



***Report for Stage II & III Air Quality
Review and Assessment for Ards
Borough Council***

**Ards Borough Council Environmental
Health Service**

June 2004

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5.1 Executive Summary

Good Air Quality is a fundamental requirement of human health. Increased priority has been given at both European and national levels to the assessment and management of air quality. A key element has been the adoption by the Government of the UK National Air Quality Strategy (revised 2000) which sets out health based standards and objectives for the control and reduction of eight air pollutants which are of greatest concern.

Until recently, there has been no statutory requirement for local authorities in Northern Ireland to carry out a local air quality review and assessment. This process comprises three stages, and involves reviewing the sources of pollution, including major roads, industrial and domestic sources within the local area to determine if national policies are likely to deliver the air quality objectives by the end of 2003-2005. The process is also designed to ensure that air quality considerations are integrated into local decision making processes, such as land use planning and traffic management.

The introduction of The Environment (Northern Ireland) Order 2002, now provides a framework for local air quality management in Northern Ireland and requires local authorities to undertake an Air Quality Review and Assessment in their local areas and to meet the local air quality targets and objectives set out in the UK National Air Quality Strategy (2000).

Ards Borough Council completed and published a Stage One air quality review and assessment, through a voluntary agreement with the Department of Environment, in June 2000. The First Stage review involved carrying out initial screening of industrial, transport, and other sources of pollution which have a significant impact within the locality and the identification of pollutants of concern locally.

In Ards, the Stage One review found that:

1. The air quality objectives for 3 of the 7 specified pollutants namely benzene, 1,3-butadiene, and lead are all likely to be achieved by 2005.
2. With regard to Carbon Monoxide, Nitrogen Dioxide, Particulates and Sulphur Dioxide, the report concluded that there were potential significant sources located within neighbouring areas which required further investigation. As a result, it was necessary to proceed to a second stage review and assessment.
3. It will also be necessary to proceed to a second stage review and assessment to investigate the impact of low level domestic coal burning on levels of particulates and sulphur dioxide.

On the basis of modelling and ratified data the relevant information has been obtained to facilitate completion of a combined Stage 2/ 3 air quality review and assessment process.

The Technical Guidance Note LAQM. TG.03 requires the council to make a decision as to whether or not to declare an air quality management area. On the basis of modelling and ratified data it can be concluded that there is no need to progress beyond a stage 2/3 Review and Assessment for carbon monoxide, nitrogen dioxide and sulphur dioxide.

Based on the results of the modelling it is concluded that the National Air Quality Objectives for the 24-hour mean PM₁₀ will be marginally exceeded within the area of Bradshaw Brae. It is therefore necessary to declare an Air Quality Management Area for PM₁₀ and undertake further assessment to confirm the location and magnitude of the exceedences.

It is recommended that the air quality monitoring station is relocated to site within the predicted hot spot, to allow for further assessment to be carried out in 2005.

The DETR guidance emphasises the need for consultation with the public and relevant organisations. To aid this process the final report will be subject to consultation, with the following organisations;

- Eastern Group
- Ards Borough Council website and copies will be available at the Council Offices reception
- Neighbouring Local Authorities
- Health Authority- health and Wellbeing
- DOE Roads service
- National Society for clean air
- Local Community Groups
- Northern Ireland Housing Executive

In compiling this Report information has been obtained from the DETR, DoE Road Service, the Environment and Heritage Service, neighbouring District Councils and other local industries and organisations. Background information was also obtained from air quality monitoring results and the UK National Air Quality Information Archive.

1.0 Introduction

1.1 The National Air Quality Strategy

In March 1997, the UK Government published the “UK National Air Quality Strategy” (revised 2000) providing a framework for air quality control. The Strategy proposed new national air quality standards and objectives for 8 major pollutants following recommendations from the Expert Panel on Air Quality Standards (EPAQS). **Air Quality Standards** are used as benchmarks for setting air quality objectives. They represent the levels at which there would be an extremely small or no risk to human health. Where EPAQS has not yet made a recommendation, the air quality standards have been derived from the World Health Organisation recommendation. **Air Quality Objectives** represent the Government’s best judgement of the progress which can be made towards getting air quality as close to the benchmark standards as is reasonable and justifiable on the grounds of cost and benefits by the year 2005. They will be used as triggers for action by local authorities.

The Air Quality (Northern Ireland) Regulations 2003, subsequently gave legal weight to these standards and objectives with the exception of ozone. The responsibility for achieving the ozone objective lies primarily at the national and international level, there being little local authorities can do to provide an effective means of control as it is a transboundary pollutant.

The pollutants for which local authorities are responsible are Benzene, 1,3-butadiene, Carbon Monoxide, Lead, Nitrogen Dioxide, PM₁₀ (particulates) and Sulphur Dioxide.

1.2 Local Air Quality Management

The Environment (Northern Ireland) Order 2002, requires local authorities to undertake an Air Quality Review and Assessment in their local areas and to meet the local air quality targets and objectives set out in the UK National Air Quality Strategy (2000).

The review and assessment process comprises three stages and is designed to enable local authorities to identify those areas at a local level where national policies are unlikely to deliver the air quality objectives by the end of 2005, and to ensure that air quality considerations are integrated into local decision making processes, such as land use planning and traffic management.

In the absence of legislation, Ards Borough Council completed and published a Stage One air quality review and assessment, through a voluntary agreement with the Department of Environment, in June 2000. The First Stage review involved carrying out initial screening of industrial, transport, and other sources of pollution which have a significant impact within the locality and the identification of pollutants of concern locally.

In areas identified by the first stage as having potential to experience elevated levels of pollutants the authority must proceed to a **second stage** review and assessment for the particular pollutants identified. This is a more detailed assessment of all the pollutants identified in the first stage, and includes estimation, modelling or measurement of levels of pollutants in areas influenced by road traffic, industrial or other significant sources. If this stage predicts that the air quality objective for a pollutant will not be achieved by the target date, the authority should undertake a **third stage** review and assessment of that pollutant.

Stage three is an accurate detailed review of pollutants, requiring more complex techniques (dispersion modelling, real-time monitoring and emission inventories) to determine the nature and size of any areas where the objectives are exceeded.

If, at the end of stage three, air pollutant concentrations are predicted to be above any of the specific objectives, then an Air Quality Management Area must be declared. In this circumstance an Air Quality Action Plan should then be developed, detailing how the local authority proposes to introduce measures to reduce the concentrations of air pollutants in line with the Government objectives.

In Ards, the Stage One review found that:

1. The air quality objectives for 3 of the 7 specified pollutants namely benzene, 1,3-butadiene, and lead are all likely to be achieved by 2005.
2. With regard to Carbon Monoxide, Nitrogen Dioxide, Particulates and Sulphur Dioxide, the report concluded that there were potential significant sources located within neighbouring areas which required further investigation. As a result, it was necessary to proceed to a second stage review and assessment.
3. It will also be necessary to proceed to a second stage review and assessment to investigate the impact of low level domestic coal burning on levels of particulates and sulphur dioxide.

On the basis of ratified data and modelling the information is available to facilitate the completion of a combined Stage 2/3 air quality review and assessment process. The aim of this combined stage 2/3 review is to provide a detailed assessment of all the pollutants identified in the first stage. Investigation methods used include fuel usage surveys, dispersion modelling, real-time monitoring and the compilation of emissions inventories to determine levels of pollutants and the size and extent of any areas where the objectives are exceeded.

Additional housing proposed for the periphery of Newtownards town has not been finalised and any associated increase in traffic flows will be investigated in a further assessment of air quality to be carried out nearer the year 2005, to ensure that there has been no significant decline in air quality.

1.3 The National Air Quality Objectives

Air quality objectives as set out in the UK National Air Quality Strategy (2000) are presented in Table 1.1 below.

Table 1.1 – The UK Air Quality Objectives included in the Air Quality (Northern Ireland) Regulations 2003

Substance	Air Quality Objective	Date to be achieved
Benzene	16.25 $\mu\text{g}/\text{m}^3$, when expressed as a running annual mean	31 December 2003
	3.25 $\mu\text{g}/\text{m}^3$, when expressed as a running annual mean	31 December 2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$, when expressed as a running annual mean	31 December 2003
Carbon Monoxide	10 mg/m^3 , maximum daily running 8-hour mean	31 December 2003
Lead	0.5 $\mu\text{g}/\text{m}^3$, when expressed as an annual mean	31 December 2004
	0.25 $\mu\text{g}/\text{m}^3$, when expressed as an annual mean	31 December 2008
Nitrogen Dioxide	200 $\mu\text{g}/\text{m}^3$ (hourly mean) not to be exceeded more than 18 times per year	31 December 2005
	40 $\mu\text{g}/\text{m}^3$ (annual mean)	31 December 2005
PM ₁₀	40 $\mu\text{g}/\text{m}^3$ annual mean	31 December 2004
	50 $\mu\text{g}/\text{m}^3$ fixed 24-hour mean, to be exceeded no more than 35 days per year	31 December 2004
Sulphur Dioxide	350 $\mu\text{g}/\text{m}^3$ (1 hour mean) not to be exceeded more than 24 times a year	31 December 2004

	<p>125 $\mu\text{g}/\text{m}^3$ (24 hour mean) not to be exceeded more than 3 times a year</p> <p>266 $\mu\text{g}/\text{m}^3$ (15 minute mean) to be exceeded no more than 35 times per year</p>	<p>31 December 2004</p> <p>31 December 2005</p>
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Source: Local Air Quality Management Technical Guidance LAQM.TG(03)

NOTE: $\mu\text{g}/\text{m}^3$ = **micrograms per cubic metre.**

2.0 Information about Ards Borough Council

Ards Borough Council is situated east of Belfast on the shores of Strangford Lough, which is designated as an area of outstanding natural beauty and special scientific interest (see Figure 2.1 below for map of Borough). It has a growing population in the region of 74,000 and covers an area of approximately 140 square miles, with 90 miles of coastline.

The Borough is of mixed urban and rural character. The main town of Newtownards is located at the northern end of Strangford Lough and is in a natural basin being surrounded by hills. The prevailing wind direction is south-westerly. Air pollution problems may arise mainly from the high dependency on coal fired domestic heating combined with the geographical features of the area that may result in temperature inversions. The other main centres of population include Comber, Donaghadee and Portaferry. Neighbouring Councils include North Down Borough Council, Castlereagh Borough Council and Down District Council.

Recently, major employers included the textile and clothing industry, but have suffered decline in recent years. However the area has seen a significant growth in both the service and engineering sectors. Tourism remains the mainstay of the local economy.

The housing stock ranges from old properties in the main population centres with extensive housing development taking place on the outskirts of the towns and villages.

Figure 2.1: Map of Ards Borough Council



Source: Ards Borough Council Environmental Health Service Business Plan 2003 -2004

3.0 Possible Sources of Pollution in Ards Borough Council

The First Stage Review and Assessment investigated the impact of the following possible sources of pollution in Ards Borough Council:-

- Industrial sources particularly Part A, Part B and Part C prescribed processes;
- Traffic on major or congested roads; and
- Domestic coal burning

3.1 Industrial Sources

Industrial sources are currently controlled under The Industrial Pollution Control (NI) Order 1997, and are classified into either Part A, (such as reforming natural gas), Part B processes (such as quarries), or Part C (such as bulk cement and timber processes) for guidance and control. Part A and B processes fall under the jurisdiction of the Department of the Environment, whilst control of Part C processes is a duty carried out by District Councils.

Each process receives an Authorisation to emit substances to the air. Local exceedences of air quality objectives caused by a process may be grounds for the imposition of stricter conditions in an authorisation than would normally be the case. However, it will have to be clear to the authorising authority that the industry alone is responsible for the exceedences, and not a combination of other factors.

Small sources, which are exempt from the requirement to be authorised, will also be considered in the review and assessment.

In Ards Borough Council there are currently no authorisations for Part A prescribed processes.

There are currently six Part B Authorisations for prescribed processes and no applications.

There are currently twenty seven Part C Authorisations and one application.

Lists of Part B and C processes in Ards are given in Appendix 1.

The Stage One Review and Assessment found that there were no significant sources of industrial pollution within Ards. Through consultation with neighbouring authorities it was identified that the impact of three industrial processes on levels of carbon monoxide, nitrogen dioxide, sulphur dioxide and particulates, required further investigation.

3.2 Road Traffic

For the purposes of the Stage One review, data from the Annual Traffic Census Report 1998, published by the DoE Roads Service was used to assess traffic flows within Ards Borough Council. It was concluded that roads did not present a significant source of pollution in Ards. However, as the review and assessment of air quality is an ongoing process, the impact of roads on nitrogen dioxide and particulate levels has been examined in this report, using updated information.

The nitrogen dioxide diffusion tube monitoring carried out within Ards was extended in 2003, following the Stage One review, to monitor two additional busy road junctions. The updated data obtained from the DoE Road Service Annual Traffic Census Report 2002, has been used to input into the Design Manual for Roads and Bridges to determine the impact of road traffic pollution. The main roads servicing Ards and traffic flow figures available are presented in table 3.1 below.

