



2010 Air Quality Progress Report for Antrim Borough Council

**In fulfillment of the Environment (Northern Ireland)
Order 2002 - Local Air Quality Management**

MAY 2010

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Executive 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 (PM₁₀) 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. Subsequently, in July 2007, the Council produced an Air Quality Action Plan (AQAP), which set out the measures to be introduced in pursuit of the air quality objectives within the AQMA.

A second round of review and assessment commenced with the submission of an Updating and Screening Assessment in 2006 and ended with a Progress Report in 2008. The second round confirmed that the conclusions of the first round were still valid.

Last year Antrim Borough Council submitted an Updating and Screening Assessment which concluded that there was no need to proceed to Detailed Assessment for any of the regulated pollutants and this report is the Council's Progress Report which represents the second step of this round of review and assessment.

Progress Reports are intended to maintain continuity in the LAQM process, and fill in the gaps between the three-yearly cycle of Review and Assessment. Progress reports are required in all years when not completing an Updating and Screening Assessment.

The report has been compiled in accordance with Technical Guidance LAQM.TG(09), using the recommended proforma. The report considers new monitoring results from the Council's automatic continuous sulphur dioxide monitoring station and passive nitrogen dioxide diffusion tube network, new local developments that might affect local air quality and progress in implementing the Action Plan for the Council's AQMA.

The main conclusions of the report are:

- Air Quality Objectives are being met at all nitrogen dioxide diffusion tube sites.
- Nitrogen dioxide concentrations at six out of eight sites are high enough to require continued monitoring. The other two sites will be closed down and the diffusion tubes relocated to monitor other road junctions.
- Data from the Council's real time sulphur dioxide monitoring station shows continuing compliance with the air quality objectives. The data does not make a case for retention of this site and it will be closed down.
- No new local developments likely to have an impact on air quality were identified.
- All the measures in Antrim Borough Council's Action Plan have been fully implemented and Antrim Borough Council is in a position to revoke its AQMA.

The next report for Antrim Borough Council will be another Progress Report which is due by the end of April 2011.

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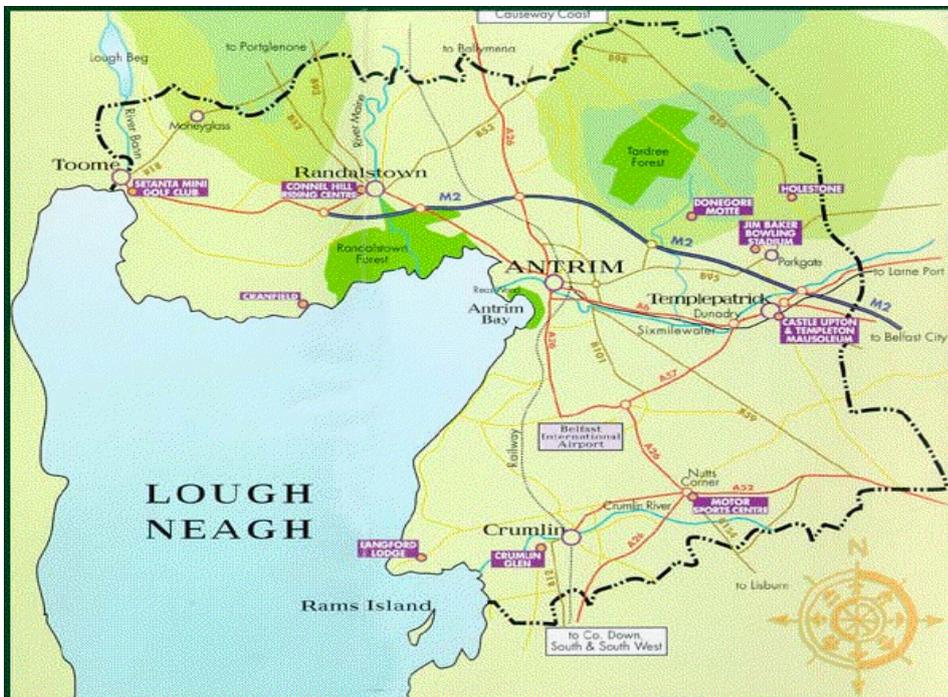
1 Introduction

1.1 Description of Local Authority Area

Situated about 19 miles (31 km) north-west of Belfast, Antrim Borough Council takes in an area of 220 square miles (570 km²) - approximately 4.1% of the total area of Northern Ireland, with a population of 52,600 (2007). Antrim borders the north and east shores of Lough Neagh, the largest fresh water lake in the UK, and includes the towns of Antrim, Toomebridge, Crumlin, Randalstown, Parkgate and Templepatrick. The council headquarters are located on the outskirts of Antrim town.

Originally predominantly rural in nature, 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. Today's economic drivers revolve around construction, distribution, retailing, 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. Although the borough is not within the Belfast Metropolitan Area, it houses the city's international airport which is located 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.

Figure 1.1 Map of Antrim Borough.



1.2 Purpose of Progress Report

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in **Northern Ireland** are set out in the Air Quality Regulations (Northern Ireland) 2003, Statutory Rules of Northern Ireland 2003, no. 342, and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in Northern Ireland.

Pollutant	Concentration	Measured as	Date to be achieved by
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	3.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM₁₀) (gravimetric)	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

The cornerstone of the LAQM process is the review and assessment of air quality. This is a statutorily required process whereby local air quality monitoring and modelling results are compared to the national air quality standards and objectives. Where objectives are breached or are predicted to be breached, an Air Quality Management Area (AQMA) is declared. An Action Plan must then be produced stating how the district council will drive air quality towards the objective.

The first round of review and assessment which was completed in 2004 concluded that:

1. The risk of the objectives for the following pollutants being exceeded was negligible:

Carbon Monoxide, Benzene, 1,3 butadiene, Lead, Nitrogen Dioxide, PM10

2. As the result of the prevalence of the use of solid fuel for domestic heating, the 15 minute mean objective for sulphur dioxide is likely to be breached in the Greystone and Ballycraig housing estates.

The first round of the Review and Assessment process resulted in the following measures:

1. The declaration of an AQMA
2. The installation of a continuous real-time sulphur dioxide analyser within the AQMA.

In October 2004 Antrim Borough Council declared an AQMA which took in the Creystone and Ballycraig housing estates in their entirety.

The second round of air quality review and assessment commenced with the USA which was completed in June 2006. This updated the review and assessments previously undertaken for all the pollutants identified in the Air Quality Regulations. The USA concluded that, other than within the Air Quality Management Area declared after the first round of review and assessment, there is no risk of exceeding any of the air quality objectives and that a detailed assessment is not required for the current round of review and assessment.

The following actions were recommended:

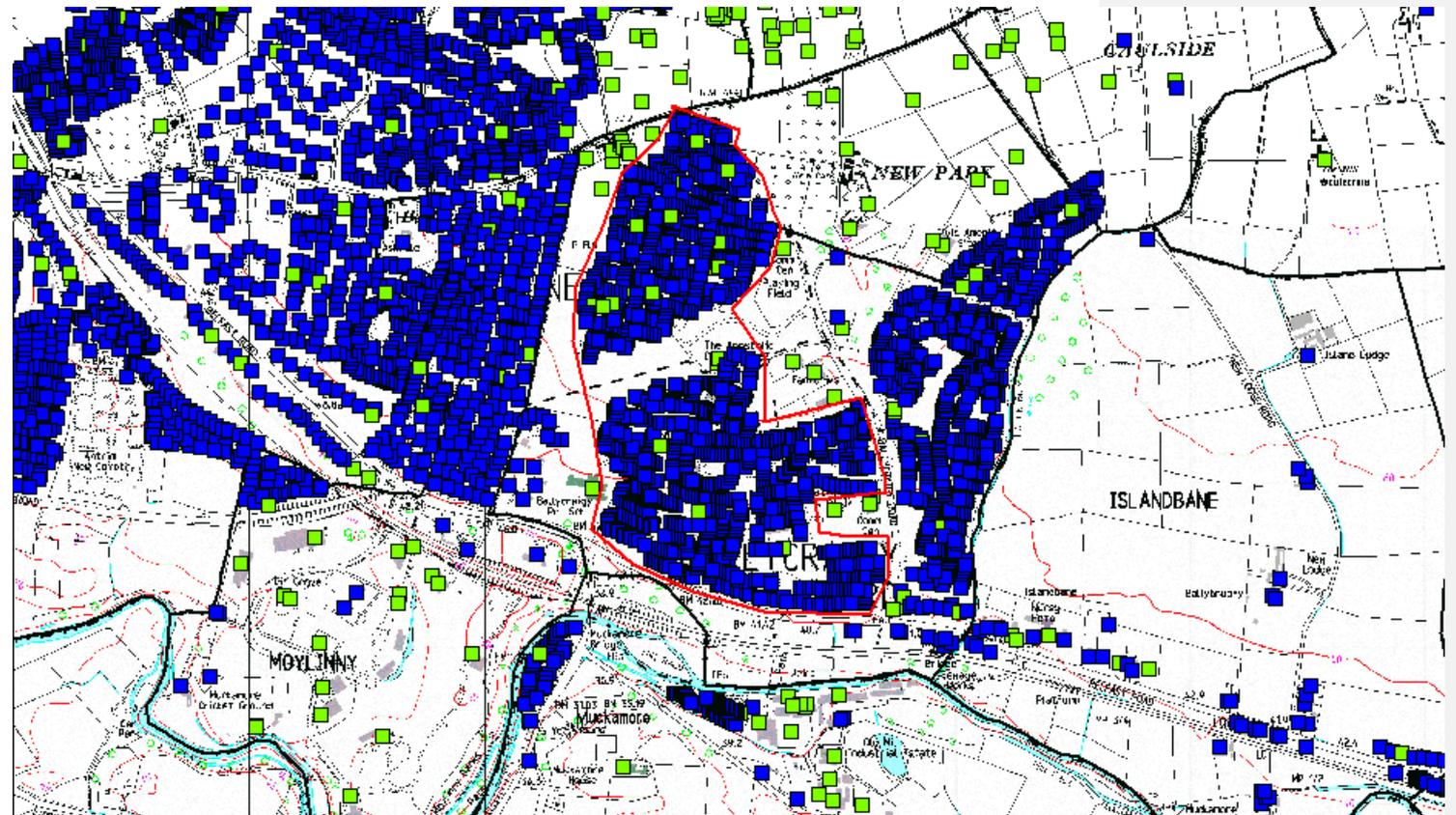
1. The production of an action plan for the AQMA setting out the measures to be introduced in pursuit of the air quality objectives.
2. Continued monitoring of the road networks for nitrogen dioxide with passive diffusion tubes.
3. Monitoring with diffusion tubes the vicinity of Belfast International Airport to assess the contribution of air traffic to ambient nitrogen dioxide concentrations.

