	Max Daily Mean µg/m^3	No of Daily means >50µg/m^3
Belfast Centre	96	21	78	10
Belfast Lombard St	92	13	66	5
Belfast Westlink	92	30	109	**41**
Lisburn Dunmurry	56	20	74	5
Lisburn Civic Centre	82	21	69	8

The PM_{10} concentrations at Belfast (Westlink) are above the objective. However, this is a roadside site near a road with very high traffic flows and conditions at this site would not be replicated anywhere within the Antrim area with relevant exposure.

9.3 Updating And Screening Assessment; Monitoring Data Within An Air Quality Management Area (AQMA)

Antrim Borough Council has no AQMAs for PM_{10}.

9.4 Updating And Screening Assessment; Roads And Road Junctions

There are no busy junctions with relevant exposure within 10m of the kerb that were not assessed in the last review and assessment of air quality.

9.5 Updating And Screening Assessment; Roads With High Flows Of Buses And/Or HGVs

There are no roads in the Antrim Borough Council area where more than 20% of the AADT traffic flow is made up of buses and/or HGVs (see Appendix 2).

9.6 Updating And Screening Assessment; New Roads Constructed Or Proposed Since Last Round Of Review And Assessment

There are no new or proposed roads since the last review and assessment.

9.7 Updating And Screening Assessment; Roads Close To The Objective During The First Round Of Review And Assessment

There were no roads close to the objective during the first round of review and assessment.

9.8 Updating And Screening Assessment; Roads With Significantly Changed Traffic Flows

There are no roads with more than 10 000 vehicles per day (AADT) that have experienced more than a 25% increase in traffic flow.

9.9 Updating And Screening Assessment; New Industrial Sources

There are no new industrial processes within Antrim Borough Council, or in neighbouring authorities to consider for the purposes of this assessment.

9.10 Updating And Screening Assessment; Industrial Sources With Substantially Increased Emissions

There are no industrial sources with substantially increased emissions to consider for the purposes of this assessment.

9.11 Updating And Screening Assessment; Areas Of Domestic Fuel Burning

There are still considerable pockets of solid fuel burning homes in the Borough of Antrim, particularly within the town of Antrim, but also within the larger villages and Crumlin.

The larger solid fuel burning areas were considered during the last round of review and assessment with a Stage 3 study being undertaken for the major solid fuel burning areas within Antrim town. The assessment concluded that the objectives for the pollutant would be met.

Professional judgement was used to identify two areas in the district that had not been fully considered during the first round of assessment and where there might be a problem; these were the Springfarm housing estate in Antrim town and the Church Road area of Randalstown.

For each of these areas, the total number of houses in a 500 x 500m area was identified and information obtained from the Northern Ireland Housing Executive (NIHE) was used in conjunction with a house-to-house survey to establish the number of houses using solid fuel regularly for heating purposes.

For Springfarm and for Church Road it was 86 and 56 houses respectively. The guidance (LAQM.TG(03) states that these figures represent significant solid fuel burning and therefore both areas were assessed in accordance with the guidance (LAQM.TG(03) (see Table 7, Below).

Table7; Application of LAQM.TG(03) to assess the density of houses burning solid fuel

Church Road, Randalstown.

There is no information on the mix of solid fuels being burnt so, as to demonstrate the worst case scenario, it is assumed that all of the 56 houses burning solid fuel are using coal. In this event, the effective number of coal-burning houses (**Ceff**) in the 500 x 500 m area is also 56.

The density of effective coal-burning houses (**Deff**) per 500 x 500 m area is then given by the following equation:
(**Deff**) = (**Ceff**)/(1 – **L**)
Where **L** = proportion of open space (in this case 70%) equal to 0.70.
So, (**Deff**) = 56/(1-0.70) = 187 houses in a 500 x 500 m area.

Randalstown covers a 2 Km^2 area and, using the assessment methodology in guidance (LAQM.TG(03), can be catergorised as a small town for assessment purposes. Using the nomogram in Figure 8.8 of the guidance the threshold density of effective coal-burning houses in 2004 for a small town with a background under 15µg/m^3 (from www.airquality.co.uk/archive/laqm) is something in excess of 300. The actual density of effective coal-burning houses (**Deff**) is 187, which is below the threshold number. It is therefore unlikely that the objective is being exceeded and there is no need to progress to a more detailed assessment.

Springfarm Housing Estate

All of the 86 houses burning solid fuel are within a clean air area and should be burning only smokeless fuels. However, in order to demonstrate the worst-case scenario, it is assumed that 10% of the houses (9) are burning coal and the rest (77) are burning smokeless fuel. In this case;
(Ceff) = 9 + (77x 0.56) = 52

The proportion of open space in the 500 x 500 m area, **L** is approximately 75% or 0.75 so; **(Deff)** = 52/(1.0-0.75) = 208 houses in a 500 x 500 m area.

At approximately 13 Km^2 in area Antrim can be considered as a small town for assessment purposes and as the background for Antrim town is everywhere under 15 µg/m^3, using Figure 8.8 the threshold density is again over 300. The actual density of effective coal-burning houses (**Deff**) is 208, which is comfortably below the threshold number. It is therefore unlikely that the objective is being exceeded and there is no need to proceed further.