Table 3.1: Traffic Flow Figures for the Main Roads servicing Ards Borough Council

Road No.	C P No	Location	24 hr AADT 2002	Predicted 24 hr AADT for 2005	% HGV
A2	510	Donaghadee – Millisle, at Ballyvester	4640	4924	N/A
A20	216	Upper Newtownards Road, Belfast at Quarry Corner	25390	26943	8 (1998)
A20	509	Portaferry Road, Newtownards	10640	11291	4 (2002)
A21	507	Bangor Road, Newtownards	22380	23750	N/A
A21	511	Newtownards Road, Comber	13960	14814	N/A
A22	217	Comber Road, Belfast, SE of New Line	10320	10737	4
A22	512	Comber – Killyleagh, at Comber	7440	7895	N/A
A48	508	Donaghadee Road, Newtownards	10550	11196	N/A

Source: Annual Traffic Census Report 1998, DoE Roads Service

NOTE: “24 hour AADT” is the annual average daily traffic based on a 7 day week

1. The predicted 24 hour AADT for 2005 is calculated by adding 2% annually to the existing 2002 figure
2. C P is the census point number

3.3 Domestic Coal Burning

Newtownards is a densely populated area with a high concentration of smaller sources such as domestic and commercial heating.

To undertake the First Stage Review and assessment data was obtained from the 1981 Population Census to determine an approximate number of houses depending on coal fired domestic heating within a designated 1km² area (see Appendix 2). This was identified as the worst case area within Ards and covered older private sector houses within Newtownards town centre and the Glen Estate, which is predominantly public sector housing. It was recognised that the data was dated so it was necessary to determine if figures would have changed substantially since 1981.

As a result, information was obtained from the Northern Ireland Housing Executive, who carried out a survey of their housing stock in 1998, covering the same designated area. The survey included data on the main source of heating in households. In addition, a survey of 46 private houses within the same area was carried out by the Environmental Services Department. The information gathered supported the 1981 Census figures.

It was concluded that the level of domestic coal burning exceeded the level recommended by the guidance as presenting a risk of exceeding the objectives for Sulphur Dioxide and PM₁₀. As a result, a more detailed investigation of the impact of domestic coal burning on Sulphur Dioxide and PM₁₀ levels has been carried out and is presented in the following sections of this report.

There is one smoke control area within Newtownards, and this covers the West Winds Estate.

4.0 Assessment Methods

4.1 Technical Guidance

The technical guidance describes approaches which can be taken to undertake Stage 2/3 review and assessment to provide a more detailed assessment of pollutants. Investigation methods used by Ards Borough Council include real-time monitoring, fuel usage surveys, dispersion modelling and the compilation of emission inventories to determine the levels of pollutants and the size and extent of any areas where the objectives are exceeded.

4.2 Air Quality Monitoring

4.2.1 Monitoring Methods

As a result of the air quality review and assessment process there has been a significant expansion of monitoring in recent years with many Councils now starting to investigate air pollution levels in their areas.

Real-time monitoring of Particulates and Sulphur Dioxide is currently carried out in Ards Borough Council and in the neighbouring councils, Castlereagh Borough Council, Lisburn City Council and North Down Borough Council.

Since mid-2002, an automatic monitoring station has been located at an urban background site in the Glen Estate, Newtownards, to monitor pollutants from the high density of domestic coal-burning properties in the area. PM₁₀ is monitored using an automatic TEOM sampler and sulphur dioxide is monitored using a uv fluorescence analyser.

The reference method for PM₁₀ is the gravimetric technique, in which the ambient concentration of PM₁₀ is calculated from the mass of particulate matter collected on a filter. The TEOM has been found to underestimate relative to this reference method. As a result data obtained from the TEOM sampler has been multiplied by a factor of 1.3 to give the gravimetric equivalent.

Since November 2000, a semi-automatic eight-port bubbler has been located in the Scrabo Estate in Newtownards, which is also an area with a high density of domestic coal burning. The 8-port bubbler apparatus is used to measure sulphur dioxide and suspended particulate matter as black smoke. The bubbler method does not allow direct comparison with the National Air Quality Objectives for Sulphur Dioxide and PM₁₀, but it does provide a useful indicative measurement.

In Ards Borough Council monitoring of NO₂ by passive diffusion tubes has been undertaken regularly since 1994 and Ards is currently part of the National NO₂ Diffusion Tube Survey. Diffusion tube data cannot be compared directly with air

quality limit values based on short-term averages, however, they can be used to help identify areas with high concentrations of NO₂, which may require more detailed investigation. The aim of the NO₂ monitoring undertaken has been to measure pollutant concentrations at busy roads and junctions especially near residential areas. In 2003, as a result of the Stage 1 review it was decided to locate two additional NO₂ diffusion tubes to monitor kerbside levels at two road junctions. The tubes were sited using guidelines from NETCEN, but are not part of the monitoring network.

The air pollution monitoring sites in Newtownards and the pollutants monitored can be seen in Appendix.

4.2.2 Quality Assurance and Quality Control – QA/QC

The supplier of the automated Sulphur Dioxide and PM₁₀ analysers has been contracted for a 5 year period to undertake routine servicing and maintenance of the equipment. This ensures a high percentage of data capture due to reduced delays in execution of repairs, in the event of equipment breakdown.

The Council has engaged the services of NETCEN to undertake independent 6-monthly calibrations. NETCEN is also responsible for data management which involves downloading data directly from the site on a daily basis and validating the data to provide reports at regular intervals. Any irregularities are notified immediately to the Council and officers can take measures to rectify any problems or notify the supplier to carry out repairs if necessary. Officers undertake routine calibration and maintenance of the equipment following the QA/QC procedures set out by NETCEN.

The semi-automatic eight-port bubbler in the Scrabo Estate in Newtownards was sited in accordance with NETCEN guidelines. The equipment is subject to routine in-house checks and is serviced and maintained at 2-year intervals. There is no independent calibration of equipment.

All six passive Nitrogen Dioxide tubes are sited in accordance with NETCEN guidelines. Four of the tubes are part of the NO₂ Diffusion Tube network.

The NO₂ tubes used are acrylic and the absorbent in the tubes is 50% TEA in water. The tubes are supplied by Gradko, St. Martins House, 77 Wales Street, Winchester and are analysed by Ruddock and Sherratt, 6 Donegall Square South, Belfast. Ruddock and Sherratt are not accredited to BS or UKAS standards for the analytical method. However, they do participate in the Workplace Analysis Scheme for Proficiency (WASP) for NO₂. In order to be confident that the results of the tube analysis are accurate it is important to collocate tubes with an automatic monitors.

Neighbouring local authorities have installed automatic chemiluminescent analysers to monitor NO₂. As a result, a collocation study can be carried out because a tube has been located at the station in Lisburn City Council. Unfortunately due to circumstances beyond the councils control, this study has not yet been completed, therefore the NO₂ results have not been corrected.

4.3 Fuel Usage Surveys

Two fuel usage surveys have been undertaken within Ards Borough Council by independent consultants employed to gather and collate the survey data.

The first survey was undertaken by PSc Consultants, Belfast, and was completed in April 2002. The survey investigated the levels of coal burning within the worst-case 1km² area identified by the Stage I review and assessment. This involved surveying part of the town centre and the Glen Estate, within Newtownards.

A second survey was undertaken by Elite Training Services, Belfast, and was completed in April 2003. This survey extended to other areas of concern including the remainder of Newtownards town and the neighbouring town of Comber.

The Council's geographical information system was used to help identify the location of any hot spots, where there was a heavy reliance on solid fuel as the main source of domestic heating. The data obtained from the fuel usage surveys has been supplied, as input data, to the independent consultant employed to undertake the advanced dispersion modelling.

4.4 Dispersion Modelling

4.4.1 Choice of Dispersion Model

Dispersion models describe how pollutants are spread and mixed in the atmosphere. Mathematical procedures are used to calculate pollutant concentrations based on emission rates under a set of known variables.

Dispersion models are one of the tools available during the management of air quality, and are particularly useful in the following areas:

- pollutant emissions arising from different sources can be accounted for in terms of their impact upon ground-level concentrations.
- for 'filling in the gaps' of a monitoring programme allowing an assessment to be made of air quality in locations where no monitoring is undertaken.
- to predict future concentrations of pollutants. Such scenario analysis is a vital part of the air quality management process, especially in the development of air quality action plans.

- to predict concentrations across a wide geographical area, and determine the geographical boundaries of areas where exceedances of objectives are identified.
- to investigate different scenarios such as the impact on pollution levels due to introduction of a smoke control area.

Ards Borough Council engaged the services of BMT Cordah Ltd, an independent consultant, to undertake dispersion modelling in order to ensure a reliable output.

The dispersion modelling was carried out using Atmospheric Dispersion Modelling System (ADMS) Roads Air Quality Management System Version 2.0. The model has a comprehensive list of validation projects including comparison with standard field, laboratory and numerical data sets, participation in EU workshops on short range dispersion models, inter-comparison with CALINE 4 and DMRB models and comparison with automatically monitored data in cities across the UK involving studies carried out by local authorities and DEFRA.

The model comes in the form of a computer program and requires various data inputs including:

- Shape files
- Ordnance Survey Terrain Data
- Meteorological data
- Domestic fuel emissions data
- Background contributions from other sources can be aggregated in an emissions inventory. A useful source is the national 1km by 1km emissions maps.

Figure 2 in the BMT Cordah Report (appendix 4) highlights the location of the SO₂ bubbler and the automatic monitoring station, figures 12 to 16 show that these monitoring stations are sited within the vicinity of the highest modelled concentrations.

4.4.2 Meteorology

Meteorology determines how quickly emissions are diluted, hence an essential input to a dispersion model is meteorological data that must be representative of the area of interest.

Technical Guidance Note LAQM.TG(03) recommends that one year of meteorological data may be used for dispersion modelling for the purposes of review and assessment.

There is insufficient meteorological data available from the local meteorological station located at the monitoring site in the Glen Estate, Newtownards. Meteorological data for the dispersion model was obtained for a 2 year period from the Meteorological Office at Belfast International Airport.

4.4.3 Model Validation

There is no straightforward way of specifying the accuracy of dispersion models. The accuracy depends on the quality of the input data used. The accuracy of the data is reduced when comparing the short-term (1-hour) modelling where the conditions are so variable whereas long-term (annual) modelling involves more stable conditions. There is also always a degree of error in atmospheric modelling due to meteorological uncertainties.

To apply a dispersion model to the Stage 3 review and assessment process, a comparison between appropriate measurements should be carried out. This is so the scope of error with the model can be determined and then applied. The method which will be used to validate the ADMS model will involve modelling the area in the location of the Glen Estate Automatic Monitoring site and comparing the results with the PM10 data from the continuous monitoring site. The data from the Glen Estate site is accurate as it meets operational QA/QC.

Local monitoring data was available for a period of eight months, although only 6 months of the dataset has been ratified. In addition, BMT Cordah Ltd have proposed used data available from the monitoring stations in Belfast which have been in operation for several years, providing a larger dataset.

By comparing the automatic monitoring site results with the modelling results an error factor can be determined from the percentage difference in results. As an example if the percentage difference is 35%, the error factor to be added to the modelling results is +/- 35%.

4.4.4 Design Manual for Roads and Bridges (DMRB)

The Design Manual for Roads and Bridges, V1.02 published by the Highway's Agency is used to calculate the contribution of traffic, on nearby road-links, to the concentration of air pollutants at a particular site location. It is a screening model to establish whether a more detailed air quality assessment is required. The model requires input data on annual average daily traffic flow (AADT); annual average speeds; proportion of different vehicle types; type of road; distance from the centre of the road to the receptor and background concentrations for pollutants.

An Excel spreadsheet version of the model has been provided by the operators of the Modelling Helpline for Local Authorities (Stanger Science and Environment) and this version (January 2000) has been used in this assessment.

The model is designed to be a conservative screening tool and is likely to overestimate any potential impact. However, it should be noted that the model is likely to underpredict concentrations of nitrogen dioxide alongside “street canyons” (narrow streets), and this must be taken into account when using the model.

The model predicts the annual mean concentration for direct comparison with National Air Quality Strategy annual mean objectives. The Technical Guidance Note LAQM.TG (03) states that if the annual mean objectives are not exceeded, it can be confidently assumed that the short-term (1-hour) objectives will also be met. If the predicted concentrations exceed the annual mean objective, then a detailed assessment is required.

4.5 Emissions Inventory

Ards Borough Council has purchased EMIT software to compile an Emissions Inventory to identify and quantify significant sources of emissions to the atmosphere within the area. The EMIT emission inventory was used to populate the modelling with fuel use survey data.

5.0 Stage 2/3 Review and Assessment of Carbon Monoxide

5.1 Introduction

Carbon monoxide is a pollutant gas generated by combustion sources. The main source of carbon monoxide in the UK is road transport, the predominant source being petrol vehicles.

Carbon monoxide affects the body by restricting the uptake of oxygen by forming carboxyhaemoglobin. Exposure to high levels (such as may occur inside a building with a faulty heating appliance) results in unconsciousness, with further exposure causing death. At outdoor concentrations there may be adverse effects for vulnerable people.

5.2 Standard and Objective for Carbon Monoxide

The Government has adopted an 8-hour running average of 10 mg/m³ as an air quality standard for carbon monoxide, to be achieved as the maximum 8 hour running average by the end of 2003.