In 2007 and 2008 Progress Reports were submitted which concluded that there had not been any significant changes in local circumstances to indicate possible exceedences of the air quality objectives and that the conclusions of the 2006 USA were still valid.

In 2009 Antrim Borough Council submitted its Updating and Screening Assessment which covered all regulated pollutants, and considered monitoring data, road traffic sources, other transport sources, industrial sources, commercial and domestic sources, fugitive or uncontrolled sources and concluded that there was no requirement to a detailed assessment for any of the pollutants.

Figure 1.2 Map of AQMA

Antrim Air Quality Management Area
Scale 1:24,500



2 Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Antrim Borough Council has monitored sulphur dioxide on an automatic continuous basis since November 2001 at a site within its Air Quality Management Area (AQMA). The equipment employed uses UV fluorescence for measurement of SO₂ and is located in the back yard of a dwelling house within the Greystone housing estate occupied by Greystone Community Group. Figure 1 shows the location of the monitoring station.

The site was initially set up to provide local data within the AQMA which could be used to adjust dispersion modelling carried out as part of the third stage review and assessment process.

Data management and QA/QC for the monitoring station are managed under contract by AEA Technology. The contract includes six-monthly station audits. All data are ratified to the QA/QC standards used in the Defra network.

Maintenance is carried out under contract by Enviro Technology Services Plc. The service contract includes routine six monthly service visits which generate written instrumentation status reports and guaranteed breakdown call out response of forty eight hours. Routine calibration is carried out in accordance with a written procedure by trained Environmental Health staff on a fortnightly basis.

Figure 2.1 Map of Automatic Monitoring Site



Table 2.1 Details of Automatic Monitoring Site

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Greystone	Urban background.	316807	386156	SO ₂	UV fluorescence	Y	Y (1m)	N/A	N

2.1.2 Non-Automatic Monitoring

Antrim Borough Council currently monitors nitrogen dioxide at 8 sites around the district using passive diffusion tubes. The diffusion tubes are supplied and analysed by Environmental Scientifics Group (EGS), formerly Bureau Veritas.

Diffusion tubes represent a simple and cost-effective method of monitoring air quality in an area, to give a good general indication of average pollution concentrations. They are particularly useful for assessment against annual mean objectives.

QA/QC

The diffusion tubes used are supplied, prepared and analysed by EGS. The preparation method used from 1st January is 20% TEA in Water. This preparation was changed from 10% TEA to coincide with the harmonisation method set out in DEFRA's Harmonisation Practical Guidance.

EGS 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. EGS participates in the WASP scheme organised by the Health and Safety Laboratory. Results for 2009 are shown in Appendix 1.

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 also assesses all external proficiency schemes results. The Quality Manager also carries out internal audits.

Quality Control at E G S

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 AEA Group is analysed once per month in order to check internal QC. Results of this check are reported back to AEA Group.

Tube Preparation and Analysis

The NO₂ 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's QA/QC.

Our QA/QC procedure is to ensure that diffusion tubes are handled and stored in accordance with the manufacturer's instructions. When a tube batch is received they are immediately placed in a refrigerator in the bag in which they are received. So far as is possible the Council conforms to the

calendar of exposure periods supplied by the EGS. 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.

Selection of Monitoring Sites

Monitoring sites are chosen 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 busy road or road junction of interest. Where sites do not represent actual relevant public exposure they are located closer to the source than the nearest receptor. The sites are subject to periodic review and where sufficient data has been gathered, some of the diffusion tubes are relocated to new locations.

Data Adjustment

Results obtained from diffusion tubes need to be corrected for possible over or under reading. Deriving a correction factor by comparing the diffusion tube results with those obtained from a continuous real time analyser can do this. The Council does not operate a continuous analyser and therefore a co-location study has not been undertaken to determine a specific local bias adjustment factor. However, bias adjustment factors for various labs are available on the review and assessment website (Spreadsheet Version 03/10), and this gives a correction factor of 0.81 for the year 2009. This value has been used in this report. The bias corrected nitrogen dioxide concentration is obtained by multiplying the measured concentration by the correction factor.

Figure 2.2 Maps of Non-Automatic Monitoring Sites

The monitoring sites referred to in this report are shown in the following maps. All maps are subject to Ordnance Survey copyright.

Fountain Street Site



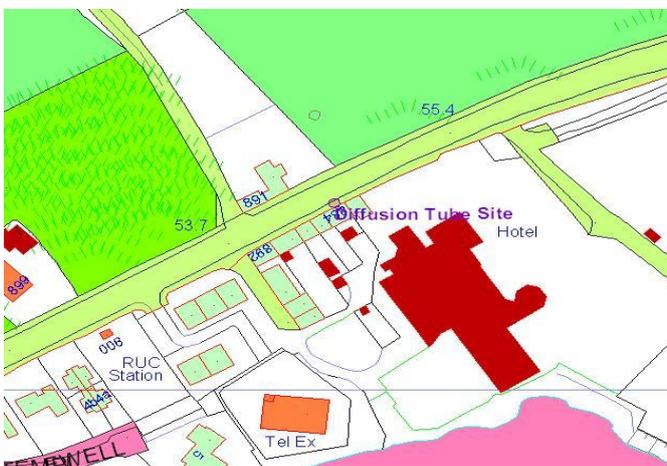
Fountain Street is the main traffic route through Antrim town and has fairly high traffic flows. The site monitors the nearest dwelling to traffic lights.

A26 Lisnevenagh Road Site



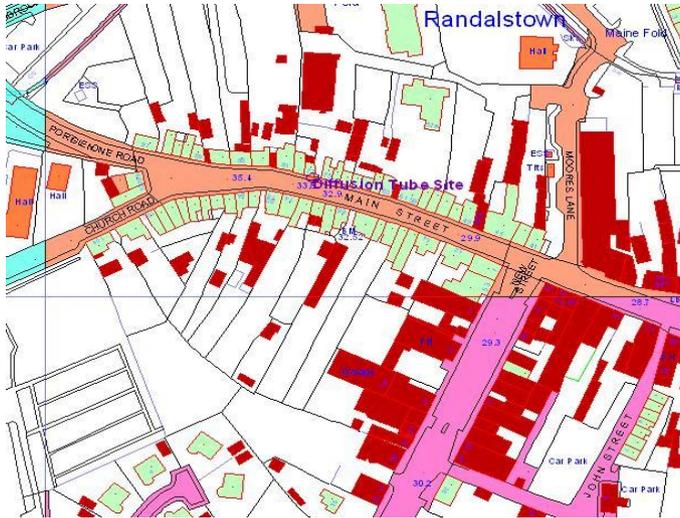
The Lisnevenagh Road is to the North of the Dunsilly roundabout and is a dual carriageway connecting Antrim with Ballymena. This site was set up to monitor concentrations close to the nearest dwelling to this busy road after Design Manual for Roads and Bridges (DMBR) modelling carried out for the Second Stage Review and Assessment predicted an exceedance of the objective at this property. This site is located outside the dwelling nearest to the road, 267 Lisnevenagh Road.