9.12 Updating And Screening Assessment; Quarries/Landfill Sites/Opencast Coal/Handling Of Dusty Cargoes At Ports Etc.

The only significant operation is a waste transfer station and landfill site located within a worked out quarry at Crosshill Road, Crumlin. Here there is a relevant location between 200 – 400 metres from the materials handling area, but the projected background concentration for 2005 is just around 14.5 $\mu g/m^3$. Using the criteria given in technical guidance LAQM. TG(03), there should not be any problem in meeting the objectives.

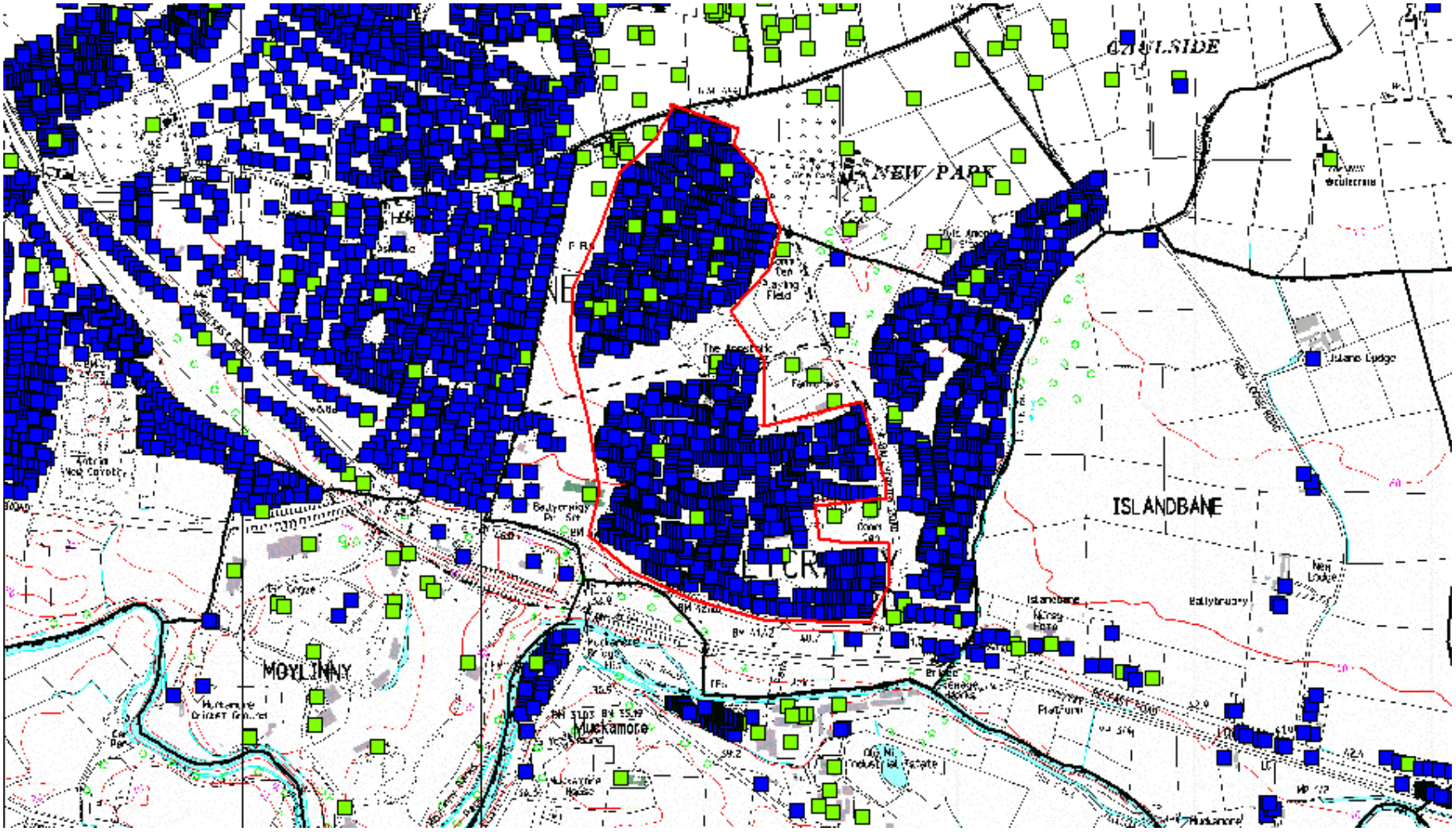
9.13 Updating And Screening Assessment; Aircraft

Belfast International Airport is situated within the Antrim Borough Council area. Although there is relevant exposure within 500m of the airport boundary, the annual total equivalent passenger throughput is less than 10 mppa, therefore it will not be considered further for the purposes of this assessment.

9.14 Conclusions

This assessment has indicated that there is no need to move to a detailed assessment for PM_{10} in relation to the 2004 objectives.

Appendix 1
Antrim Air Quality Management Area
Scale 1:24,500



Appendix 2

Summary of Traffic Data used in Updating and Screening Assessment.