5.3 The National Perspective

Since 1990 carbon monoxide emissions have been decreasing as a result of national policies to reduce carbon monoxide emissions from vehicles. These include the introduction of three way catalysts and a reduction of the carbon monoxide limit in exhaust gases.

These national policies are expected to deliver the national air quality objective by the end of the year 2003, with the possible exception of heavily trafficked roads or in the vicinity of certain stationary sources.

5.4 Carbon Monoxide Monitoring in the UK

Carbon monoxide is monitored at 39 sites throughout the UK. The results show that carbon monoxide levels are declining.

There are currently 2 carbon monoxide monitoring sites within Northern Ireland that are part of the UK automatic monitoring network. These sites are located at Belfast (Lombard Street) and Londonderry (Brooke Park). The results for Northern Ireland's air quality monitoring for carbon monoxide in 2001, are presented in Table 6.1 below and show that the Air Quality Strategy objective is being met.

Table 5.1 – Carbon Monoxide Results for Northern Ireland 2001 – Automatic Monitoring Network ($\mu\text{g}/\text{m}^3$)

	Annual Mean ($\mu\text{g}/\text{m}^3$)	Max 1 Hour Level ($\mu\text{g}/\text{m}^3$)	Max 8 Hour Level ($\mu\text{g}/\text{m}^3$)	Number of days exceeding EPAQS Standard
Belfast (Lombard Street) (Limited data capture 60%)	0.5	7.2	5.5	0
Londonderry (Brooke Park)	0.3	4.9	2.4	0

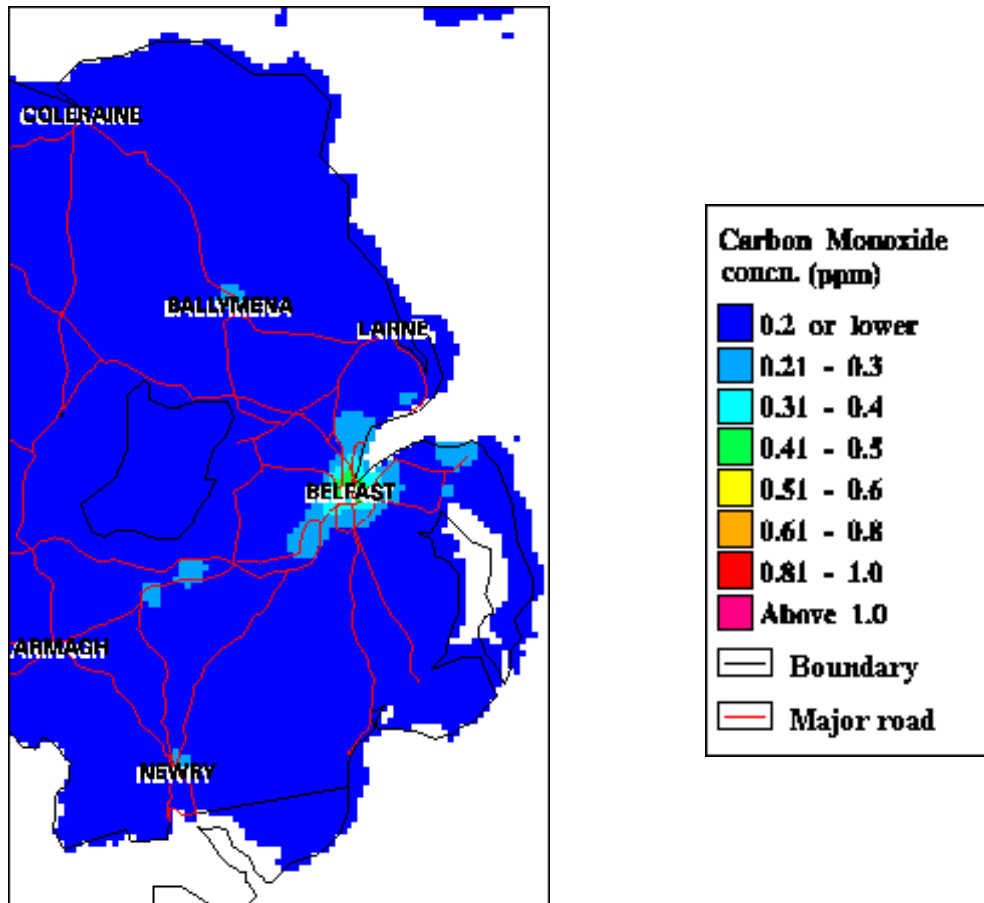
Source: Air Quality Monitoring in Northern Ireland, 2000-2001 (DoE and CEHOG)

5.5 Carbon Monoxide Monitoring in Ards Borough Council and in Neighbouring District Councils

No carbon monoxide monitoring has been carried out in Ards Borough Council or in neighbouring District Councils.

National maps are available from the UK National Air Quality Information Archive which indicate the estimated background carbon monoxide concentrations across the UK in 1996 (See Figure 6.1 below). Using current information available from the Archive, the estimated background annual mean carbon monoxide concentrations for 2003, in Ards Borough Council, are below $0.3 \text{ mg}/\text{m}^3$.

Figure 5.1: Carbon Monoxide Background Concentrations in the UK, 1996



Source: The UK National Air Quality Information Archive

5.6 The situation in Ards Borough Council

The first stage review and assessment identified 3 potential significant sources of carbon monoxide within neighbouring areas which could impact on Ards. These were:

Knockbracken Healthcare Park, Castlereagh Borough Council
Ulster Hospital, Castlereagh Borough Council
Stoneyroad Incinerator (DANI), Belfast City Council

The incinerators located at the Ulster Hospital and Knockbracken have since closed and can be disregarded. The incinerator at Stoneyroad has now converted to natural gas and is not a potential significant source of carbon monoxide.

The Technical Guidance Note LAQM.TG(03) states that where the 2003 background is expected to be below 1 mg/m³, there is no need to progress any further. The 2003 background level in Ards is expected to be below 0.3 mg/m³. In addition, the new guidance does not include incinerators as a potential source of carbon monoxide.

As a result it is not necessary to undertake further investigation of the potential sources of carbon monoxide.

5.7 Conclusions for Carbon Monoxide

It is not necessary to proceed beyond a Stage 2/3 review and assessment for carbon monoxide to investigate further the CO levels generated by those potentially significant sources located within neighbouring areas which may impact on the air quality within Ards. Ards Borough Council will not declaring an air quality Management area for carbon monoxide.

5.8 Recommendations for Carbon Monoxide

It is recommended that Ards Borough Council do not proceed beyond a stage 2/3 review and assessment for carbon monoxide.

6.0 Stage 2/3 Review and Assessment of Nitrogen Dioxide

6.1 Introduction

Nitrogen dioxide (NO₂) and nitric oxide (NO) are both oxides of nitrogen and are collectively referred to as NO_x. It is nitrogen dioxide which is of most concern. Nitrogen dioxide is a respiratory irritant, and is also thought to be a sensitiser, which may worsen other conditions such as hayfever.

The main source of nitrogen dioxide in the UK is road transport, with other major sources being power stations and domestic sources.

6.2 Standard and Objective for Nitrogen Dioxide

The Government has adopted a 1 hour average of 200 µg/m³ (not to be exceeded more than 18 times per year) and an annual average of 40 µg/m³ as the air quality standards for nitrogen dioxide (NO₂) to be achieved by the end of 2005.

6.3 The National Perspective

Nationally there has been little improvement in nitrogen dioxide levels in recent years despite the increasing use of cars with catalytic converters. The National Air Quality Strategy states that for nitrogen dioxide, a reduction in nitrogen oxides (NO_x) emissions over and above that achieved by national measures will be required in some areas if the NO₂ objective for 2005 is to be achieved.

6.4 Nitrogen Dioxide Monitoring in the UK

Nitrogen dioxide is measured nationally as part of the automatic monitoring network. There are four automatic monitoring network sites located in Northern Ireland: Belfast (Lombard Centre); Londonderry (Brooke Park); Newry (Monaghan Row) and Newry (Trevor Hill). Since 1994, all sites complied with the hourly and annual Air Quality Strategy objective. The results for the Belfast site for 1999-2001, are presented in Table 6.1 below.

Table 6.1 Results from Automated Nitrogen Dioxide Monitor in Belfast

Year	Annual Mean (µg m ⁻³)	Maximum 1Hour Level (µg m ⁻³)	Exceedances	
			1 Hour Level	Annual Mean
1999	34	141	0	0
2000	31	124	0	0
2001	32	334	3	0

Source: Air Quality Monitoring in Northern Ireland, 2000-2001 (DoE and CEHOG)

Nitrogen dioxide is also measured nationally through the NO₂ Diffusion Tube Survey, with over 150 diffusion tube sites in Northern Ireland.

6.5 Nitrogen Dioxide Monitoring in Ards Borough Council and in Neighbouring District Councils

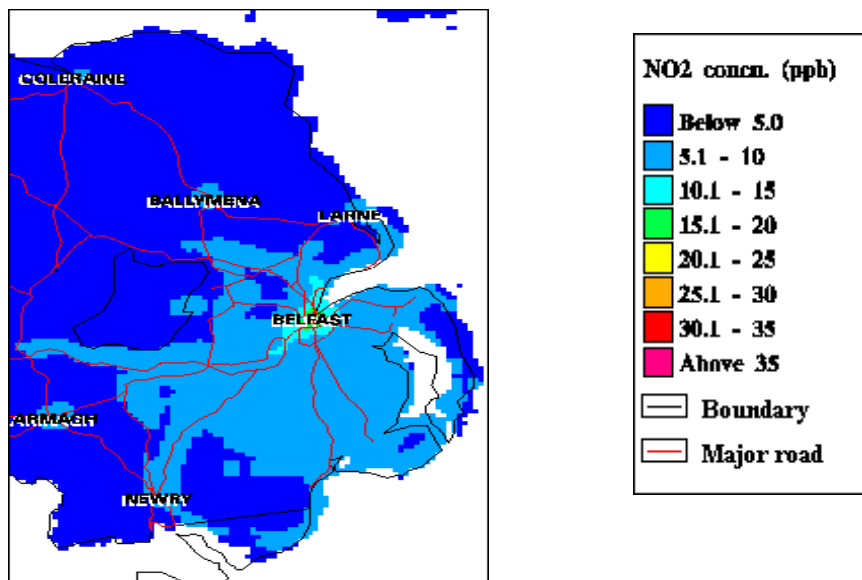
In Ards Borough Council monitoring of NO₂ by passive diffusion tubes has been undertaken regularly since 1994 and Ards is currently part of the National NO₂ Diffusion Tube Survey. The aim of the NO₂ monitoring undertaken has been to measure pollutant concentrations at busy roads and junctions especially near residential areas. In 2003, as a result of the Stage 1 review it was decided to locate two additional NO₂ diffusion tubes to monitor kerbside levels at two road junctions. The tubes were sited using guidelines from NETCEN, but are not part of the monitoring network.

The monitoring results for 2001-2002 are presented in Appendix and results are discussed in detail in Section 6.7.1 below. A full year's dataset for 2003, is not yet available, and this would include the results for the two additional sites. The 2003 results will be presented and discussed in the final report.

NO₂ is monitored using the automatic chemiluminescent technique in neighbouring councils, Castlereagh Borough Council, Lisburn City Council and North Down Borough Council. This facilitated a collocation study for the NO₂ diffusion tubes to determine a bias factor for the tubes. Unfortunately due to circumstances beyond the councils control, this study has not been completed therefore the NO₂ results have not been corrected.

The National Maps available from the UK National Air Quality Archive indicate estimated background NO₂ concentrations across the UK in 1996 (see Figure 8.1 below). Using current information available from the Archive, the estimated background annual mean NO₂ concentrations for 2005, in Ards Borough Council, are below 20 µg/m³.

Figure 6.1: Nitrogen Dioxide Background Concentrations in the UK, 1996



Source: The UK National Air Quality Information Archive

6.6 The situation in Ards Borough Council

6.6.1 Neighbouring Sources

The Stage I review and assessment identified the need for further investigation of nitrogen dioxide due to potential significant sources located within neighbouring areas which could impact on Ards. These were:

Knockbracken Healthcare Park, Castlereagh Borough Council
Ulster Hospital, Castlereagh Borough Council
Stoneyroad Incinerator (DANI), Belfast City Council

The incinerators located at the Ulster Hospital and Knockbracken have since closed and can be disregarded. The incinerator at Stoneyroad has now converted to natural gas and is not a potential significant source of nitrogen dioxide.

The Technical Guidance Note LAQM.TG(03) does not include incinerators as a potential source of nitrogen dioxide.

As a result it is not necessary to undertake further investigation of the potential sources of nitrogen dioxide located within neighbouring areas.

6.6.2 Road Traffic Sources

For the purposes of the Stage One review, data from the Annual Traffic Census Report 1998, published by the DoE Roads Service was used to assess traffic flows within Ards Borough Council. It was concluded that roads did not present a significant source of pollution in Ards. However, as the review and assessment of air quality is an ongoing process, the impact of roads on nitrogen dioxide levels has been examined in this report, using updated information.