Templepatrick Site



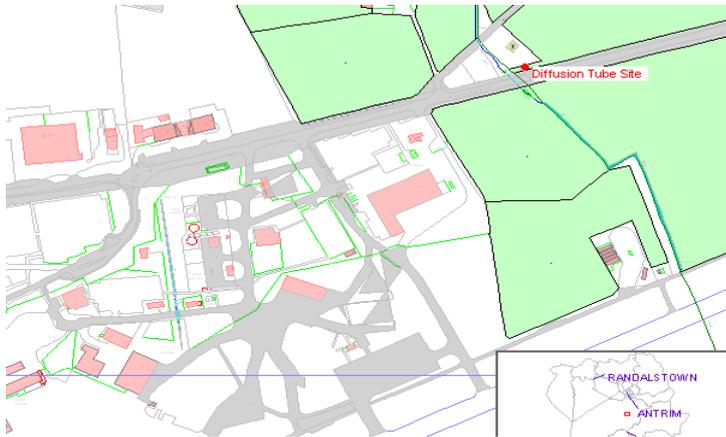
The site in Templepatrick is located on a lamppost in front of the Templeton Hotel. The site is very close to the facade of a residential property. Templepatrick is on the main route between the M2 motorway and Belfast International Airport and experiences high traffic flows. This site has been in operation for 8 years.

Randalstown Site



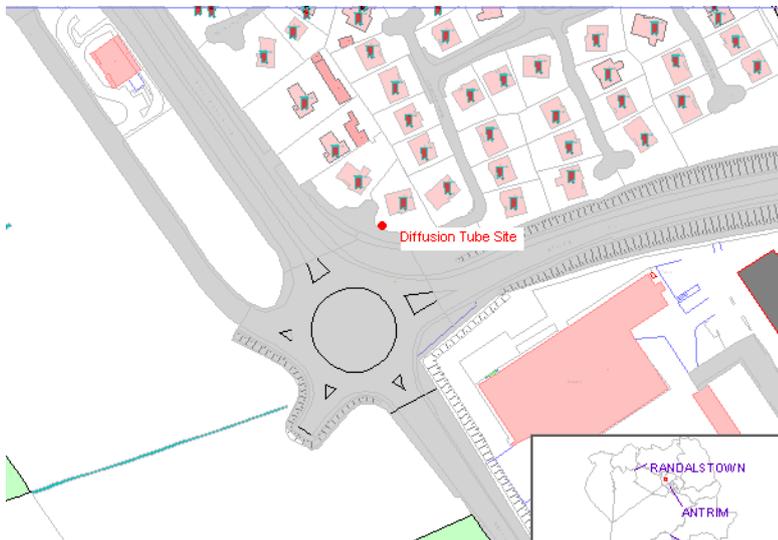
This site is located in front of a residential property on Main Street. The street is narrow at this location and traffic can be slow moving during periods of the day. This site has been operational for 7 years. The narrow street and high buildings here could give rise to raised concentrations because of the canyon effect.

Ballyrobin Road (Airport) Site



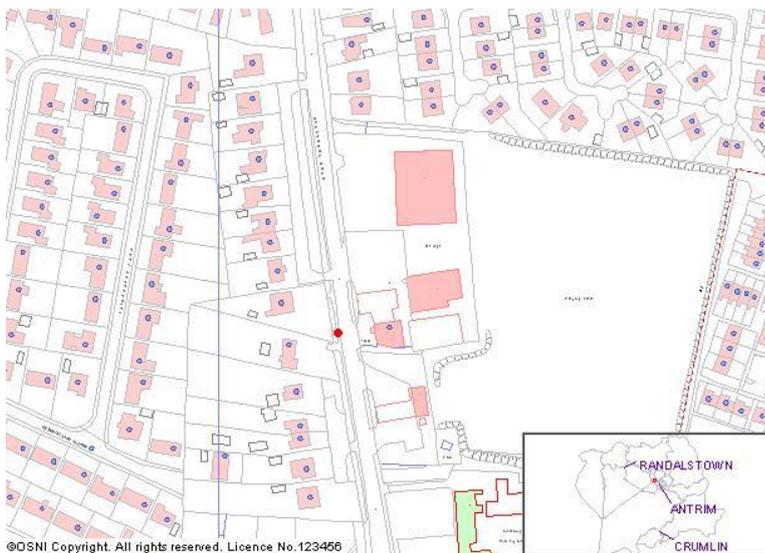
The 2006 USA found that passenger numbers at Belfast International Airport had crossed the 5mppa screening threshold set out in LAQM. TG(03). Although it was concluded that the objective was unlikely to be exceeded it was proposed that monitoring should be carried out to establish a greater picture of the concentrations in this area. This site is near to the nearest property to the airport.

Meadowlands Site



This site is at the Stiles Way / Ballymena Road junction, leading to the Junction One retail & leisure development.

Ballymena Road Site.



The Ballymena road is the main arterial route between Antrim town centre and the new Junction One development.

Tully Road Site.



Tully Road is a single carriageway with an AADT of 20000 (2005). The monitoring site is close to the nearest roadside receptor.

Table 2.2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Example 1	Urban backgrd.	X111222	Y222111	NO ₂	Y	Y (1m)	3m	Y
Fountain St	Kerbside	315197	386539	NO ₂	N	Y(<.5m)	1.5m	Y
Lisnevenagh RdRd	Kerbside	313254	319205	NO ₂	N	Y (4m)	3m	Y
Templepatrick	Kerbside	322992	385675	NO ₂	N	Y(<.5m)	1.5m	Y
Randalstown	Kerbside	308113	390461	NO ₂	N	Y(<.5m)	1.5m	Y
Ballyrobin Rd (Airport)	Kerbside	315786	381225	NO ₂	N	N (15)	2m	Y
Meadowlands	Kerbside	314360	388309	NO ₂	N	N (15)	5m	Y
Ballymena Rd	Kerbside	314670	387541	NO ₂	N	N(8)	2m	Y
Tully Rd	Kerbside	318087	379682	NO ₂	N	N(8)	2.5m	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

Monitoring results for the year 2009 are considered in the following sub-sections.

2.2.1 Nitrogen Dioxide

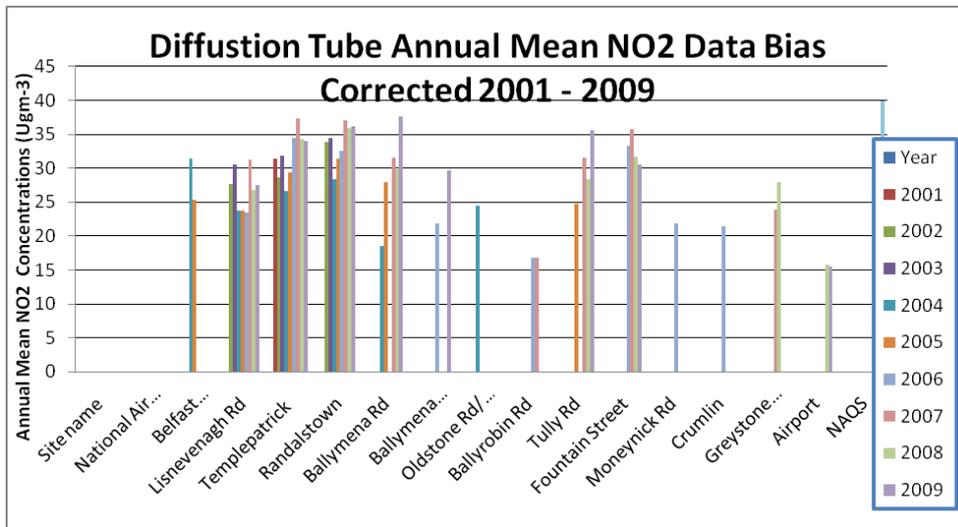
Automatic Monitoring Data

Antrim Borough Council does not operate a continuous nitrogen dioxide analyser.

Diffusion Tube Monitoring Data

Annual mean concentrations for 2009 are shown in Table 2.3. The annual mean air quality objective of 40 µg/m³ was not exceeded at any of the monitoring sites. The full data set (monthly mean values) for 2009 are set in Appendix 2

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentration.



Annual mean concentrations for 2009 and, where they are available, for preceding years are shown in the graph. Although the increases have not been uniform, the graph shows that concentrations at most sites have risen over time. The Ballymena Road exhibits a sharply rising trend which would tend to indicate that the continuing development in this area is resulting in increased traffic flow along this road. The trend at the Fountain Street site is in a downwards direction probably as a result of development elsewhere taking traffic away from the town centre. None of the sites exceed the national objective although results from the Fountain Street, Templepatrick and Randalstown sites are close to it. Monitoring will continue at these three sites and although some of the other sites may be discontinued the findings have highlighted the need to continue monitoring the roads networks at key locations.