Road Name	Vehicle* count from first Round of Assessment	Vehicle Count 2005	% HDV	Average speed (mph)
A522 Fountain Street Antrim	20137	17866	1.8	21.6
Main Street Crumlin	10040	4277	1.8	26.8
A6 Belmont Road Antrim	8307	7851	5.1	48.4
B18 Roguery Road Moneyglass	5076	5124	4.3	48.6
B154 Dundrod Road Nutts Corner	N/A	10968	6.3	40.8
Shane Street Randalstown	N/A	10065	3.7	41.7
B95 Greystone Road (St. Joseph's Primary)	9317	7997	2.8	30.0
A52 Belfast Road Nutts Corner	N/a	5049	7.1	39.4
B518 Stiles Way Antrim	11205	7963	3.4	43.0
A57 Ballyrobin Road (Airport)	12308	13092	6.2	37.4
A57 Ballyrobin Road (Templepatrick)	11823	10827	13.0	47.9
A26 Tully Road Nutts Corner	N/A	19090	12.3	48.9
A26 Moira Road Nutts Corner	N/A	12022	17.2	51.4
A26 Lisnevenagh Road	30573	30372	8.0	44.9
A26 Ballymena Road Antrim	15887	17443	8.1	41.3
A6 Belfast Road Antrim	11034	10676	6.6	35.2
A6 Moneynick Road Toome	17042	18557	10.8	45.6
A6 Randalstown Road Antrim	14945	10076	7.5	39.4
B95 Greystone Road Antrim (Daewoo)	N/A	9646	5.3	44.1
M2 Rathbeg-T'patrick	37091	43867	11.2	66.6
M2 Dunsilly-Rathbeg	32352	39074	10.9	66.3
M22 Moneynick Road	N/A	20055	14.3	63.4

*Figures used were based on projections from earlier counts.

Appendix 3
Quality Assurance and Quality Control of diffusion tubes (QA/QC).

The nitrogen dioxide diffusion tubes used in this study were supplied and analysed by Casella CRE Air.

Casella CRE Air has a defined quality system, which forms part of the UKAS accreditation that the laboratory holds. All accredited methods are fully documented. UKAS assessors visit on an annual basis and review all aspects of the analysis, from sample handling to analysis and reporting. As a condition of accreditation, the laboratory is required to participate in any suitable proficiency schemes in operation. Casella CRE Air participates in the WASP scheme organised by the Health and Safety Laboratory.

Any result from such a scheme that falls outside the relevant limits is immediately investigated and steps taken to rectify the situation. The Quality Manager at Casella also assesses all external proficiency schemes results. The Quality Manager also carries out internal audits.

Quality Control at Casella CRE Air
A series of ten quality control check solutions are analysed before any samples in order to check system stability and performance.

A quality control check is run after every ten samples and is assessed against warning and action limits defined in the method. Quality control solutions are prepared from standards supplied by a different vendor to that of the calibration standards.

An external quality control check solution prepared by NETCEN is analysed once per month in order to check internal QC. Results of this check are reported back to NETCEN.

Tube preparation and analysis
The NO_2 tubes are prepared and analysed in a separate, designated part of the laboratory. Ambient nitrogen dioxide concentrations within the laboratory are monitored routinely. Blanks from each batch of tubes prepared in the laboratory are retained for verification.

Incoming samples are stored in a fridge used solely for this purpose. Calibration standards, QC solutions and other reagents are stored in a separate fridge.

The analyst checks data as it is generated and QC data is plotted immediately after it is obtained. All raw data and data transfer is checked by the supervisor, data entry into the Laboratory Information Management System is also checked and the final reports are checked before signing.

Antrim Borough Council QA/QC.
Our QA/QC procedure is to ensure that when a tube batch is received they are stored in a refrigerator. On the day of sampling they are removed from the fridge and installed. Laboratory blanks are retained in the fridge and are taken out only when the exposed tubes are being returned to the laboratory.

When tubes are collected from sampling sites they are immediately packaged and sent to the laboratory for analysis.

Appendix 4
Data from Antrim Borough Council's Real Time Sulphur Dioxide Monitor

Produced by netcen on behalf of Antrim Borough Council

ANTRIM GREYSTONE ESTATE
25 November 2004 to 05 September 2005

These data are provisional from 01/04/2005 and may be subject to further quality control

POLLUTANT	SO_2
Number Very High	0
Number High	0
Number Moderate	1
Number Low	26743
Maximum 15-minute mean	335 µg m^{-3}
Maximum hourly mean	184 µg m^{-3}
Maximum running 8-hour mean	113 µg m^{-3}
Maximum running 24-hour mean	68 µg m^{-3}
Maximum daily mean	62 µg m^{-3}
Average	13 µg m^{-3}
Data capture	97.7 %

All mass units are at 20'C and 1013mb

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
Sulphur Dioxide	15-minute mean > 266 µg m^{-3}	1	1
Sulphur Dioxide	Hourly mean > 350 µg m^{-3}	0	0
Sulphur Dioxide	Daily mean > 125 µg m^{-3}	0	0