In 2003, the nitrogen dioxide diffusion tube monitoring carried out within Ards was extended following the Stage One review to monitor two additional busy road junctions. A full year's dataset for 2003 is available, unfortunately due to circumstances beyond the councils control the collocation study has not been completed, therefore the NO₂ results have not been corrected.

The updated data obtained from the DoE Road Service Annual Traffic Census Report 2002 (see Table 3.1), has been used to input into the Design Manual for Roads and Bridges to determine the impact of road traffic pollution.

6.7 Assessment Methods and Results

6.7.1 Air Pollution Monitoring

The monitoring results for 2001-2003 are presented in Appendix 1. The annual mean results for 2001-2003 are presented in Table 6.2 below and results indicate that the air quality annual mean limit value of 40 µgm⁻³, is currently being complied with and that the objective will be met by 2005. LAQM.TG(03) states that if the annual mean objective is met then the 1 hour mean is unlikely to be exceeded.

Table 6.2 Annual Mean Monitoring Results (µgm⁻³) for NO₂ Diffusion Tube Sites in Newtownards for 2001-2003

	8 Court Street, Newtownards (Kerbside)	Rear of Town Hall, Newtownards (Kerbside)	7 Ash Grove, Newtownards (Urban background)	19 Islandmore, Newtownards (Urban Background)	Belfast road (kerbside)	A20 (Kerbside)
2001	25	21	9	8	-	-
2002	25	25	7	9	-	-
2003	26	30	11	10	20.5	20.5

Note: A Kerbside Site is 1-5 metres from the kerb of a busy road
An Urban Background Site is greater than 50 metres from any busy road

6.7.2 DMRB Modelling

The Design Manual for Roads and Bridges, Volume 11, has been used to predict the annual average concentrations for nitrogen oxides and nitrogen dioxide, for six road sections within Ards. Nitrogen Dioxide is the pollutant of interest and it was measured against the annual mean of 40ug/m³. LAQM.TG(03) states that if the annual mean objective is met then the 1 hour mean is unlikely to be exceeded.

The input data for the DMRB model was obtained from a number of sources. The information for the individual roads was obtained from the DoE Road Service Annual Traffic Census 2002 (see Table 3.1). Geographical Information Systems (GIS) methodology was used to measure the nearest properties to the road sections assessed, thus identifying the most at risk receptors. The estimated annual mean background concentrations for pollutants modelled were obtained from the UK National Air Quality Information Archive.

Table 6.3 below details the input data for the DMRB locations modelled. The modelling sites chosen were governed by the available traffic data and where reasonable took into account road junctions that would cause delayed traffic thus increasing the pollution levels in those areas. Please note that for some road sections two locations were modelled to account for a receptor adjacent to a free-flowing section of a road and a receptor adjacent to a junction on the same road.

Table 6.3 Input Data for DMRB Modelling

Road No.	Location	Receptor Details	Predicted 24 hr AADT for 2005	Average Vehicle speed (kmph)	Distance to Receptor	% HGV
A20	Upper Newtownards Road, Belfast at Quarry Inn	No.2 adjacent to main carriageway	26943	(90kmph) Speed limit	10m	8
A20	Upper Newtownards Road, Belfast at Quarry Inn	No.4 approaching junction	26943	(30kmph) fast-flowing junction	10m	8
A20	Portaferry Road, Newtownards	No.2 approaching junction	11291	20kmph (congested junction)	5m	4
A21	Bangor Road and Donaghadee Road, Newtownards	No.2 approaching Junction from Bangor Road	Link 1: 23750 Link 2: 11196	20kmph (congested junction)	10m	Assume 8
A21	Bangor Road and Donaghadee Road, Newtownards	No.4 adjacent to junction on Bangor Road	Link 1: 23750 Link 2: 11196	20kmph (congested junction)	20m	Assume 8

A21	Newtownards Road, Comber	No.2 adjacent to main carriageway	14814	90kmph (speed limit)	10m	Assume 8
A21	Newtownards Road, Comber	No.4 approaching junction	14814	20kmph (congested junction)	5m	Assume 8
A22	Comber Road, Belfast, SE of New Line	No.2 adjacent to main carriageway	10737	90kmph (speed limit)	10m	4
A48	Donaghadee Road and Bnagor Road, Newtownards	No.2 approaching junction from Donaghadee Road	Link 1: 11196 Link 2: 23750	20kmph (congested junction)	15m	Assume 8
A48	Donaghadee Road and Bnagor Road, Newtownards	No.4 adjacent to junction on Donaghadee Roadm	Link 1: 11196 Link 2: 23750	20kmph (congested junction)	38m	Assume 8

NOTE:“24 hour AADT” is the annual average daily traffic based on a 7 day week

1. The predicted 24 hour AADT for 2005 is calculated by adding 2% to the existing 2002 figures following advice from the DoE Road Service.
2. Where average vehicle speed data is not available the speed limit is used, except for a junction where the speed is assumed to be 30kmph, or 20kmph for more congested junctions.
3. Where % HGV data is not available 8% is the assumed level following advice from the DoE Road Service.

The results for each road section’s modelling are shown in Appendix 3. These indicate that all of the road sections meet the air quality objectives Nitrogen Dioxide.

6.8 Conclusions for Nitrogen Dioxide

It is not necessary to proceed beyond a Stage 2/3 review and assessment to investigate further the NO₂ levels generated by those potentially significant sources located within neighbouring areas which may impact on the air quality within Ards.

The ongoing review and assessment of the impact of traffic sources on NO₂ levels in Ards, involved examining updated road traffic flow figures using the DMRB screening model and available nitrogen dioxide diffusion tube data. Monitoring results for 2001-2003 and the DMRB modelling results indicate that there is no need to progress to a detailed review and assessment of the impact of road traffic on NO₂ levels.

The results from NO₂ diffusion tubes as shown in appendix 1 indicate that the air quality objective for Nitrogen Dioxide has not been exceeded. Ards Borough Council will not be declaring an Air Quality Management Area for nitrogen dioxide.

6.9 Recommendations for Nitrogen Dioxide

It is recommended that Ards Borough Council do not proceed beyond a Stage 2/3 review and assessment to investigate further the NO₂ levels generated by those potentially significant sources located within neighbouring areas which may impact on the air quality within Ards.

Monitoring of NO₂ levels from road traffic should continue as part of the ongoing process of review and assessment.

7.0 Stage 2 and 3 Review and Assessment for PM10

7.1 Introduction

Particulate matter in the atmosphere is composed of a wide range of materials arising from a variety of sources. The major single source of particulate matter is the motor vehicle, with other major sources being industrial emissions and power stations and domestic and other low power combustion. These represent the primary PM₁₀ emissions.

Additional contributions to the atmosphere arise from secondary particles that are formed through chemical reactions involving nitrogen dioxide and sulphur dioxide in the atmosphere.

Further significant sources of 'coarse' or 'other' PM₁₀ include sea salt, road dust and wind blown soil.

Small particles less than 10µm in size have the greatest chance of reaching the lungs. Particles within this size range are known as PM₁₀. Particulate matter appears to be associated with a range of medical conditions including effects on the respiratory and cardiovascular systems; asthma; and mortality.

7.2 Standard and Objective for PM10

The two air quality objectives for PM10, are 40µg/m³ (gravimetric) as the annual mean, and 50µg/m³ (gravimetric) as the fixed 24-hour mean to be exceeded on no more than 35 days per year, to be achieved by the end of 2004.

7.3 The National Perspective

Significant progress in recent years, such as the introduction of modified diesel fuels and controls on industrial emissions of particles, has led to reductions in emissions of particles from both the transport and industrial sectors, with the total national UK emissions declining by nearly 40% between 1990 and 1999.

The controls on PM10 may not reduce concentrations sufficiently to meet the NAQS objective by 2004.

7.4 PM₁₀ Monitoring in the UK

PM₁₀ is monitored nationally as part of the automatic monitoring network. Monitoring data shows that the National Air Quality Standard of 50µg/m³ as a 24-hour running mean is currently exceeded at the vast majority of monitoring sites throughout the UK. These include both central urban sites and more remote monitoring in rural areas. (Broughton et al 1998).

There are currently 31 non-automatic PM₁₀ (8-port sampler) sites and six automatic monitoring sites in Northern Ireland. These are located in Belfast (one at Lombard Street and one at Clara Street); Londonderry (Brooke Park); Lough Navar and Newry (Monaghan Row and Trevor Hill). Results for 2000 and 2001 are summarised in Table 7.1 below, and show that all automatic sites meet the Air Quality Strategy objectives.

Table 7.1 Results from Automated PM₁₀ Monitors

Site	Calendar Year	Annual Mean µgm ⁻³	Max 24 Hour Mean µgm ⁻³	Daily means > 50 µgm ⁻³
Belfast Centre (Lombard Street)	2000	25	69	8
	2001	25	108	15
Belfast East (Clara Street)	2000	16	69	2
	2001	19	128	14
Lough Navar (Lough Navar Forest)	2000	12	35	0
	2001	13	41	0
Londonderry (Brooke Park)	2000	20	84	6
	2001	23	130	15
Newry (Monaghan Road)	2000	22	114	5
	2001	20	68	4
Newry (Trevor Hill)	2001	34	86	26

Source: Air Quality Monitoring in Northern Ireland, 2000-2001 (DoE & CEHOG)

7.5 PM₁₀ Monitoring in Ards and Neighbouring District Councils

As a result of the air quality review and assessment process there has been a significant expansion of monitoring in recent years with many Councils now starting to investigate air pollution levels in their areas.

Real-time monitoring of PM₁₀ is currently carried out in Ards Borough Council and in the neighbouring councils, Castlereagh Borough Council, Lisburn City Council and North Down Borough Council.

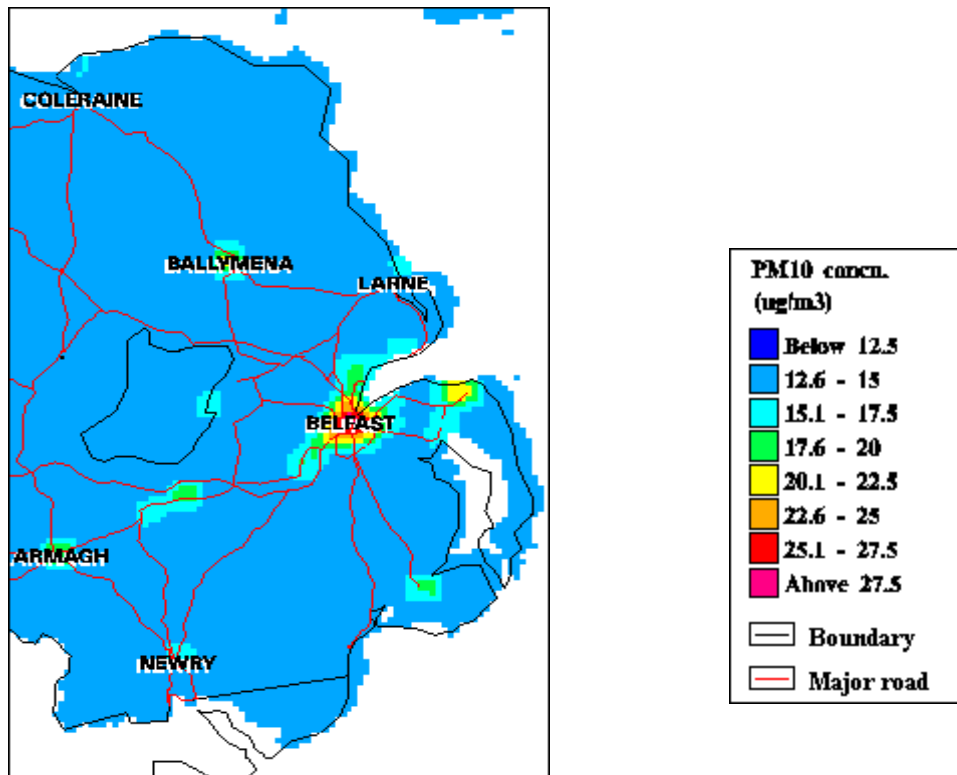
Since mid-2002, an automatic monitoring station has been located at an urban background site in the Glen Estate, Newtownards, to monitor PM₁₀ from the high density of coal burning houses in the area. PM₁₀ is monitored using a TEOM analyser. Monitoring results are presented and discussed in detail in Section 7.6.1 below.

Since November 2000, a semi-automatic eight-port bubbler has been located in the Scrabo Estate in Newtownards which is also an area with a high density of domestic coal burning. Bubbler data is presented in Appendix 3 and discussed in Section 7.6.1 below.

Figure 2 in the BMT Cordah Report (appendix 4) highlights the location of the SO₂ bubbler and the automatic monitoring station, figures 12 to 16 show that these monitoring stations are sited within the vicinity of the highest modelled concentrations.

National maps are available from the UK National Air Quality Information Archive which indicate estimated background concentrations across the UK in 1996 (see Figure 7.1 below). Using current information available from the Archive, the estimated background annual mean concentrations for PM₁₀ for 2004, for Ards Borough Council, are below 20 µg/m³.

Figure 7.1: PM₁₀ Background Concentrations in the UK, 1996



Source: The UK National Air Quality Information Archive

National maps are also available for secondary particulate concentrations in the UK in 1996, and they indicate that the estimated secondary particulate background concentrations for Ards are less than 8 µg/m³.