Table 2.3 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture for	Data Capture	Annual mean concentrations (µg/m ³)
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			monitoring period ^a %	for full calendar year 2009 ^b %	2007 ^{c, d}	2008 ^{c, d}	2009 ^c
A1	1 Example Site	N	95	95	30.1	25.1	26.2
1	Fountain St	N		100	35.78	31.62	30.58
2	Lisnevenagh Rd	N		75	31.28	26.79	27.54
3	Templepatrick	N		92	37.26	34.24	33.95
4	Randalstown	N		92	37.05	35.9	36.23
5	Airport	N		100	16.85	15.77	15.46
6	Meadowlands	N		67	23.89	21.96	29.67
7	Ballymena Rd	N		92	31.58	29.80	37.63
8	Tully Rd	N		92	31.5	28.3	35.57

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Antrim Borough Council

May 2010

2.2.22.2.1 PM₁₀

Antrim Borough Council does not monitor for PM₁₀.

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2.2.32.2.1 Sulphur Dioxide

Antrim Borough Council has been monitoring levels of SO₂ using a real time analyser since December 2004. The monitoring station is located in the Greystone housing (see Fig 2.1) which is within the AQMA.

The site was established primarily to provide local monitoring data which could be used to correct the dispersion modelling required to be carried out as the result of the findings of the Third Stage Review and Assessment report of 2003. The monitoring station was set up in a site within the Greystone housing estate, one of the two estates making up Antrim Borough Councils AQMA.

Monitoring data from the Greystone monitoring station for year 2009 is shown below.

ANTRIM GREYSTONE ESTATE 01 January to 31 December 2009

These data have been fully ratified by AEA

POLLUTANT	SO ₂
Number Very High	0
Number High	0
Number Moderate	0
Number Low	28840
Maximum 15-minute mean	157 µg m ⁻³
Maximum hourly mean	128 µg m ⁻³
Maximum running 8-hour mean	95 µg m ⁻³
Maximum running 24-hour mean	79 µg m ⁻³
Maximum daily mean	44 µg m ⁻³
Average	5 µg m ⁻³
Data capture	82.4 %

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	0	0
Sulphur Dioxide	Hourly mean > 350 µg m ⁻³	0	0
Sulphur Dioxide	Daily mean > 125 µg m ⁻³	0	0

Table 2.4 Results of SO₂ Automatic Monitoring: Comparison with Objectives

Site ID	Location	Within AQMA	Data Capture for monitoring period ^a %	Data Capture 2009 ^b %	Number of Exceedences of: (µg/m ³)		
					15-minute Objective (266 µg/m ³)	1-hour Objective (350 µg/m ³)	24-hour Objective (125 µg/m ³)
A1	1 Example Site	N	98	95	4	1	0
1.	Greystone Estate	Y		82.4	0	0	0

2.2.42.2.2 Benzene

Antrim Borough Council does not monitor for benzene.

2.2.52.2.3 Other pollutants monitored

No other pollutants are monitored within the Antrim Borough Council area

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2.2.4 Summary of Compliance with AQS Objectives

Antrim Borough Council has examined the results from monitoring in the borough. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

3.1 Road Traffic Sources

There have been no new roads constructed or proposed since the completion of the last Updating and Screening Assessment and no roads have been identified with significantly changed traffic flows. There are no new narrow, busy streets, junctions, or bus stations.

3.2 Other Transport Sources

No new airports, railway stations or ports have opened or are planned for the Antrim area. There have been no changes to the existing Belfast International Airport.

3.3 Industrial Sources

There are no new industrial installations within the borough and none are planned. There have been no substantial changes to existing installations. There are no major fuel storage depots within the area and no new petrol stations or poultry farms have been opened since the completion of the Updating and Screening Assessment.

3.4 Commercial and Domestic Sources

No new biomass installations have been identified and no areas of significant solid fuel burning have been identified.

3.5 New Developments with Fugitive or Uncontrolled Sources

No new landfill sites, quarries or other potential sources of fugitive particulate emissions have been identified since the last Updating and Screening Assessment.

Antrim Borough Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area.

4 Planning Applications

No planning applications were received or approved that necessitated the submission of an air quality assessment or required the attachment of planning conditions relating to air quality.

There were a number of planning approvals for developments which, although they did not necessitate air quality related conditions, could increase traffic on already busy roads. These are set out in the following table.

Table 4.1 Planning Permissions 2009

Location	Description	Relevant Pollutants	Source of Information	Comments
Main Street Crumlin	37 Houses & 2 retail units	NO ₂ PM10	Planning Application T/2006/0755	Potential for increased traffic on Main Street
Millmount, Bridge Street, Randalstown	Housing Development	NO ₂ PM10	Planning Application T/2003/0576	Potential for increased traffic on Main Street Randalstown
Junction of Kilbeg and Ballymena Rd	33 dwellings	NO ₂ PM10	Planning Application T/2009/0613	Potential for increased traffic on Ballymena Road
Land between Niblock Road & Ballymena Rd.	260 dwellings	NO ₂ PM10	Planning Application T/2007/0908	Potential for increased traffic on Ballymena Rd
Belfast Road Antrim	Sheltered accommodation 35 units	NO ₂ PM10	Planning Application T/2007/0090	Potential for increased traffic on Belfast Road

5 Implementation of Action Plans

When Antrim Borough Council published the Stage 2/3 Review and Assessment Report in May 2004 it confirmed the need for the declaration of an Air Quality Management Area (AQMA) in Antrim town in relation to exceedences of the 15 minute mean air quality objective for sulphur dioxide. The AQMA was brought into effect on 31st October 2004 by means of an order made by Antrim Borough Council. A map with the AQMA outlined in red is shown in Figure 1.2.

Having declared an AQMA, Antrim Borough Council was then required by Article 13(2) of the Environment (Northern Ireland) Order 2002 to prepare and submit a written action plan to the Department of the Environment for Northern Ireland. The action plan, which outlined the measures to be taken in pursuit of achieving the air quality objectives and air quality standards for sulphur dioxide within the AQMA and proposed the timescale for implementing such measures, was submitted in July 2007.

5.1 Action Plan Measures

Source apportionment carried out as part of the review & assessment process had shown that domestic fuel burning was the only significant source of emissions of sulphur dioxide in the AQMA. It was therefore appropriate that measures to reduce the prevailing sulphur dioxide concentrations were focused primarily on measures aimed at reducing domestic emissions of this pollutant and primarily targeted at solid fuel burning. The plan also contained measures that did not directly target domestic fuel burning. The measures that made up the action plan are set out below: -

- Bringing forward the Northern Ireland Housing Executive (NIHE) heating conversion scheme for the relevant areas of the Antrim Borough Council area;
- Bringing forward the planned demolition of two blocks of solid fuel burning flats at Chain Walk, Ballycraigy;
- Increasing awareness and uptake of the Warm Homes Scheme and other energy efficiency schemes within eligible properties;
- Introducing guidance on the use of bonfires and/or prohibiting bonfires;
- Including air quality considerations in consultation responses to Planning Service.

5.1.1 Bringing forward the NIHE Heating Conversion Scheme

In Northern Ireland public sector housing provision is not a function of district councils but of the Northern Ireland Housing Executive (NIHE). During the 1970s and 1980s NIHE embarked upon a construction programme which saw a dramatic increase in the public sector housing stock. Solid fuel heating systems were installed in the majority of these properties. Oil was not used due to the crisis in the worldwide market which coincided with the planning of the programme. Since 1996, NIHE has been implementing a conversion programme to replace solid fuel and electric heating systems in their properties. Since 2000, only gas and oil (where gas is not available) have been offered as the replacement fuel. At the start point, out of 110,000 NIHE properties, 40,000 currently used oil or gas, 50,000 properties used solid fuels, while 20,000 used electricity for heating.

The ongoing rate of conversion is 9,000 properties a year (a third of which are to gas) and the solid fuel properties are being prioritised for conversion. This could mean that all solid fuel will be phased out in the public sector housing stock by 2010.

NIHE is a major landlord within the Antrim Borough Council area and within the estates making up the AQMA were responsible for the management of 232 dwellings reliant on solid smokeless fuel for domestic heating. All these properties were eligible for the conversion scheme, and with the arrival in the town of a supply pipeline, could be conversion to natural gas. Information taken from the National Atmospheric Emissions Inventory (NAEI) showed that the emission rate of sulphur dioxide from burning smokeless solid fuel (both estates are in smokeless zones) is 16.00 kt / mt fuel burnt whereas the emission rate for oil is 0.58 kt / mt.

Natural gas is even more environmentally friendly, producing virtually no sulphur dioxide. It was obvious that conversion of the NIHE owned homes would provide a significant reduction in emissions of sulphur dioxide.