7.6 The situation in Ards Borough Council

7.6.1 Neighbouring Sources

The first stage review and assessment identified 3 potential significant sources of PM₁₀ within neighbouring areas which could impact on Ards. These were:

Knockbracken Healthcare Park, Castlereagh Borough Council
Ulster Hospital, Castlereagh Borough Council
Stoneyroad Incinerator (DANI), Belfast City Council

The incinerators located at the Ulster Hospital and Knockbracken have since closed and can be disregarded. The incinerator at Stoneyroad has now converted to natural gas and is not a potential significant source of PM₁₀.

The Technical Guidance Note LAQM.TG(03) does not include incinerators as a potential source of PM₁₀.

As a result it is not necessary to undertake further investigation of the potential sources of PM₁₀ located within neighbouring areas.

7.6.2 Road Traffic Sources

For the purposes of the Stage One review, data from the Annual Traffic Census Report 1998, published by the DoE Roads Service was used to assess traffic flows within Ards Borough Council. It was concluded that roads did not present a significant source of pollution in Ards. However, as the review and assessment of air quality is an ongoing process, the impact of roads on PM₁₀ has been examined in this report, using updated information.

There is no roadside monitoring for PM₁₀ undertaken within Ards. The updated data obtained from the DoE Road Service Annual Traffic Census Report 2002 (see Table 3.1), has been used to input into the Design Manual for Roads and Bridges to determine the impact of road traffic pollution.

7.6.3 Domestic Coal Burning

The first stage review and assessment identified the need to progress to Stage 2/3, to investigate further the risk of exceeding the objectives for PM₁₀ due to a high density of domestic coal burning within Ards.

The Stage 1 review and assessment of PM₁₀, was carried out using the simple screening methods recommended in Technical Guidance Note LAQM.TG4(00), and involved assessing the number of people per square kilometre within coal burning households in the area.

Data was obtained from the 1981 Population Census to determine an approximate number of houses depending on coal fired domestic heating within a designated 1km² area (Appendix 3). This was identified as the worst case area within Ards and covered older private sector houses within Newtownards town centre and the Glen Estate, which is predominantly public sector housing. It was recognised that the data was dated so it was necessary to determine if figures would have changed substantially since 1981.

As a result, information was obtained from the Northern Ireland Housing Executive, who carried out a survey of their housing stock in 1998, covering the same designated area. The survey included data on the main source of heating in households. In addition, a survey of 46 private houses within the same area was carried out by the Environmental Services Department. The information gathered supported the 1981 Census figures.

It was concluded that the density of people in households burning coal exceeded the level recommended by the guidance as presenting a risk of exceeding the objective for PM₁₀. As a result, a more detailed investigation of PM₁₀ levels from domestic coal burning was carried out and the methods used are presented in Section 7.6 below.

7.7 Assessment Methods and Results

7.7.1 Air Pollution Monitoring

Since mid-2002, an automatic monitoring station has been located at an urban background site in the Glen Estate, Newtownards, to monitor PM₁₀ using a TEOM analyser.

Unfortunately, data capture has been intermittent due to technical difficulties with the data logger which eventually required replacing. This caused a substantial amount of data to be lost. Since March 2003, data from the automatic monitoring site has been managed and ratified by NETCEN. It is this ratified data which will be discussed in this report.

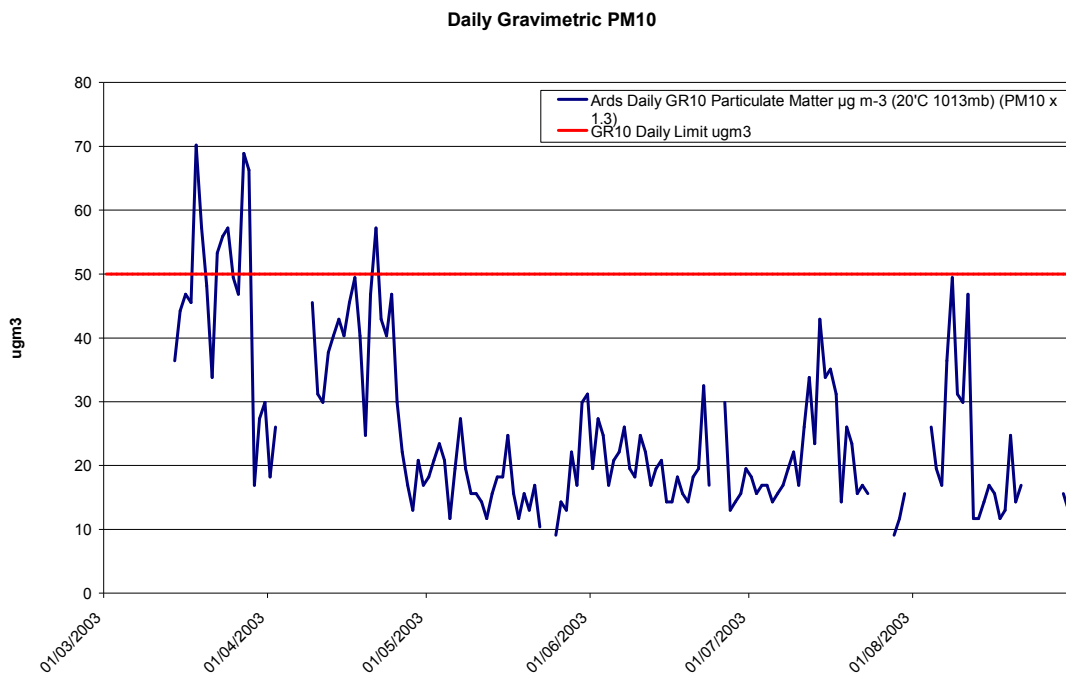
The reports provided by NETCEN for 2003, indicate that there have been only 12 exceedences of the fixed 24-hour mean of 50µg/m³ (gravimetric), which is within the objective of no more than 35 exceedences per year. The data capture for PM₁₀ is 92.9% of ratified data available for 2003. The annual mean is 19 µg/m³, with a maximum daily mean of 58 µg/m³.

The graphs (figure 7.2) below show the time series of ratified daily average PM₁₀ gravimetric concentrations (TEOM x 1.3) for 2003 and the 12 exceedences of the PM₁₀ air quality objective can be seen.

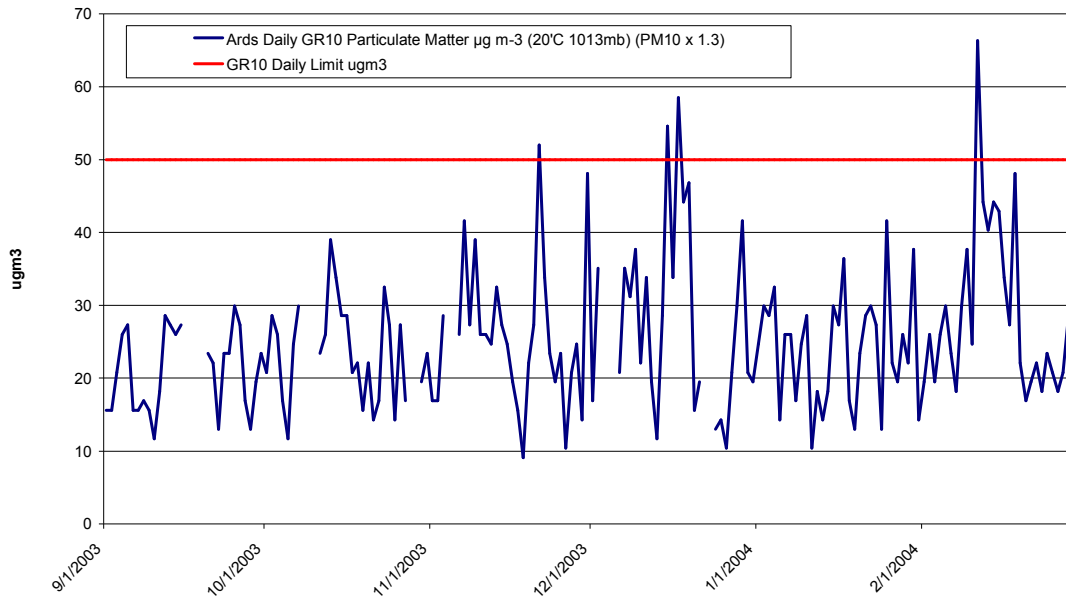
The Technical Guidance Note LAQM.TG(03) requires that a local authority should aim to be confident at the end of the review and assessment process that it has identified all locations and pollutants for which it is likely that the air quality objective will be exceeded.

Data obtained from the semi-automatic eight-port bubbler in the Scrabo Estate in Newtownards, can only be used to indicate levels of PM10 and data is presented in Appendix 3. The data indicates that there were more than the permitted number of 35 exceedences of the PM10 24-hour mean in 2001. In 2002, there were only slightly less than the 35 permitted exceedences of the 24-hour mean, however, there was a lack of data capture for a 3 week period over October and November due to servicing of the analyser.

Figure 7.2: Daily Gravimetric PM10 2003



Daily Gravimetric PM10



7.7.2 Fuel Usage Surveys

Two fuel usage surveys have been undertaken within Ards Borough Council by independent consultants employed to gather and collate the survey data.

The first survey was undertaken by PSc Consultants, Belfast, and was completed in April 2002. The survey investigated the levels of coal burning within the worst-case 1km² area identified by the Stage I review and assessment. This involved surveying approximately 1500 houses within Newtownards town centre and the Glen estate. The response rate was 51.5% (i.e. 805 properties). The questionnaire and the findings are presented in appendix 3. The survey results indicated a high level of solid fuel burning within this area with 34.4% of the households surveyed relying on coal for the main source of heating fuel.

A second survey was undertaken by Elite Training Services, Belfast, and was completed in April 2003. This survey extended to other areas of concern within Ards Borough Council. The survey covered the remainder of Newtownards town and the neighbouring town of Comber. Data was gathered and collated for approximately 1600 houses covering 13 wards comprising of over 16000 properties. The survey sample represented approximately 10% of the total number of houses within the wards surveyed. It should be noted, however, that there was a higher percentage of properties surveyed in some wards which are located more centrally in the towns surveyed. The original questionnaire was used and the findings are presented in appendix 3. The results indicate that 12% of properties surveyed relied on solid fuel for the main type of heating fuel.

The Council's geographical information system was used to help identify the location of any hot spots, where there was a heavy reliance on solid fuel as the main source of domestic heating. This highlighted two hot spots within Newtownards, notably the Glen and Scrabo Estates, which were known to have a high density of domestic coal burning. The Gregstown and Central wards within Newtownards, which were not areas of concern, were also identified as having a high density of domestic coal burning. The survey results were displayed on digital maps which can be seen in Appendix 3.

The three areas identified by the fuel usage surveys as having a heavy reliance on solid fuel as the main source of domestic heating will be investigated further using dispersion modelling.

7.7.3 Advanced Dispersion Modelling

The results from the dispersion modelling are included in the attached BMT Cordah report on assessment of domestic fuel emissions (see appendix 4 and the amendment report).

The areas of interest are presented on Ordnance Survey digital base maps showing contours of pollution levels and figure 1 of the amended report.

The amended BMT Cordah report concluded the predicted annual mean PM₁₀ concentration plots with Newtownards were over estimated, in the original report therefore based on the modelling contour plots it is unlikely that the 2004 annual NAQS objective for PM₁₀ will be exceeded as a result of domestic fuel burning.

The modelling predictions for 24-hour mean PM₁₀ concentrations were found to underestimate measured levels by 11% in areas of high estimated emissions and by 42% in areas of potentially diluted emissions. A contour plot of the predicted 90.4th percentile of 24-hour mean concentrations is included with the amended BMT Cordah report. The plot indicates that the 90.4th percentile of 24-hour mean PM₁₀ concentrations in areas of the Bradshaw Braes ward is close to the NAQS objective at 48ug/m³. Based on the model verification it was found that the model underestimated at the Glen monitoring station by a concentration by 11%. If an increase of 11% is applied to account for this under-read then the NAQS 24-hour mean objective of 50ug/m³ will be marginally exceeded.

7.7.4 DMRB Modelling

The Design Manual for Roads and Bridges, Volume 11, has been used to predict the annual average concentrations for PM₁₀, for six road sections within Ards. PM₁₀ concentrations were assessed against the 24 hour mean of 50 ug/m³.

The input data for the DMRB model was obtained from a number of sources. The information for the individual roads was obtained from the DoE Road Service Annual Traffic Census 2002 (see Table 3.1). The estimated traffic flow figures for 2005 were used as input data to model for the PM₁₀ 2004 objectives. As a result, it is likely that the modelled results are over-estimated. Geographical Information Systems (GIS) methodology was used to measure the nearest properties to the road sections assessed, thus identifying the most at risk receptors. The estimated annual mean background concentrations for pollutants modelled were obtained from the UK National Air Quality Information Archive.

Table 7.3 below details the input data for the DMRB locations modelled. The modelling sites chosen were governed by the available traffic data and where reasonable took into account road junctions that would cause delayed traffic thus increasing the pollution levels in those areas. Please note that for some road sections two locations were modelled to account for a receptor adjacent to a free-flowing section of a road and a receptor adjacent to a junction on the same road.