NIHE is a relevant authority under the Air Quality Regulations (NI) 2003 and had a major role to play in improving air quality by implementing the heating conversion scheme within the shortest reasonable time. Whilst the conversion scheme was due to reach Antrim in 2007 and a timetable had been established, NIHE agreed to amend the timetable to prioritise the AQMA. It was agreed that the NIHE conversion programme would give priority to the AQMA estates and as a result Ballycraigie was programmed to be the first estate in Antrim town to benefit from the conversion scheme with Greystone scheduled for the following year.

5.1.2 Demolition of flats at Chain Walk, Ballycraigie

Chain Court consisted of two blocks of flats and was located within the Ballycraigie housing estate and therefore within the AQMA. All 33 of the flats that make up Chain Court were heated using solid smokeless fuel burnt in room heaters.

The Housing Executive, which owned the properties, had decided that both blocks were to be demolished. Although the reasons for demolition did not relate to air quality the proposed action would have the effect of removing 33 potential solid fuel burners from the AQMA and as such was deemed to be appropriate for inclusion in the air quality action plan.

5.1.3 Promotion of energy efficiency schemes

Several schemes, such as the Warm Homes Scheme, Warmer Ways to Better Health Project and Help the Aged Energy Efficiency Project, are available to assist owner-occupiers and tenants of private landlords in installing new central heating systems and insulation measures in their homes in order to improve energy efficiency. Householders who are in receipt of certain benefits or meet other income related criteria may qualify for free conversion to oil or natural gas and/or insulation measures through one of the schemes. The range of insulation measures available include cavity wall insulation, loft insulation, hot water tank jacket, oil burner jacket, reflective radiator panels and draught proofing to windows and doors, as well as energy saving advice.

In addition to the above schemes, the Energy Savings Trust run an Insulation Cash-Back Scheme available to all owner-occupiers and private landlords, regardless of income levels or whether or not the householder is in receipt of benefits. The scheme offers £150 cash back for cavity wall insulation and £75 cash back for loft insulation.

Although primarily targeted at alleviating fuel poverty, it was considered that promotion of the above-mentioned schemes would contribute towards providing improved air quality. In some cases the result would be the conversion to oil from solid fuel and, where conversion did not take place increased energy efficiency would have the knock on effect of reducing fuel usage.

In order to promote these schemes, Council staff targeted the AQMA, carrying out door-to-door visits to all owner-occupied and privately rented properties within the AQMA, referring eligible householders to the appropriate body for inclusion in the applicable scheme.

5.1.4 Introducing guidance relating to bonfires

Each year, Antrim Borough Council receives a number of complaints in relation to the burning of waste materials. The Council routinely uses the relevant powers available under the Clean Air (Northern Ireland) Order 1981 and other legislation in order to control and prohibit further instances of burning.

There are also a number of traditional bonfire sites within the Antrim area. In Northern Ireland the main bonfire event occurs each year on 11th July when they are lit in Protestant areas to celebrate the approach of the anniversary of the battle of the Boyne. There are 10 traditional bonfire sites within the Antrim area, including one within the AQMA in the Ballycraigie housing estate.

It was believed that these sources made a contribution to levels of sulphur dioxide within the AQMA. The Council was aware of the guidance contained in the Interagency Working Group on Bonfires (2004). This

guidance is the latest available for use within district councils and other relevant authorities. The adoption of this guidance was deemed to be a relevant factor to be included in the air quality action plan.

5.1.5 Including air quality considerations in planning consultations

Local planning decisions have the potential to affect local air quality significantly and development control is an important tool in the improvement of air quality. In Northern Ireland responsibility for planning control is exercised by the Department of the Environment, through the Planning Service. District Council Environmental Health Departments are consultees within the planning process and procedures currently exist whereby comments are forwarded to Planning Service in relation to material matters that are relevant to applications for planning permission.

It was considered that adopting the guidance contained within the National Society for Clean Air 2004 document – Development Control: Planning for Air Quality was an appropriate measure for inclusion in the action plan.

Table 5.1 Action Plan Progress

No.	Measure	Focus	Lead authority	Implementation phase	Indicator	Progress to date	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
1	Conversion of solid fuel properties to natural gas	Reduction of principle source of SO ₂ emissions	Northern Ireland Housing Executive (NIHE)	2008/2009	Conversion of 50% of eligible properties within the 2 housing estates	In 2008 97.6% (123 out of 126) eligible properties in Ballycraigy converted to natural gas	87.7% (93 out of 106) eligible properties in Greystone converted to natural gas	Complete	Scenario modelling has predicted that a 50% conversion rate in conjunction with measure 2 is sufficient to meet the air quality standard throughout the AQMA. This outcome has been exceeded
2	Demolition of flats at Chain Walk, Ballycraigy	Remove 33 solid fuel burning appliances	NIHE	2008	Demolition of the flats	Demolition took place in 2008	N/A	Complete	This is part of the modelled scenario which along with a 50% conversion rate in measure 1 predicted compliance

No.	Measure	Focus	Lead authority	Implementation phase	Indicator	Progress to date	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
									with the air quality objective.
3	Promotion of energy efficiency schemes	Reduction of solid fuel burning	Antrim Borough Council	2007/2008	Uptake of efficiency schemes	629 properties surveyed resulting in 119 receiving insulation measures & 27 conversions from solid fuel to oil.	N/A	Complete	Improved energy efficiency should have a beneficial impact on emissions.
4	Introduction of guidance relating to bonfires	Minimise emissions from bonfires including the Ballycraigy traditional July 11 bonfire.	Antrim Borough Council	2006/2007	Reduction in the number of bonfires & removal of materials other than clean wood from the traditional July 11 bonfire	A B C Bonfire Sub-Committee has been operating successfully for several years and has succeeded in having tyres & other materials other than wood removed from traditional bonfires	In 2009 the Traditional July 11 Bonfire in Ballycraigy was tyre & plastic free for the first time. No other bonfires were reported in the area.	Complete	The traditional bonfire is an annual event over one night only. It is recognised that any reduction in so2 emissions are fairly minor
5	Include Air Quality considerations in consultation responses to Planning Service	Ensuring proposed developments do not impact negatively on ambient SO2 concentrations	Antrim Borough Council	2006/2007	Number of requests for air quality assessments for proposed developments	Recommendations of the NSCA document Development Control: Planning for Air Quality have been adopted when responding to Planning Service consultations	N/A	Complete	The AQMA & vicinity are mature residential areas. No planning applications likely to impact on air quality have been

No.	Measure	Focus	Lead authority	Implementation phase	Indicator	Progress to date	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
									received to date.

Source apportionment carried out as part of the review & assessment process had shown that domestic fuel burning was the only significant source of emissions of sulphur dioxide in the AQMA. It was therefore appropriate that measures to reduce the prevailing sulphur dioxide concentrations were focused primarily on measures aimed at reducing domestic emissions of this pollutant and primarily targeted at solid fuel burning. The plan also contained measures that did not directly target domestic fuel burning but would have a beneficial impact on sulphur dioxide concentrations.

The main aim of the action plan was to reduce concentrations of sulphur dioxide within the AQMA to the point where the Governments Air Quality Objectives were being achieved and the AQMA could be revoked.

As part of the action planning process, Antrim Borough Council was required under Article 13 of the Environment (Northern Ireland) Order 2002 to assess existing and likely future air quality within the AQMA and to assess why air quality standards and objectives were not being achieved within the AQMA by the relevant dates. In order to comply with this requirement, Antrim Borough Council commissioned Netcen (now AEA Energy & Environment) to carry out detailed air quality dispersion modelling of emissions within the AQMA. In this study it was intended to re-model the existing situation within the AQMA with the benefit of updated fuel use information and to model a number of scenarios with regard to changes to fuel usage within the AQMA. This was intended to address the "business as usual", or no change case, and to evaluate the impact of a range of fuel use changes.

When the "business as usual" scenario was remodelled and the model verified with a data set from the council's real time sulphur dioxide analyser which had been installed at a site within the AQMA it was confirmed that the 15 minute mean objective for sulphur dioxide was likely to be exceeded within the two housing estates that comprised the AQMA. The model outcomes of the "business as usual" scenario are shown in Appendix 3.

The highest 99.9 percentile 15 mean sulphur dioxide concentration predicted in the verified modelling study was just over $320 \mu\text{g}/\text{m}^3$. The reduction in concentration required to achieve the objective was a reduction of approximately $54 \mu\text{g}/\text{m}^3$.

Having established that the "business as usual" scenario would result in exceedences of the objective further modelling became necessary to consider how certain emission reduction scenarios would impact upon sulphur dioxide concentration levels.

When Antrim Borough Council undertook out a further assessment of air quality within the AQMA, it was already known that NIHE was planning to convert their solid fuel burning properties within the borough. Antrim was about to benefit from a supply of natural gas for the first time and it was planned that the conversions would coincide with the arrival of the gas pipeline. It was also known that NIHE planned the demolition of 2 blocks of flats within the AQMA, so it was decided that it was opportune to model the effects of scenarios based on these two upcoming events.