Table 7.3**Input Data for DMRB Modelling**

Road No.	Location	Receptor Details	Predicted 24 hr AADT for 2005	Average Vehicle speed (kmph)	Distance to Receptor	% HGV
A20	Upper Newtownards Road, Belfast at Quarry Inn	No.1 adjacent to main carriageway	26943	(90kmph) Speed limit	10m	8
A20	Upper Newtownards Road, Belfast at Quarry Inn	No.3 approaching junction	26943	(30kmph) fast-flowing junction	10m	8
A20	Portaferry Road, Newtownards	No.1 approaching junction	11291	20kmph (congested junction)	5m	4
A21	Bangor Road and Donaghadee Road, Newtownards	No.1 approaching Junction from Bangor Road	Link 1: 23750 Link 2: 11196	20kmph (congested junction)	10m	Assume 8
A21	Bangor Road and Donaghadee Road, Newtownards	No.3 adjacent to junction on Bangor Road	Link 1: 23750 Link 2: 11196	20kmph (congested junction)	20m	Assume 8
A21	Newtownards Road, Comber	No.1 adjacent to main carriageway	14814	90kmph (speed limit)	10m	Assume 8
A21	Newtownards Road, Comber	No.3 approaching junction	14814	20kmph (congested junction)	5m	Assume 8
A22	Comber Road, Belfast, SE of New Line	No.1 adjacent to main carriageway	10737	90kmph (speed limit)	10m	4
A48	Donaghadee Road and Bnagor Road, Newtownards	No.1 approaching junction from Donaghadee Road	Link 1: 11196 Link 2: 23750	20kmph (congested junction)	15m	Assume 8
A48	Donaghadee Road and Bnagor Road, Newtownards	No.3 adjacent to junction on Donaghadee Roadm	Link 1: 11196 Link 2: 23750	20kmph (congested junction)	38m	Assume 8

NOTE: "24 hour AADT" is the annual average daily traffic based on a 7 day week

1. The predicted 24 hour AADT for 2005 is calculated by adding 2% to the existing 2002 figures following advice from the DoE Road Service.
2. Where average vehicle speed data is not available the speed limit is used, except for a junction where the speed is assumed to be 30kmph, or 20kmph for more congested junctions.
3. Where % HGV data is not available 8% is the assumed level following advice from the DoE Road Service.

The results for each road section's modelling are shown in Appendix 4 These indicate that all of the road sections meet the air quality objectives for PM₁₀.

7.8 Conclusions for PM₁₀

The Technical Guidance Note LAQM.TG(03), requires the council to make a decision as to whether or not to declare an air quality management area. The monitoring results, together with the advanced dispersion modelling (taking into account the underestimation) show that the NAQS for PM₁₀ will be marginally exceeded. Therefore an Air Quality Management should be declared for PM₁₀ for Ards Borough Council.

7.9 Recommendations for PM₁₀

It is recommended that Ards Borough Council relocate the air quality monitoring station to a site within the predicted hot spot area and continue to monitoring, to confirm the location and magnitude of the exceedences. A further assessment should be carried out in 2005.

8.0 Stage 2 and 3 Review and Assessment for Sulphur Dioxide

8.1 Introduction

Sulphur dioxide is generated during combustion of fuels containing sulphur. The most significant source is fossil fuelled power stations, and other major sources include industrial emissions and commercial and domestic heating. Sulphur dioxide is a respiratory irritant, and high concentrations may cause breathing difficulties in people exposed to it.

8.2 Standards and Objectives for Sulphur Dioxide

The air quality standards and objectives for SO₂ include a 15-minute mean of 266µg/m³, not to be exceeded more than 35 times in a year by the end of 2005. In addition, a 1-hour mean objective of 350µg/m³, to be exceeded no more than 24 times per year and a 24-hour mean objective of 125µg/m³, to be exceeded no more than 3 times per year, to be achieved by the end of 2004.

8.3 The National Perspective

It is recognised that exceedances of the standard do occur in the vicinity of industrial processes for which the stack heights were designed to meet previous air quality standards and in areas where significant quantities of coal are used for space heating. Further measures than those applicable nationally may be required to achieve the air quality objective.

Discussions at European level on measures to combat acid rain will cut future Sulphur Dioxide concentrations, as will the introduction of low Sulphur diesel and its derivatives.

8.4 Sulphur Dioxide Monitoring in the UK

Sulphur dioxide is currently measured nationally through a variety of monitoring networks, including the automatic monitoring networks, the smoke and SO₂ network and the rural SO₂ network.

Most sites experience exceedances of the air quality standard for SO₂, however, the overall trend is downwards.

There are 34 non-automatic sites and five automatic sites located in Northern Ireland. The automatic sites include two in Belfast, one in Londonderry and two in Newry. These sites are part of the Government's automatic monitoring network. Results from the automatic sites in Belfast are presented in Table 8.1 below.

Table 8.1 Results from Automated SO₂ Monitors in Belfast

Belfast Centre						
Year	Max 15-minute mean ($\mu\text{g m}^{-3}$)	No. of 15-minute means > $266\mu\text{g m}^{-3}$	Max 1-hr mean ($\mu\text{g m}^{-3}$)	No. of 1-hr means > $350\mu\text{g m}^{-3}$	Max 24-hr mean ($\mu\text{g m}^{-3}$)	No. of 24-hr means > $125\mu\text{g m}^{-3}$
1999	378	5	338	0	90	0
2000	436	16	322	0	67	0
2001	301	2	253	0	69	0
Belfast East						
1999	601	98	487	5	152	5
2000	479	38	466	2	112	0
2001	450	139	399	13	226	5

Source: Air Quality Monitoring in Northern Ireland, 2000-2001 (DoE & CEHOG)

The levels recorded at the automated sites in Belfast are generally acknowledged as being the highest in the UK. This can be attributed to prevalent domestic solid fuel use.

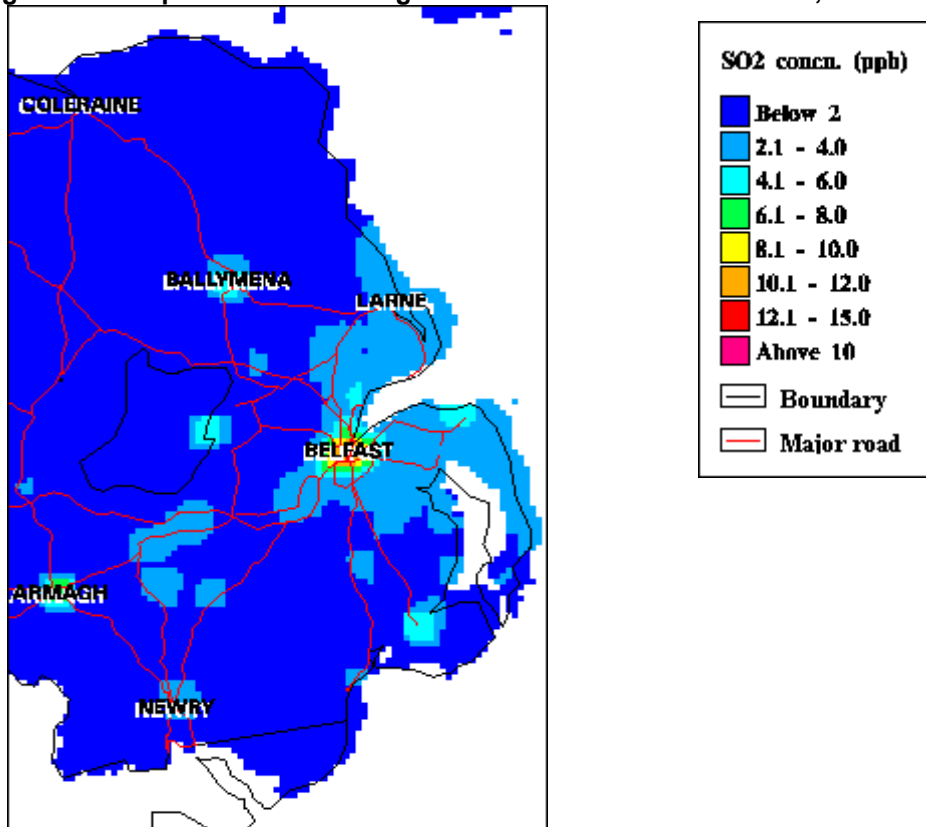
8.5 Sulphur Dioxide Monitoring in Ards and Neighbouring Local Authorities

Real-time monitoring of sulphur dioxide is currently carried out using a chemiluminescent analyser in Ards Borough Council and in the neighbouring councils, Castlereagh Borough Council, Lisburn City Council and North Down Borough Council.

Since November 2000, Ards Borough Council has measured sulphur dioxide using the semi-automatic 8-port bubbler sampler for measuring SO₂ (this equipment is also used to measure levels of suspended particulate matter as black smoke). This method samples on a 24-hour basis and results cannot be compared with air quality objectives based on shorter periods. It is useful as an indicative measurement of sulphur dioxide. The equipment is sited in the Scrabo Estate, Newtownards, which is a low lying housing area with a high density of domestic coal burning.

National Maps are available from the UK National Air Quality Archive which indicate estimated background SO₂ concentrations across the UK in 1996 (see Figure 8.1 below). The estimated background concentrations of SO₂ for the Ards area are below 4ppb. Using updated information available from the Archive the predicted estimated background SO₂ concentrations for 2001 in Ards Borough Council are below 4 µg/m³.

Figure 8.1: Sulphur Dioxide Background Concentrations in the UK, 1996



Source: The UK National Air Quality Information Archive

8.6 The situation in Ards Borough Council

8.6.1 Neighbouring Sources

The first stage review and assessment identified the following 3 potential significant sources of Sulphur Dioxide within neighbouring areas which could impact on Ards:

Knockbracken Healthcare Park, Castlereagh Borough Council
 Ulster Hospital, Castlereagh Borough Council
 Stoneyroad Incinerator (DANI), Belfast City Council

The incinerators located at the Ulster Hospital and Knockbracken have since closed and can be disregarded. The incinerator at Stoneyroad has now converted to natural gas and is not a potential significant source of sulphur dioxide.

The Technical Guidance Note LAQM.TG(03) does not include incinerators as a potential source of sulphur dioxide.

As a result it is not necessary to undertake further investigation of the potential sources of sulphur dioxide located within neighbouring areas.

8.6.2 Domestic Coal Burning

The first stage review and assessment identified the need to progress to Stage 2/3, to investigate further the risk of exceeding the objectives for sulphur dioxide due to a high density of domestic coal burning within Ards.

The Stage 1 review and assessment of SO₂, was carried out using the simple screening methods recommended in Technical Guidance Note LAQM.TG4(00), and involved assessing the density of coal burning houses in the area.

Data was obtained from the 1981 Population Census to determine an approximate number of houses depending on coal fired domestic heating within a designated 1km² area (see Appendix 3). This was identified as the worst case area within Ards and covered older private sector houses within Newtownards town centre and the Glen Estate, which is predominantly public sector housing. It was recognised that the data was dated so it was necessary to determine if figures would have changed substantially since 1981.

As a result, information was obtained from the Northern Ireland Housing Executive, who carried out a survey of their housing stock in 1998, covering the same designated area. The survey included data on the main source of heating in households. In addition, a survey of 46 private houses within the same area was carried out by the Environmental Services Department. The information gathered supported the 1981 Census figures.

It was concluded that the density of coal burning houses exceeded the level recommended by the guidance as presenting a risk of exceeding the objective for sulphur dioxide. As a result, a more detailed investigation of sulphur dioxide levels from domestic coal burning was carried out and the methods used and results are presented in Section 8.7 below.

8.7 Assessment Methods and Results

8.7.1 Air Pollution Monitoring

Since mid-2002, an automatic monitoring station has been located at an urban background site in the Glen Estate, Newtownards, to monitor sulphur dioxide using a UV fluorescence monitor analyser.

Unfortunately, data capture has been intermittent due to a technical difficulty with the data logger which eventually required replacing. Therefore a substantial amount of data has been lost. Since March 2003, data from the automatic monitoring site has been managed and ratified by NETCEN. It is this ratified data which will be discussed in this report. .

The reports provided by NETCEN for the period 2003, indicate that during this monitoring period there have been no exceedences of the 15-minute mean objective of $266 \mu\text{g}/\text{m}^3$, no exceedences of the 1-hour mean objective of $350 \mu\text{g}/\text{m}^3$ and no exceedences of the daily mean objective of $125 \mu\text{g}/\text{m}^3$.

The data capture for SO₂ is 96.7% of ratified data available for 2003. The maximum 15-minute mean 2003 is $137 \mu\text{g}/\text{m}^3$, the maximum 1-hour mean for this period is $116 \mu\text{g}/\text{m}^3$ and the maximum daily mean for this period is of $36 \mu\text{g}/\text{m}^3$. This monitoring data indicates that the air quality standards and objectives for 2004 and 2005 have not been exceeded.

Figures 8.2, 8.3 and 8.4 below show the time series of daily average SO₂ concentrations, 1-hour average concentrations and 15-minute average concentrations respectively, for 2003 and no exceedences of the SO₂ air quality objectives can be seen.