In order to ensure the relevance of any scenario modelling it was felt necessary to model a scenario that could be achieved as a worst case. It was established during consultation with residents and residents groups that there was likely to be some opposition to conversion to natural gas, based on fears about future fuel costs. This was in line with experiences in other district council areas where the conversion scheme had been implemented and where up to 25% of residents in the first estates to be schemed had declined the conversion offer.

AEA Energy & Environment was therefore commissioned to model a scenario that envisaged a 50% uptake rate for the NIHE conversion scheme within the AQMA and the demolition of the 33 solid fuel burning flats. This scenario allowed for the demolition of the 33 flats, which was certain to proceed, and a much lower uptake of natural gas than was actually anticipated. It disregarded any other improvements that could arise resulting from the implementation of other action plan measures or the uptake of gas by owner-occupiers or the private rented sector as these could not be quantified with any degree of accuracy.

This scenario ignored any other factors that might occur, such as the effect of the conversion programme in surrounding estates and improvements that might be brought about by the implementation of other action plan measures.

When this scenario was modelled the result was a prediction that the implementation of the scenario would result in air quality objective being met throughout the AQMA. This established a benchmark against which action plan progress could be measured thus providing a mechanism for determining whether or not compliance with the objective has been achieved. The scenario modelling report is set out in Appendix Y.

In the event the uptake of gas greatly exceeded the required 50% rate with the uptake rate amongst eligible properties being 97% in the Ballycraigy estate and 87% in the Greystone estate.

A comparison between the modelled scenario and the actual outcome is shown in the following table.

	Solid Fuel Burnin Flats Demolished	Properties conve from solid fuel to gas (Ballycraigy)	Properties conve from solid fuel to gas (Greystone)
Modelled Scenar	33	63 (50%)	53 (50%)
Actual Outcome	33	123 (97.6%)	93 (87.7%)

106 Conclusions and Proposed Actions

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10.16.1 Conclusions from New Monitoring Data

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Antrim Borough Council monitored for nitrogen dioxide at eight sites throughout 2009. No exceedences of the air quality objective were identified at any of the site. Annual mean concentrations of Nitrogen dioxide of 30µg/m³ or above were recorded at five of the eight sites and these along with the Meadowlands site that monitors the Ballymena Road which has seen considerable development in recent years will be retained for at least a further year. The remaining two sites will be discontinued and the diffusion tubes moved to monitor road junctions identified in the 2008 Updating and Screening Assessment as having high traffic volumes:

- Fountain Street/Fountain Hill/Belfast Road Junction
- Tully Road/Oldstone Road/Ballyrobin Road Junction

Antrim Borough Council has monitored sulphur dioxide on an automatic continuous basis since November 2001 at a site within its Greystone estate. A summary of recent results from the site is shown in the following table

Table 6.1 Summary of Results from Real Time Analyser

Year	Data Capture	Exceedences of 15-min objective (not to be exceeded more than 35 times in a year)	Exceedences of 1-hour objective (not to be exceeded more than 24 times in a year)	Exceedences of 24-hour objective (not to be exceeded more than 3 times in a year)
2004	96%	1	0	0
2005	99%	3	0	0
2006	98.9%	7	0	0
2007	99.4%	1	0	0
2008	99.8%	3	0	0
2009	82.4%	0	0	0

When the site was set up initially it was within an area where the predominant method of home heating was solid fuel. Since then, a natural gas supply has reached Antrim and this form of heating has been superseded.

The analyser is approaching 10 years old and in the course of the year has suffered a number of breakdowns. Continued monitoring will require replacement of the monitor in the near future and it is considered that recent results from the site would not justify the costs of retaining the site. It is concluded that continued operation of the site is unnecessary.

10.26.2 Conclusions relating to New Local Developments

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There are no new local developments that will require more detailed in the next Updating and Screening Assessment.

10.36.3 Other Conclusions

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When Antrim Borough Council was required to draw up an action plan after declaration of its AQMA it was already known that NIHE was planning to convert their solid fuel burning properties within the borough. Antrim was about to benefit from a supply of natural gas for the first time and it was planned that the conversions would coincide with the arrival of the gas pipeline. The planned conversion was an ideal solution because as the conversion also entailed the physical removal of the solid fuel fires from the properties being converted thus guaranteeing the permanent removal of the emission source.

It was also known that NIHE planned the demolition of 2 blocks of flats within the AQMA. With these in mind when undertaking detailed dispersion modelling within the AQMA it was decided that it was opportune to model the effects of scenarios based on these two upcoming events.

In the event the first scenario to be modelled, namely the conversion of 50% of the available NIHE properties within the two estates comprising the AQMA from solid fuel to gas coupled with the demolition of the flats, resulted in a prediction that the maximum 99.9 percentile 15-minute mean sulphur dioxide within the AQMA would be below the objective level. This scenario ignored any other factors that might occur, such as the uptake of natural gas by owner occupiers or private landlords within the estates, the effect of the conversion programme in surrounding estates and the impact of the implementation of other action plan measures. A copy of the scenario modelling report can be found at Appendix 4.

The measures set out in the action plan have now been fully implemented and in the event the uptake of gas greatly exceeded the required 50% rate with the uptake rate amongst eligible properties being 97% in the Ballycraig estate and 87% in the Greystone estate. The NIHE conversion programme has been so successful that, even if no owner occupiers or private landlords availed themselves of the opportunity to convert to gas, there remain a maximum of 45 homes in Greystone and 33 in Ballycraig reliant on solid fuel for space heating. These numbers mean that the remaining density of solid fuel burning premises is well under the screening density above which a detailed assessment would be necessary as set out in Technical Guidance LAQM.TG(09).

A comparison between the modelled scenario and the actual outcome is shown in the following table.

	Solid Fuel Burning Flats Demolished	Properties converted from solid fuel to gas (Ballycraig)	Properties converted from solid fuel to gas (Greystone)
Modelled Scenario	33	63 (50%)	53 (50%)
Actual Outcome	33	122 (97%)	92 (87%)

Source apportionment carried out as part of the assessment process identified domestic solid fuel burning as the sole cause of the air quality objective for sulphur dioxide being contravened within the AQMA. A scenario involving the removal of domestic sources that has been shown to demonstrate compliance with the air quality objectives throughout the AQMA has been achieved and exceeded. It can therefore be concluded that the air quality objectives for sulphur dioxide is now being met throughout the AQMA and that Antrim Borough Council can revoke the AQMA.

10.46.4 Proposed Actions

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New monitoring data has not identified any likely breaches of the air quality objectives and it is not necessary to proceed to a Detailed Assessment for any of the monitored pollutants. Monitoring of nitrogen dioxide with diffusion tubes will continue at 6 of the 8 sites monitored over the year. Two sites will be discontinued and the diffusion tubes relocated to monitor road junctions identified in the 2008 Updating and Screening Assessment.

Results from the real time sulphur dioxide monitoring station in the Greystone housing estate has shown consistent compliance with the air quality objectives over the last 6 years. There is no compelling reason to continue monitoring at this site and it will be closed down when the current QA/QC and maintenance contracts expire.

All the actions set out in Antrim Borough Council's action plan have been implemented. The main actions consisted of the removal of sources of solid fuel combustion from the housing estates making up the AQMA. Detailed assessment carried out prior to development of the action plan identified the number of individual sources that needed to be removed to ensure compliance with the relevant air quality standard. In the event the number of sources removed greatly exceeded the number required to meet the objective and Antrim Borough Council would now propose to revoke the AQMA.

Antrim Borough Council's next air quality report will be the 2011 Progress Report.

417 References

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Start writing here... Defra (2009) Part IV of the Environment Act 1995. Local Air Quality Management. Technical Guidance LAQM.TG(09).

AEA Energy & Environment (2008). Diffusion Tubes for Ambient NO₂ Monitoring: A Practical Guide for Laboratories and Users.

Antrim Borough Council Updating and Screening Report – August 2009

Antrim Borough Council Air Quality Action Plan – July 2007

Appendices

Appendix 1: Wasp Scheme results

Wasp Round	n	Nominal value µg/tube	BV Average µg/tube	BV Standard Deviation	BV RSD	BV Z-Score	Current Z-Score PT PerformanceScore	
104A Jan 09	2	2.02	1.323*	0.003	0.2%	-2.7	warning	N/A
104B Jan 09	2	1.22	0.803*	0.01	1.2%	-2.6	warning	N/A
105A Apr 09	2	1.68	1.703	0.003	0.2%	0.4	good	CAT 1
105B Apr 09	2	0.96	1.018	0.007	0.7%	0.7	good	CAT 1
106A Jul 09	2	1.84	2.002	0.012	0.6%	1.2	acceptable	CAT 2
106B Jul 09	2	1.42	1.574	0.015	1.0%	1.4	acceptable	CAT 2
107A Oct 09	2	2.03	1.998	0.013	0.7%	-0.2	good	CAT 1
107B Oct 09	2	2.20	2.140	0.010	0.5%	-0.4	good	CAT 1

* Round 104: The poor performance in this round triggered a non-conformance report and review by QA management. Review revealed that the raw analytical data was good but was submitted before applying a multiplication factor of 1.5. When correctly applied, the data is close to the nominal values and would have fit into the PT performance criteria applied at the time as good (CAT 1) for both rounds 104A and 104B. Procedures were put in place to prevent recurrence.

Appendix 2: Nitrogen Dioxide diffusion Tube Data Set

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Valid Mths	Annual Mean	Corrected
Fountain St	39	50	43	39	30	46	27	23	41	35	34	46	12	37.75	30.58
Lisnevenagh Rd	52	41	29	21	0	0	26	23	28	41	0	45	9	34.00	27.54
Templepatrick	48	52	41	34	0	54	32	36	43	46	33	42	11	41.91	33.95
Randalstown	0	53	47	43	47	55	31	29	50	43	41	53	11	44.73	36.23
Airport	47	24	18	16	0	19	15	17	17	16	18	22	12	19.08	15.46
Meadowlands	52	34	28	45	0	19	19	0	26	0	26	44	8	36.63	29.67
Ballymena Rd	83	48	34	42	36	42	29	33	35	41	37	51	11	46.45	37.63
Tully Rd	69	40	37	39	34	35	32	31	41	35	53	37	11	43.91	35.57

Appendix 3: AQMA Model Results “Business as Usual Scenario”

In July 2005, netcen undertook the “*Air Quality Review and Assessment – Stage 4*” for Antrim Borough Council. This modelling study assessed Particulate Matter (PM10) and Sulphur Dioxide (SO2) concentrations in Antrim and concluded that the daily PM10 objective and the 15 minute SO2 objective were unlikely to be exceeded across the study area. This modelling was validated with automatic monitoring data from the closest site, which at that time was in Carrickfergus. At the time of the modelling, there was not enough automatic monitoring data in Antrim BC to validate the results.

Following Stage 3, an automatic monitoring station has monitored SO2 in Antrim from January 2005. Figure 1 shows the location of Antrim’s monitoring station. The data has been ratified to the QA/QC standards used in the Defra network by Netcen. These data have been used to verify the modelled results from Stage 4 domestic combustion assessment for Antrim for SO2.

The model adjustment factor used is based on *Monitoring/(Modelled + Background)*. This approach takes into account the uncertainty of the two modelling approaches (1x1km UK Background maps using empirical model and 25m resolution using DISP). By adding up modelled and background, we are adjusting both uncertainties rather than only adjusting the domestic modelling and leaving background unadjusted. This way, we are also taking into account other sources that may arise in the local area that might not be included in the background data like traffic. Experience with point source ADMS and DISP modelling has placed great confidence in this approach. Netcen is very confident that this approach is the most reliable. This approach is consistent with the uncertainties reported by Stedman et al. in UK air quality modelling for annual reporting 2003 on ambient air quality assessment under Council Directives 96/62/EC, 1999/30/EC and 2000/69/EC.

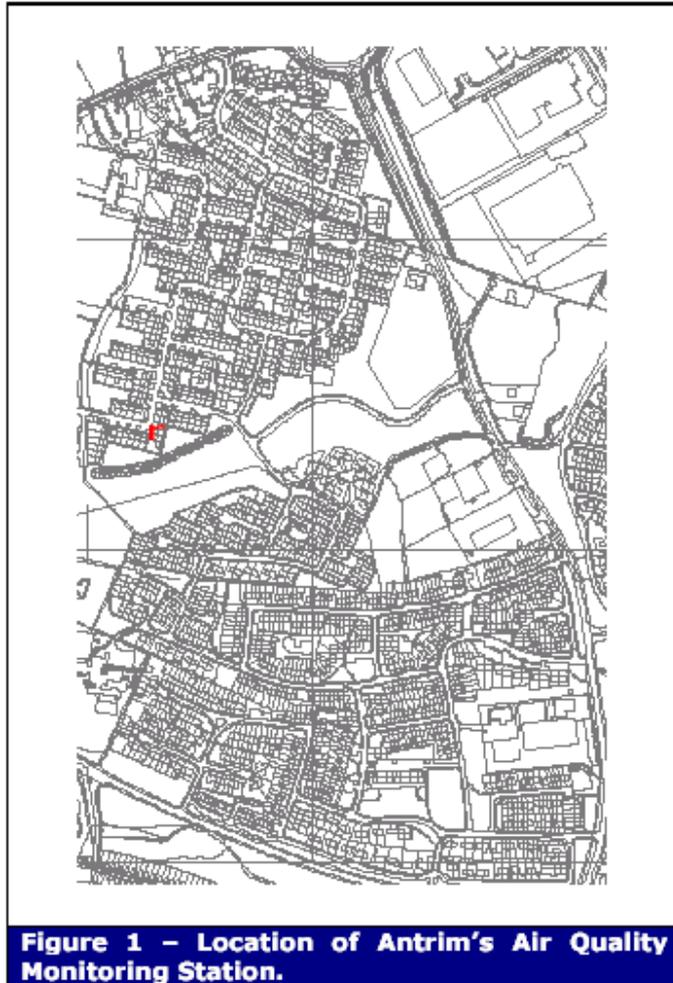


Table 1 and 2 show the way the model results were adjusted using monitoring data from Antrim’s monitoring station.

Table 1 Model adjustment for annual average

$\text{SO}_2 \text{ monitoring data} = (\text{SO}_2 \text{ background (monitoring period)} + \text{SO}_2 \text{ modelled}) \times f$ [annual mean]			
Monitoring data ¹	Background ²	Modelled	Adjustment factor f
13	2.09	6.50	1.51
¹ Annual average at Antrim (99.0% data capture) ² Background SO ₂ data (Excluding sources modelled explicitly – 0.94 ug _m ⁻³)			

Table 2 Model adjustment for 15 minute average

$\text{SO}_2 \text{ monitoring data} = (15.568 * (\text{SO}_2 \text{ background (monitoring period)} + \text{SO}_2 \text{ modelled}) - 23.673) \times f$ [99.9 th %ile of 15 min mean]			
Monitoring data ¹	Background ²	Modelled	Adjustment factor f
178	2.09	6.50	1.62
¹ 99.9 th %ile 15 minute mean at Antrim (99.0% data capture) ² Background SO ₂ data (Excluding sources modelled explicitly – 0.94 ug _m ⁻³)			

SO₂ annual mean verified plots is shown in figure 2. The maximum SO₂ annual mean has been predicted to vary between 6 and 22 ug_m⁻³ across the grid.

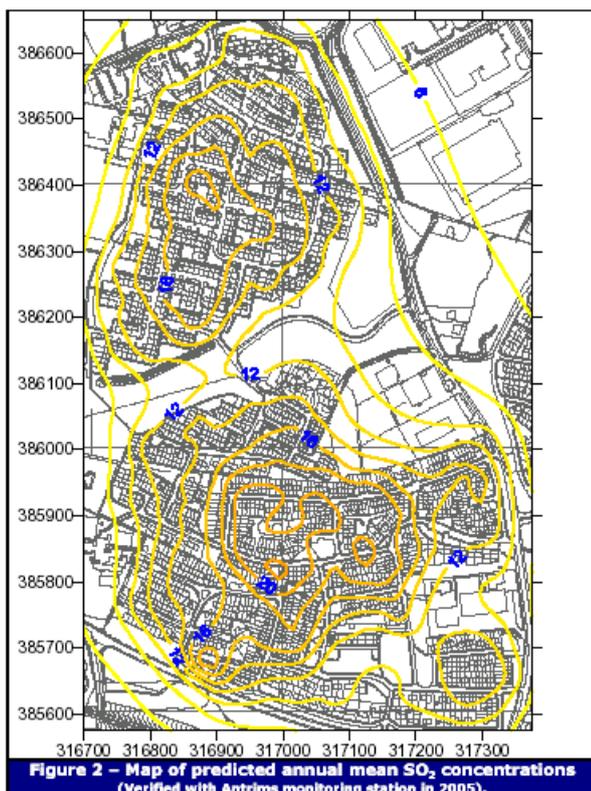
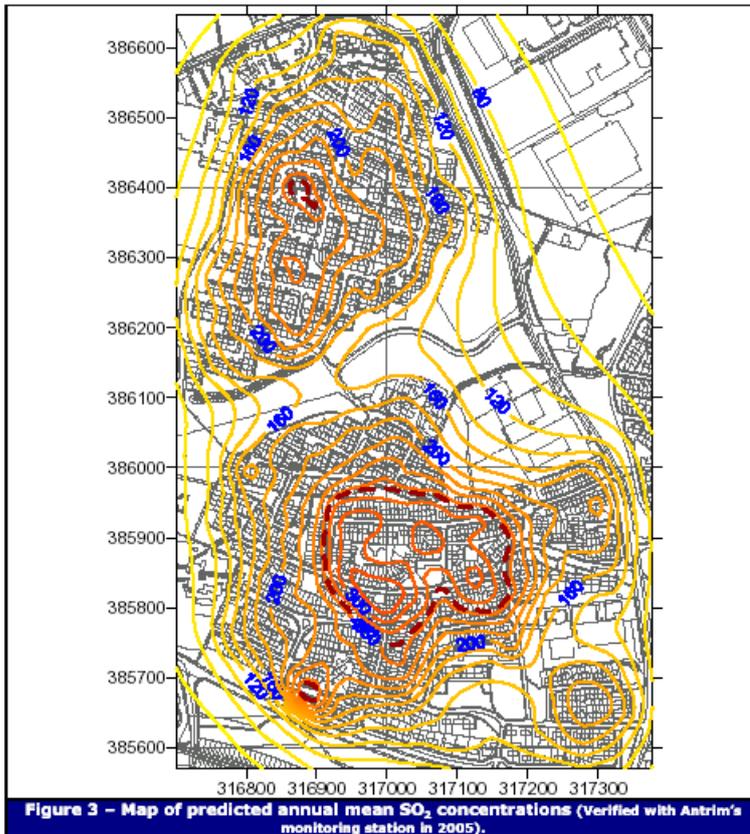