Figure 8.2 Time series of daily average SO2 concentrations

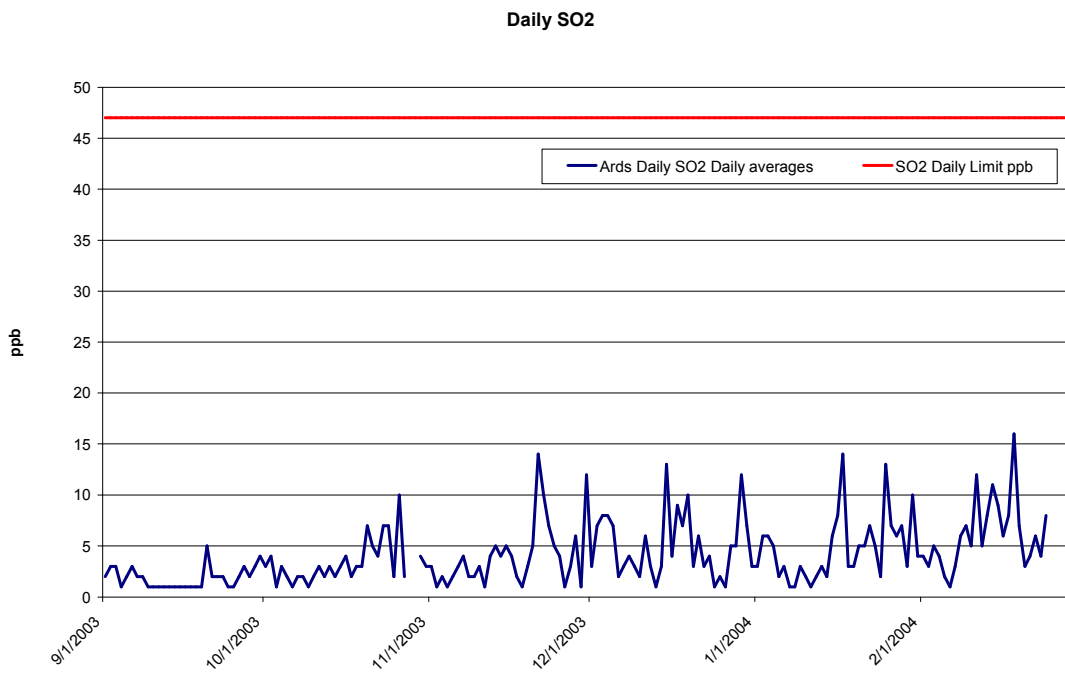
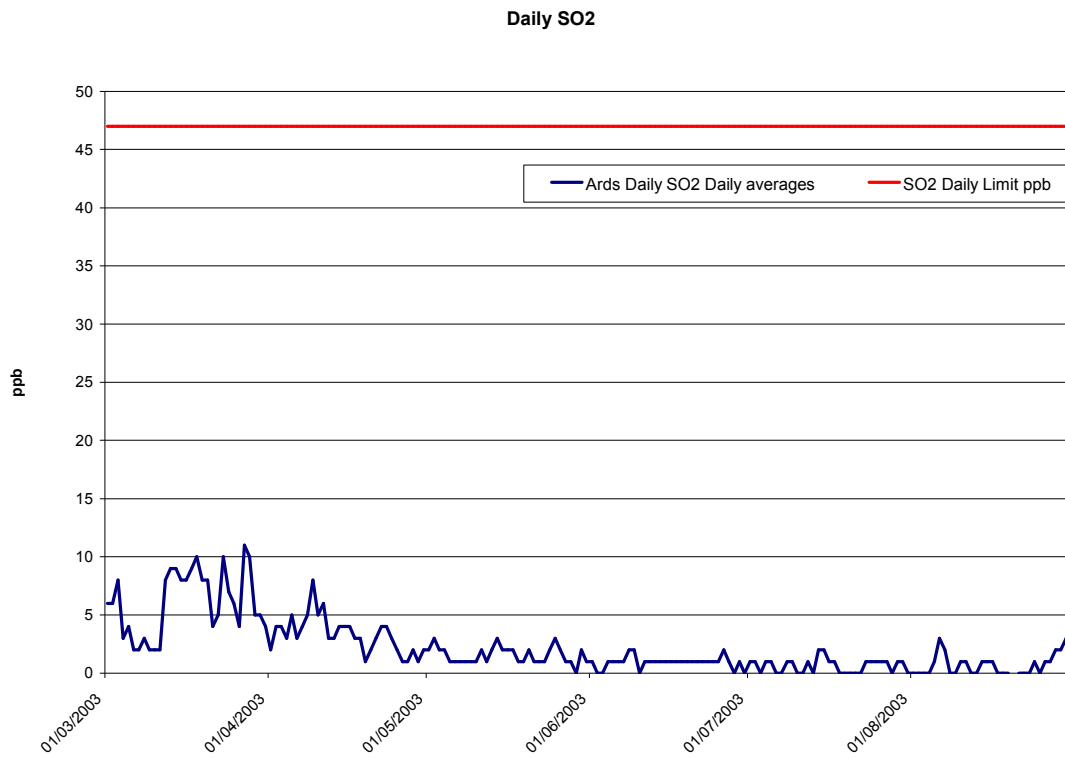


Figure : 8.3 Time series of 1-hour average SO2 concentrations

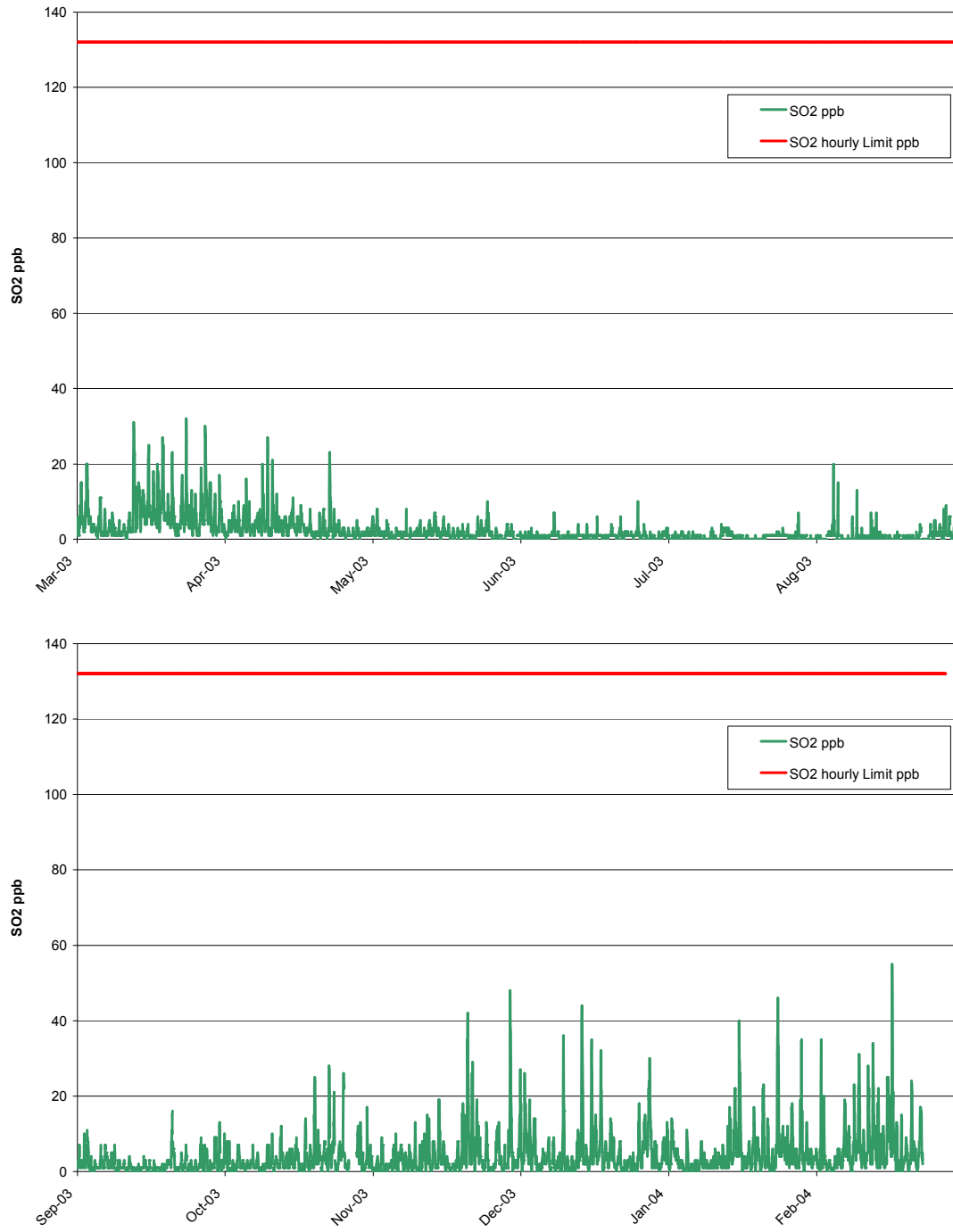
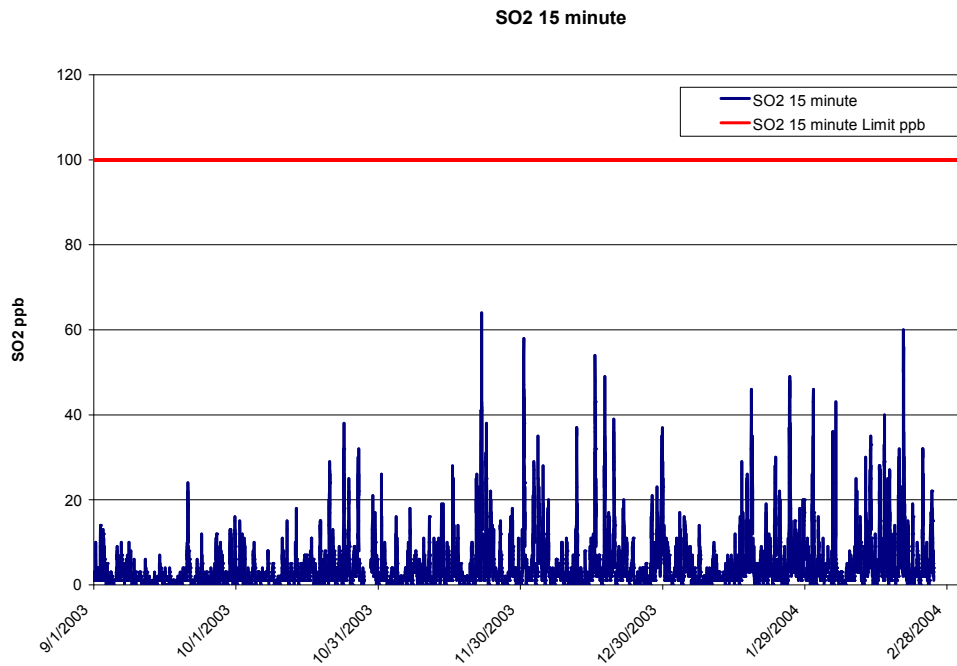
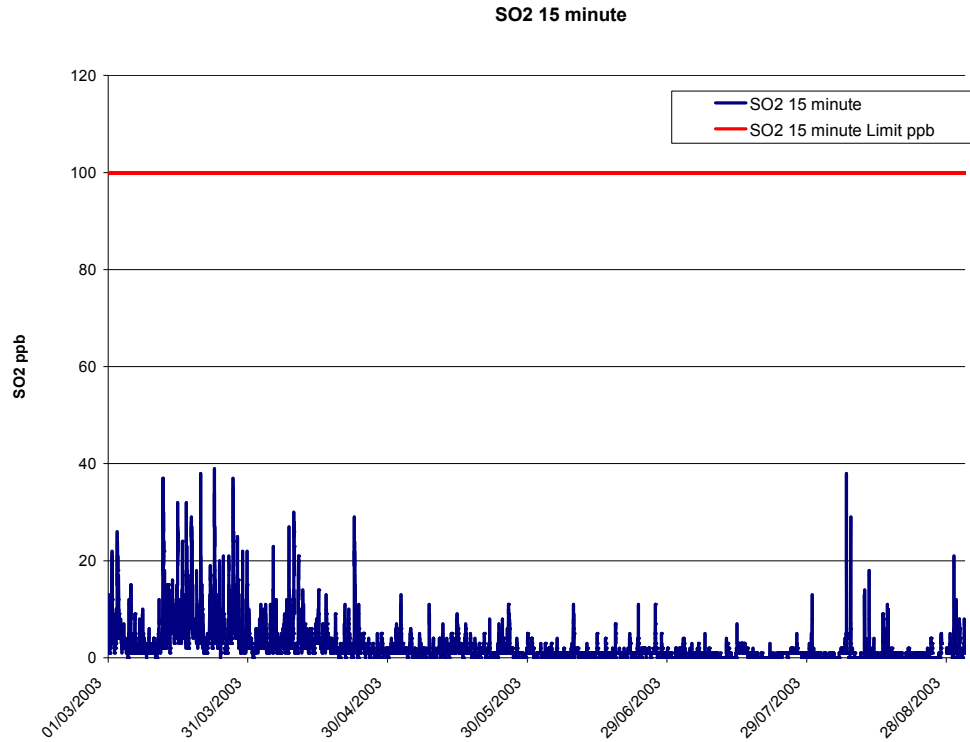


Figure 8.4 Time series of 15-minute average SO₂ concentrations



The Technical Guidance Note LAQM.TG(03) requires that a local authority should aim to be confident at the end of the review and assessment process that it has identified all locations and pollutants for which it is likely that the air quality objective will be exceeded. Based on the monitoring data and on the dispersion modelling the Council would have confidence to draw conclusions and make a decision on whether or not to declare an air quality management area.