Figure 3 shows the predicted 99.9 percentile 15 minute mean SO₂ concentrations for Antrim's study area. The re-verification of the modelling study predicts that the maximum 99.9 percentile 15 minute mean SO₂ within Antrim's grid is above the 266 µg/m³ objective level. Figure 3 shows an area with two smaller areas where the 15 minute mean SO₂ objective is likely to be exceeded.



* Should read "Figure 3 – Map of predicted 15 minute mean SO₂ concentrations"

The re-verification study predicts that the 99.9%ile 15 minute mean SO₂ objective is likely to be exceeded in Antrim.

Appendix 4: AQMA Emissions Reduction Scenario Study

In April 2006, AEA Energy & Environment (formerly netcen) carried out the reverification of the modelling results obtained in the "Air Quality Review and Assessment – Stage 4" for Antrim Borough Council. The reverification study predicts that the 99.9%ile 15 minute mean SO₂ objective is likely to be exceeded in Antrim.

AEA Energy & Environment has carried out scenario testing to determine the predicted SO₂ levels following emissions reduction in the two areas of exceedences. This will consist of 50% NIHE heating conversion and the demolition of the flats at Chainé Court, Ballycraigy.

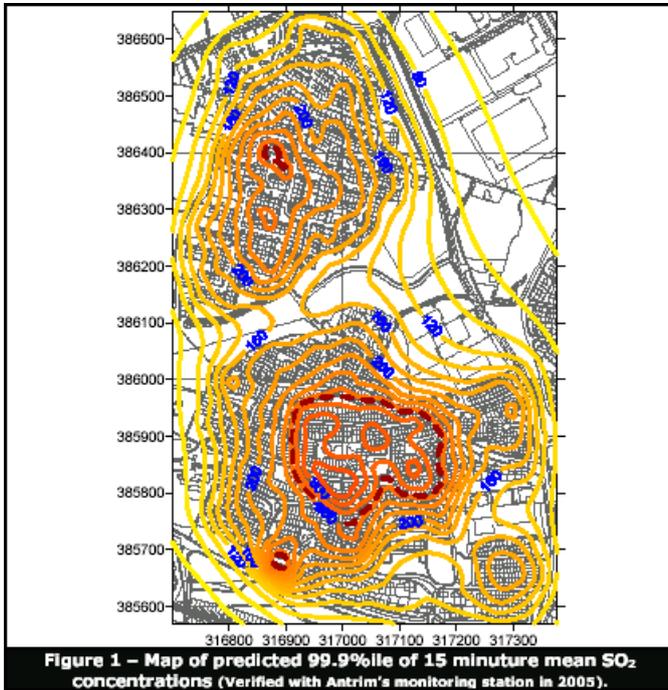
The modelling approach undertaken within this scenario testing is consistent with Stage 4 and the reverification report. Table 1 shows the way the model results were and have been adjusted using monitoring data from Antrim's monitoring station.

The model adjustment factor used here is based on Monitoring/(Modelled + Background). This approach takes into account the uncertainty of the two modelling approaches (1x1km UK Background maps using empirical model and 25m resolution using DISP). By adding up modelled and background, we are adjusting both uncertainties rather than only adjusting the domestic modelling and leaving background unadjusted. This way, we are also taking into account other sources that may arise in the local area that might not be included in the background data like traffic. Experience with point source ADMS and DISP modelling has placed great confidence in this approach. This approach is consistent with the uncertainties reported by Stedman et al. in UK air quality modelling for annual reporting 2003 on ambient air quality assessment under Council Directives 96/62/EC, 1999/30/EC and 2000/69/EC (http://www.airquality.co.uk/archive/reports/cat05/0501121424_dd12003mapsrep4.pdf).

Table 1: - Model adjustment for 15 minute average			
SO ₂ monitoring data = (15.568 + (SO ₂ background (monitoring period) + SO ₂ modelled) - 23.673) × f [99.9th %ile of 15 min mean]			
Monitoring data ¹	Background ²	Modelled	Adjustment factor f
178	2.09	6.50	1.62

¹ 99.9%ile 15 minute mean at Antrim (99.0% data capture)
² Background SO₂ data (Excluding sources modelled explicitly – 0.94 µg_m⁻³)

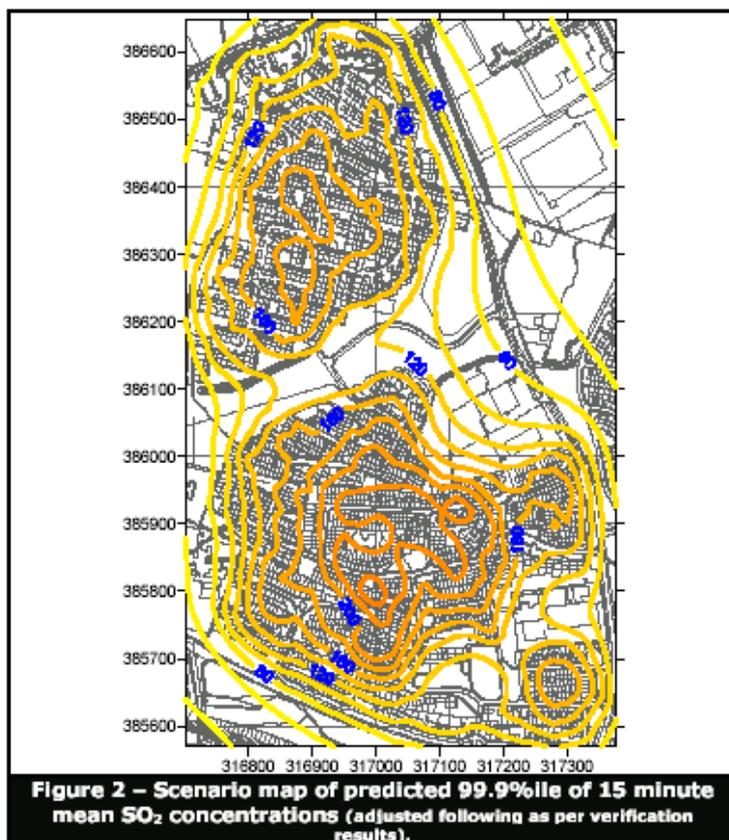
Figure 1 shows the predicted 99.9 percentile 15 minute mean SO₂ concentration for Antrim's study area. The reverification of the modelling study predicted that the maximum 99.9 percentile 15 minute mean SO₂ within Antrim's grid is above the 266 µg_m⁻³ objective level.



AEA Energy & Environment has carried out fuel domestic modelling for the including the following changes:

- Demolition of the flats at Chaine Court, Ballycraigy, and
- 50% NIHE heating conversion to gas

The emissions reduction has been calculated to be 22% compared to the current estimations. Most of this reduction of emissions is due to the conversion of NIHE properties to gas. The reduction in emissions following the implementation of both changes has been modelled and results plotted in figure 2. Figure 2 shows the predicted scenario 99.9 percentile 15 minute mean SO₂ concentration for Antrim's study area. The scenario of the modelling study predicted that the maximum 99.9 percentile 15 minute mean SO₂ within Antrim's grid is below the 266 µgm⁻³ objective level. Highest modelled result is 260 µgm⁻³ in a very small area.



The scenario of the modelling study predicts no exceedence in the SO₂ 15 minute objective level if the demolition of the flats at Chaine Court and a 50% heating conversion within NIHE properties in the area. We recommend that monitoring of SO₂ is continued to ascertain if this is confirmed in the measurement data.