Data obtained from the semi-automatic eight-port bubbler in the Scrabo Estate in Newtownards, can only be used to indicate levels of SO₂ and data is presented in Appendix 3. The data indicates no potential exceedances of SO₂ 24-hour mean objective in 2001 or 2002. It should be noted, however, that there was a lack of data capture for a 3 week period over October and November due to a technical fault with the analyser.

8.7.2 Fuel Usage Surveys

Two fuel usage surveys have been undertaken within Ards Borough Council by independent consultants employed to gather and collate the survey data.

The first survey was undertaken by PSc Consultants, Belfast, and was completed in April 2002. The survey investigated the levels of coal burning within the worst-case 1km² area identified by the Stage I review and assessment. This involved surveying approximately 1500 houses within Newtownards town centre and the Glen estate. The response rate was 51.5% (i.e. 805 properties). The questionnaire and the findings are presented in appendix 3. Briefly, the survey results indicated a high level of solid fuel burning within this area with 34.4% of the households surveyed relying on coal for the main source of heating fuel.

A second survey was undertaken by Elite Training Services, Belfast, and was completed in April 2003. This survey extended to other areas of concern within Ards borough Council. The survey covered the remainder of Newtownards town and the neighbouring town of Comber. Data was gathered and collated for approximately 1600 houses covering 13 wards, comprising of over 16000 properties. The survey sample represented approximately 10% of the total number of houses within the wards surveyed. It should be noted, however, that there was a higher percentage of properties surveyed in some wards which are more centrally located in the towns surveyed. The original questionnaire was used and the findings are presented in appendix 3. Briefly, 12% of the houses surveyed relied on solid fuel for the main type of heating fuel.

The Council's geographical information system was used to help identify the location of any hot spots, where there was a heavy reliance on solid fuel as the main source of domestic heating. This highlighted two hot spots within Newtownards, notably the Glen and Scrabo Estates, which were known to have a high density of domestic coal burning. The Gregstown and Central wards

within Newtownards, which were not an area of concern, were also identified as having a high density of domestic coal burning. The survey results were displayed on digital maps which can be seen in Appendix 3.

The three areas identified by the fuel usage surveys as having a heavy reliance on solid fuel as the main source for domestic heating will be investigated further using dispersion modelling.

8.7.3 Advanced Dispersion Modelling

The results given from the modelling for the areas of interest are included in the attached BMT Cordah report for assessment of domestic fuel emissions and the amendment report (appendix 4). Results are presented on Ordnance Survey digital base maps showing graded contours of pollution levels.

Based on the results of the verification study (amended BMT Cordah report) for the dispersion modelling, it can be concluded that the predicted sulphur dioxide concentrations are over estimated and are therefore a worse case scenario. The modelled results based on seasonally varying emissions show that there are no exceedences of the National Air Quality standards and objectives SO₂ for 2004 or 2005 at any location within the modelled area of Newtownards.

8.8 Conclusions for Sulphur Dioxide

The Technical Guidance Note LAQM.TG(03), requires the council to make a decision as to whether or not to declare an air quality management area. The monitoring results and the advanced dispersion modelling have indicated that the air quality statutory objectives for SO₂ will not be exceeded. Therefore an Air Quality Management area is not required.

8.9 Recommendations for Sulphur Dioxide

It is recommended that Ards Borough Council continue to monitor SO₂, for one year to allow for the SO₂ levels to be assessed in a progress report in 2005.

9.0 Conclusions and Recommendations for Ards Borough Council's Stage 2/3 Air Quality Review and Assessment

9.1 Conclusions

The Technical Guidance Note LAQM.TG(03), requires the council to make a decision as to whether or not to declare an air quality management area. It can be concluded that there is no need to progress beyond a Stage 2/3 Review and Assessment to investigate the impact of potential neighbouring sources on levels of Carbon Monoxide, Nitrogen Dioxide, and Sulphur Dioxide within Ards. However based on the results of the advanced dispersion modelling it is necessary to declare an Air Quality Management Area for PM₁₀ for Newtownards.

As part of the ongoing review and assessment process the impact of road traffic on levels of PM₁₀ and nitrogen dioxide has been examined in this report using updated information available from the Doe Road Traffic Census Report 2002. The DMRB modelling results indicate that road traffic does not require a more detailed assessment.

The 2003 NO₂ diffusion tube monitoring results, including data from two additional sites (table 6.2), indicate that the air quality annual mean limit value of 40 µg m⁻³, is currently being complied with and that the objective will be met by 2005. LAQM.TG (03) states that if the annual mean objective is met then the 1 hour mean is unlikely to be exceeded. Therefore Ards Borough Council will not be declaring an air quality management area for Nitrogen Dioxide.

The monitoring undertaken in Newtownards during 2003/2004 indicates that there are no exceedences of the NAQS objective levels for PM₁₀ in 2004 and SO₂ in 2005. This is not consistent with the modelled predictions across the whole assessment area of the borough. The model has predicted that the NAQS 24-hour mean objective of 50ug/m³ will be marginally exceeded. The predictions are therefore used in conjunction with the monitoring data as the basis for concluding that an AQMA should be declared for PM₁₀ for Ards Borough Council.

While local authorities in Northern Ireland are only required to compare concentrations of PM₁₀ with the 2004 objective, it should be noted that based on the data collected to date at the Glen automatic monitoring station, there are likely to be exceedences of the 2010 PM₁₀ objectives for both the 24 hour and annual mean objectives based on current emissions levels.

9.2 Recommendations

It is recommended that automatic monitoring station at the Glen community centre should be relocated to an area within the predicted hot spot of Bradshaw Brae. Monitoring PM10 and Sulphur Dioxide should continue in order to confirm the location and magnitude of the exceedences. Data will continue to be ratified and managed by NETCEN.

It is also recommended that the NO2 diffusion tube monitoring continues as part of the ongoing review and assessment process to assess the impact of road traffic on pollutant levels within Ards.

Appendices

Appendix 1

Table 1: Monitoring Results for Nitrogen Dioxide ($\mu\text{g m}^{-3}$) in Newtownards in 2001

	8 Court Street, Newtownards (Kerbside)	Rear of Town Hall, Newtownards (Kerbside)	7 Ash Grove, Newtownards (Urban background)	19 Islandmore, Newtownards (Urban Background)
January	23	21	8	9
February	27	24	9	12
March	14	5	18	n/a
April	16	13	5	3
May	24	14	5	5
June	27	22	6	6
July	19	15	5	3
August	31	27	8	7
September	26	23	9	7
October	24	28	8	9
November	36	34	13	13
December	35	31	13	15

Note: A Kerbside Site is 1-5 metres from the kerb of a busy road
 An Urban Background Site is greater than 50 metres from any busy road

Table 2: Monitoring Results for Nitrogen Dioxide ($\mu\text{g m}^{-3}$) in Newtownards in 2002

	8 Court Street, Newtownards (Kerbside)	Rear of Town Hall, Newtownards (Kerbside)	7 Ash Grove, Newtownards (Urban background)	19 Islandmore, Newtownards (Urban Background)
January	13	21	3	7
February	20	25	7	8
March	20	28	9	1
April	36	23	7	17
May	n/a	n/a	7	4
June	n/a	26	2	n/a
July	22	17	4	4
August	24	22	5	5
September	34	30	8	10
October	26	27	9	11
November	29	28	11	11
December	25	29	11	14

Note: A Kerbside Site is 1-5 metres from the kerb of a busy road
 An Urban Background Site is greater than 50 metres from any busy road

Table 3: Monitoring Results for Nitrogen Dioxide ($\mu\text{g m}^{-3}$) in Newtownards in 2003

	8 Court Street, Newtownards (Kerbside)	Rear of Town Hall, Newtownards (kerbside)	7 Ash Grove, Newtownards (Urban Background)	19 Islandmore Newtownards (Urban Background)	Belfast	A20
January	25.6	21.5	9	11.9	-	-
February	30.5	39.6	18.2	20.3	24.2	46.3
March	37.2	36.8	13.4	12.8	20.6	19.3
April	n/a	31.8	11.6	10	22.9	n/a
May	24.7	34	8.2	6.1	20.6	12.5
June	27.9	32/9	8.9	9.3	20	18.8
July	27.6	29.6	8.2	8.1	17.4	15.2
August	28	22.3	9.1	7.2	20.5	12.2
September	32	29	11.2	9.5	20.6	16.8
October	21.6	23.6	7.4	6,8	15.6	11.9
November	27.7	n/a	13.3	11.6	23	18.8
December	27.5	23.7	9.1	9.6	20	n/a

Note: A Kerbside Site is 1-5 metres from the kerb of a busy road
An Urban Background Site is greater than 50 metres from any busy road

Appendix 2: Lists of Part B and C Industrial Processes within Ards

Part B Industrial Processes

1. Airstep, Newtownards Road, Comber (Authorised)
2. Carpets International UK Ltd, High Bangor Road, Donaghadee (Authorised)
3. Miskelly Bros Ltd, Carrickmannon Quarry, Moss Road, Ballygowan (Authorised)
4. RMC Catherwood Ltd, Carrowdore Quarry Complex, Manse Road, Carrowdore (Authorised)
5. Technical Metals Ltd, 64 South Street, Newtownards (Authorised)
6. Whitemountain Quarries Ltd, Ballystockart Quarry, Ballystockart Road, Comber (Authorised)

Part C Industrial Processes

1. A1 Fuel Services, 181 Mill Street, Newtownards (Authorised)
2. Autobody, North Road, Newtownards (Application stage)
3. Ballygowan Service Station, 2 Saintfield Road, Ballygowan (Authorised)
4. Brae Service Station, 5 Church Street, Newtownards (Authorised)
5. Centra Donaghadee, 323 Beersbridge Road, Belfast (Authorised)
6. CE Stevensons & Son, 163 Moneyreagh Road, Ballygowan (Authorised)
7. Comber Costcutter, 31-37 Mill Street, Comber (Authorised)
8. Drome Filling Station, 17 Comber Road, Newtownards (Authorised)
9. Farrans Ltd, Ballybarnes Quarry, 61 Ballybarnes Road, Newtownards (Authorised)
10. Frances Street Service Station, 110-117 Frances Street, Newtownards (Authorised)
11. Hardford Link Service Station, Hardford Link, Newtownards (Authorised)
12. Hillview Service Station, 91 High Street, Portaferry (Authorised)
13. High Trees Filling Station, 28 New Road, Donaghadee (Authorised)
14. John Hagan & Son, 125/127 Movilla Road, Newtownards (Authorised)
15. S Kelly & Son, 39 Cooks Brae, Kircubbin (Authorised)
16. Maxol/Mace, 61 Harbour Road, Portavogie (Authorised)
17. Merron Oil & Fat, 4 Craigarodden Road, Portaferry (Authorised)
18. North Down Garage, 40 Belfast Road, Comber (Authorised)
19. Parkview Service Station, 57 Portaferry Road, Newtownards (Authorised)
20. Ready Mixed Concrete (Ulster) Ltd, North Road, Newtownards (Authorised)
21. Riverview Service Station, Killinchy Road, Comber (Authorised)
22. Rosevale Filling Station, 37-55 Bangor Road, Newtownards (Authorised)
23. Safeway Petrol Station, Ards Shopping Centre, Newtownards (Authorised)
24. Shop 4 You, 56 Donaghadee Road, Newtownards (Authorised)
25. Spar, Carrowdore, PO Box 49, Hightown Avenue, Newtownabbey (Authorised)
26. Spar Filling Station, Donaghadee Road, Newtownards (Authorised)
27. Strickland Brothers, 2A Newtownards Road, Comber (Authorised)
28. Watson's, 2 The Square, Cloughey (Authorised)

Appendix 3: Maps Charts & Graphs

- a) Most densely populated square kilometre in Ards Borough Council**
- b) 2002 & 2003 Fuel use survey results**
- c) DMRB Output sheets**
- d) Smoke & Bubbler readings 2001 – 2003**

**Appendix 4 : BMT Cordah Stage 2& # Air quality Assessment of Domestic
Fuel Emissions**

References

1. DoE, The United Kingdom National Air Quality Strategy
2. Review and Assessment: Monitoring Air Quality (LAQM.TG1(00))
3. Review and Assessment: Emission Inventories (LAQM.TG2(00))
4. Review and Assessment: Selection and Use of Dispersion Models (LAQM.TG3(00))
5. Review and Assessment: Pollutant Specific Guidance (LAQM.TG4(00))
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8. Broughton GFJ, Bower JS, Clark H and Willis PG (1998) Air Pollution in the UK:1996
9. Framework for Review and Assessment of Air Quality LAQM.G1
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N02 results 2003

